QST

October 1983 $2.50

devoted entirely to Amateur Radio

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

1983 National Convention
Houston, Texas

the tempo S-15

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

The S-15 is the kind of hand held most people want. Simple, rugged, reliable, easy to use...it's the hand held for today and tomorrow. The S-15 offers a full 5 watts of power...power that extends your range and improves your talk power. The S-15 operates from 140 to 150 mHz (and 150 to 160 on export models). Compare that to the others. Its state-of-the-art integrated circuitry provides far more reliability and ease of maintenance than conventional circuitry...just one more indication of the kind of quality that goes into the S-15.

Consider all of these features before you decide on any hand held:

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

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

Available soon!!
The CS-15.. a new version of the S-15.. for commercial use.

- ✶ FCC type accepted
- ✶ Fully synthesized
- ✶ Ultra compact, portable
- ✶ Internally programmable
- ✶ Full 5 watt output
- ✶ 10 MHz receiver coverage

TEMPO M-1
Superb quality VHF marine band hand held. Synthesized for world wide use.. all marine channels & 4 weather channels. Ch 16 override. All offsets built in.

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

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

Available at your local Tempo dealer or from..

54 YEARS OF SERVICE

Henry Radio

2050 S. Bundy Dr., Los Angeles, CA 90025 (213) 820-1234
931 N. Euclid, Anaheim, CA 92801 (714) 772-9200
Butler, Missouri 64730 (816) 679-3127

TOLL FREE ORDER NUMBER: (800) 421-6631
For all states except California.
Calif. residents please call collect on our regular numbers.

Expand and Protect Your RTTY Text

DSK 3100

DSK3100-DS3100ASR-ST6000 SYSTEM

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

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

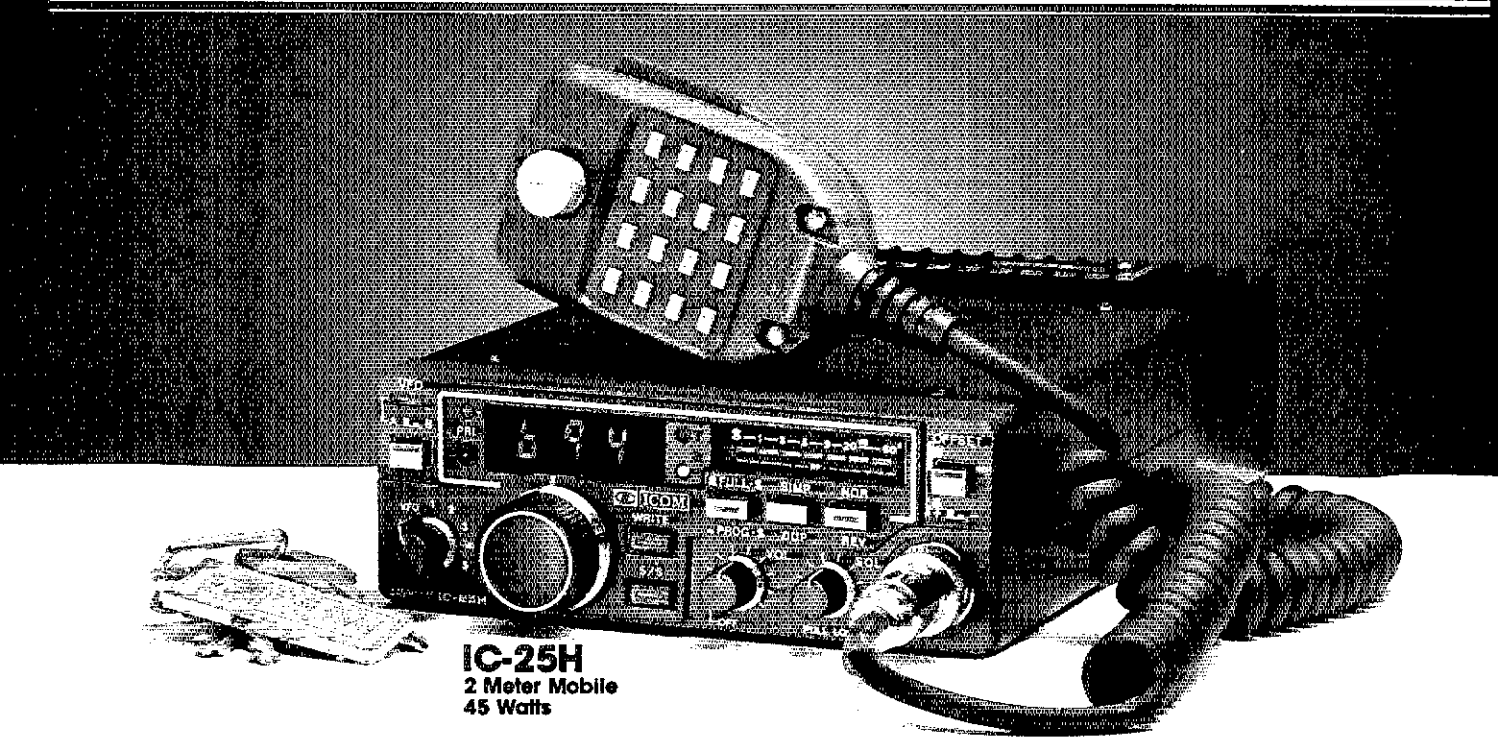
The DSK3100 adds non-volatile memory and extended storage features you, our customer, need. Rather than designing a new product to replace it, we have again up-dated the DS3100 to make it truly the most advanced and user-friendly RTTY system sold. With the addition of the DSK3100, the DS3100 remains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

HAL

HAL COMMUNICATIONS CORP.
BOX 365
URBANA, IL 61801 • (217) 367-7373 • TWX 910-245-0784 (HALCOMM URB)

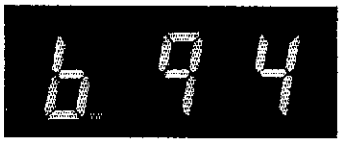
ICOM IC-25H

45 Watts of Compact Power



IC-25H
2 Meter Mobile
45 Watts

45 watts / green LED readout / compact size / touchtone® scanning microphone / 2"H x 5½"W x 8¾"D / 2 VFO's / 5 memories make the IC-25H the best 2 meter mobile value on the market.



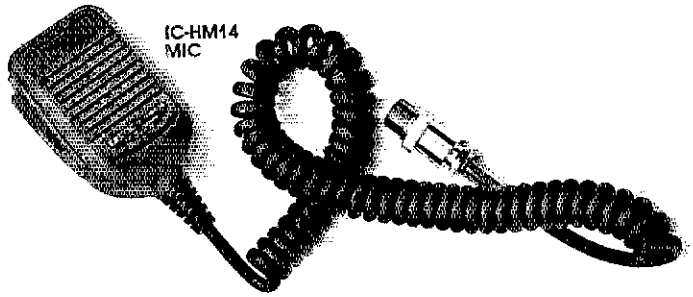
New Green LED. Easier to read in bright sunlight, and not glaring at night, the IC-25A's new readout provides good visibility under all conditions.

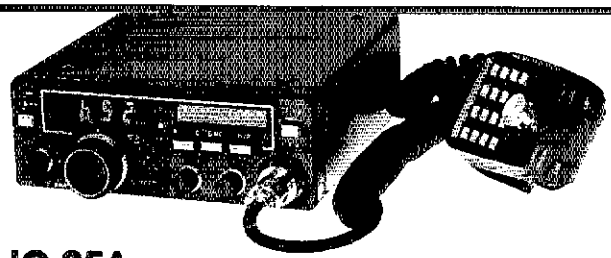
Dual VFO's. Dual VFO's give an extra stored frequency for scanning (memory scan scans 5 memories plus 2 VFO's) and each VFO has a different tuning rate for easy QSY.

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

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

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





IC-25A
25 Watts / 2 meters

The IC-25A is a very compact 2 meter FM mobile. Only 2"H x 5½"W x 7"D, the IC-25A features a green LED readout which is visible in any lighting condition, a touchtone® / scanning microphone and 25 watts of output.

These standard features have made the IC-25A the most popular 2 meter mobile on the market.

Scanning. Pushing the S/S button initiates the scan circuitry. With the mode switch in a memory position the unit will scan all 5 memories plus the 2 VFO frequencies. With the mode switch in a VFO position, the unit will scan the entire band or the portion of the band defined by memories 1 and 2.

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155** / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-2780**

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. **25H883**

October 1983 *Volume LXVII Number 10*

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NEWS AND FEATURES

OPERATING

DEPARTMENTS

MORE PERFORMANCE FOR YOUR DOLLAR!

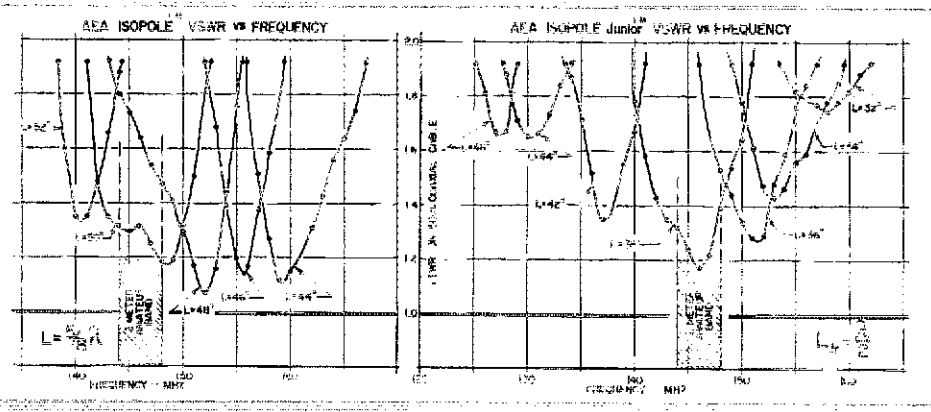
COMPETITORS KNOW ABOUT THE ISOPOLE™

DO YOU? STUDY THE FACTS . . .

ISOPOLE 440

The IsoPole antenna is building a strong reputation for quality in design and superior performance. Innovative IsoPole conical sleeve decouplers (pat. pend.) offer many **new** design advantages.

All IsoPole antennas yield the **maximum gain attainable** for their respective lengths and a zero degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane and present an unsightly bird's roost with an inevitable "fallout zone" below. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other when used with SWR protected solid state transceivers.



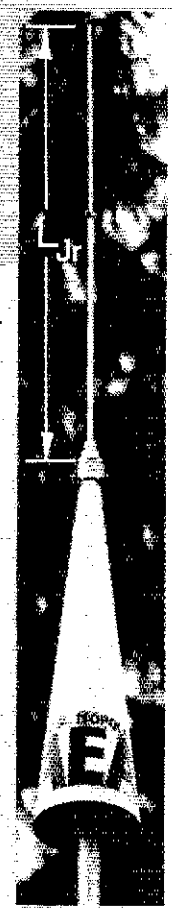
Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station antenna. A standard Amphenol 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole, you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. All IsoPole antennas are D.C. grounded. The insulating material offers superb strength and dielectric properties, plus excellent long-term ultra-violet resistance. All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is **not supplied**).

IsoPole antennas have also become the new standard for repeater applications. They all offer low angle of radiation, low maintenance, easy installation, and low cost with gain comparable to units costing several times as much. Some repeater installations have even eliminated the expense of a duplexer by using two IsoPole antennas separated vertically by about twenty feet. This is possible because of the superior decoupling offered by the IsoPole antennas.

The IsoPole antenna is now available in a 440 MHz version which is fully assembled and tuned.

Our competitors have reacted to the IsoPole, maybe you should too! Order your IsoPole or IsoPole Jr. today from your favorite Amateur Radio Distributor.

ISOPOLE 144
ISOPOLE 220
MAST NOT SUPPLIED



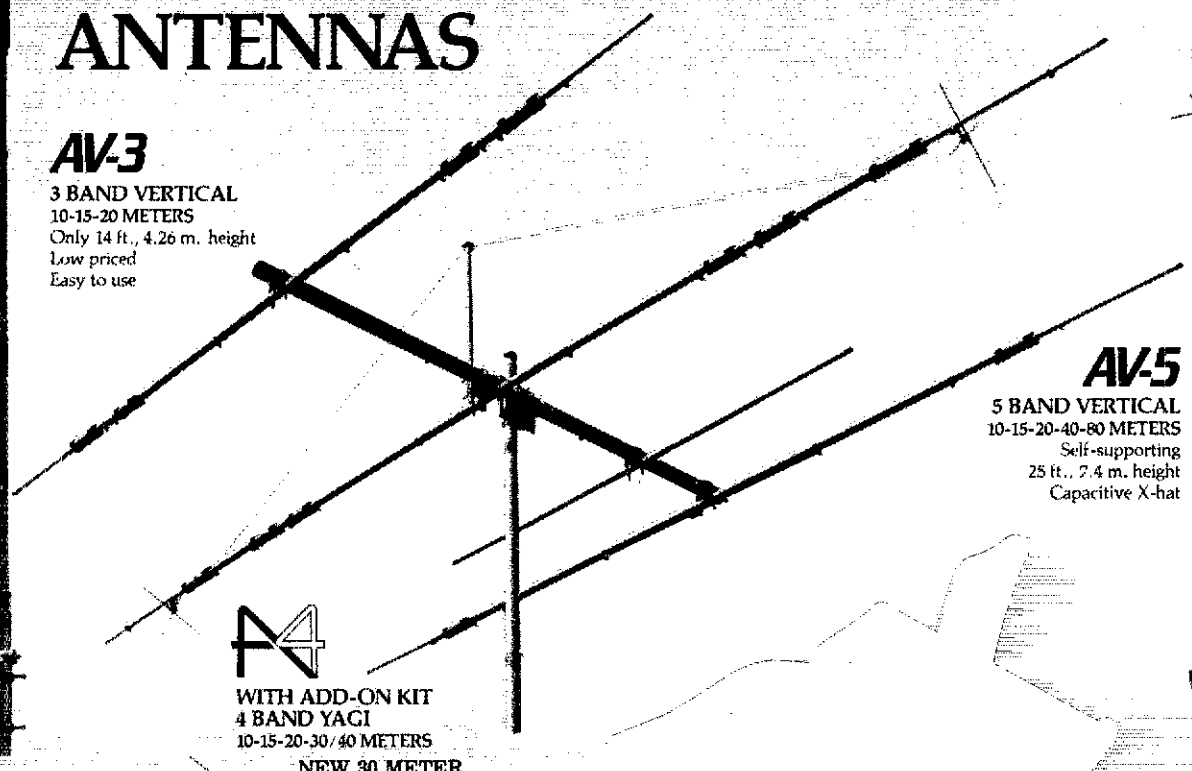
ISOPOLE 144JR
ISOPOLE 220JR
MAST NOT SUPPLIED

AEA Brings you the Breakthrough!

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

CUSHCRAFT HF MULTIBAND

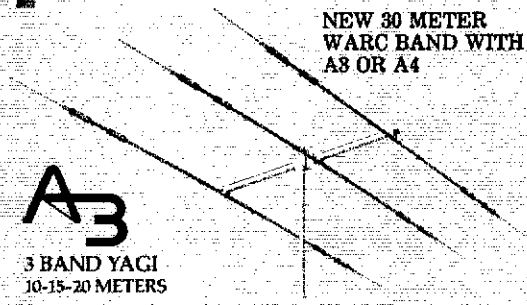
CONTEST WINNING ANTENNAS



AV-3
3 BAND VERTICAL
10-15-20 METERS
Only 14 ft., 4.26 m. height
Low priced
Easy to use

AV-5
5 BAND VERTICAL
10-15-20-40-80 METERS
Self-supporting
25 ft., 7.4 m. height
Capacitive X-hat

A4
WITH ADD-ON KIT
4 BAND YAGI
10-15-20-30/40 METERS
NEW 30 METER WARC BAND WITH A3 OR A4



A3
3 BAND YAGI
10-15-20 METERS

R3
3 BAND VERTICAL
10-15-20 METERS
No radials
Remote tuning
Better than average performance
22 ft., 6.7 m. height

THE CHOICE, A FAVORITE FOR DX-PEDITIONS

The world renowned Cushcraft HF Multiband antennas are chosen time after time for DX-peditions to far corners of the globe. Their excellent gain, outstanding radiation pattern, 2kw power rating, easy assembly, and high strength-clean profile aluminum construction enable the adventurous DX-er to travel further and make more contacts.

For your home QTH, DX-pedition, field day, or contest select a high performance Cushcraft antenna available through dealers worldwide.

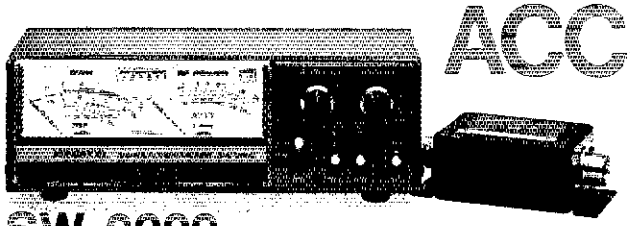
A3
Broadband, excellent gain and f/b ratio, 2 kw power rating direct 50 Ω feed, Boom 14 ft., 4.26 m., longest element 28 ft., 8.5 m, weight 27 lbs., 12.9 kg., turn radius 15.5 ft., 4.7 m., mast dia. 1¼ in. to 2 in., 3.18 cm. to 5.08 cm., material 6063-T832 seamless aluminum.

A4
Broadband, excellent gain and f/b ratio, 2 kw power rating, direct 50 Ω feed, boom 18 ft., 5.48 m., longest element 32 ft., 9.7m., weight 37 lbs., 16.8 kg., turn radius 18 ft., 5.48 m., mast dia. 1¼" to 2 in., 3.18 to 5.08 cm., material 6063-T832 seamless aluminum.

cushcraft
CORPORATION

THE ANTENNA COMPANY
P.O. Box 4680
Manchester, NH 03108 USA
TELEX 953050

ACCESSORIES

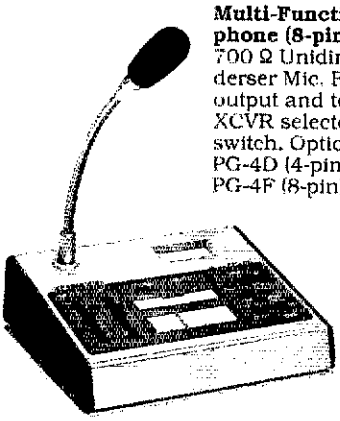


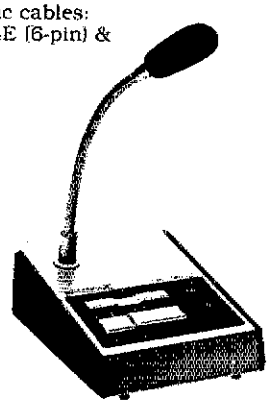
SW-2000

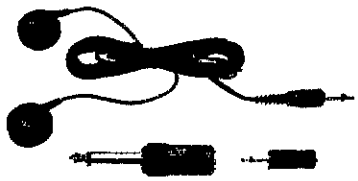
160~6-m 2 KW SWR/PEP-POWER Meter
Up to 3 separate directional couplers may be connected. (One SWC-3 is supplied.) Optional couplers: SWC-2 (2-m/70-cm, 200 W) & SWC-3 (160~6-m, 2 KW).

MC-85

Multi-Function Desk Top Microphone (8-pin)
700 Ω Unidirectional Electret Conderser Mic. Built-in mic-amp with output and tone control, meter, XCVR selector and UP/DOWN switch. Optional mic cables: PG-4D (4-pin), PG-4E (6-pin) & PG-4F (8-pin).





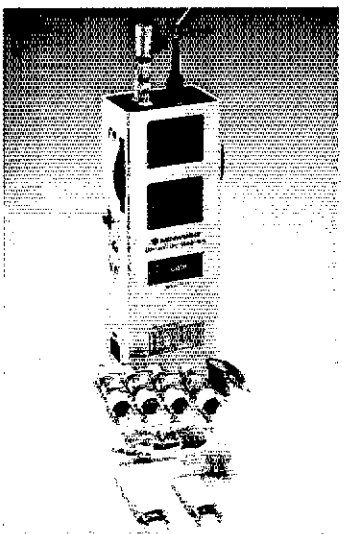


HS-7

Micro Headphones (16 Ω)
Ultra light weight and portable ear-fitting headphones supplied with two audio adaptor plugs.

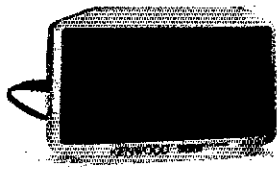
MC-80

Desk Top UP/DOWN Microphone (8-pin)
700 Ω Unidirectional Electret Conderser Mic. with "FLEX" type boom. Built-in mic-amp and UP/DOWN switch. Optional mic plug adaptors: MJ-84 (8p-4p) & MJ-86 (8p-6p).



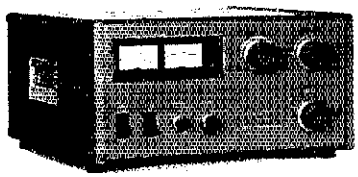
DM-81

700 kHz-250 MHz Dip Meter
All solid-state and built-in battery.



SP-50

High Quality External Mobile Speaker

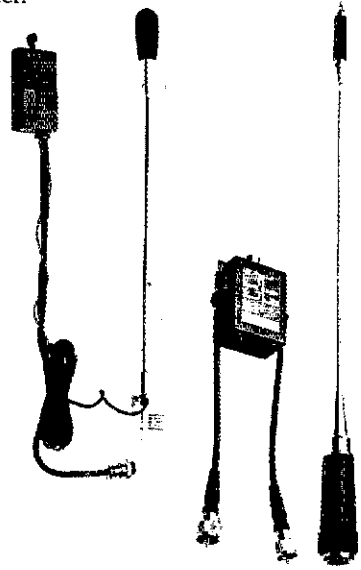


TL-922A

160~15-m 2 KW PEP/1 KW DC Input Linear Amplifier
Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.

MC-55 (8P/6P)

Mobile Microphone (8-pin or 6-pin)
700 Ω Electret Conderser Mic. with flexible boom, and separate STAND-BY box built-in UP/DOWN switch and 5 minute Time-Out-Timer.

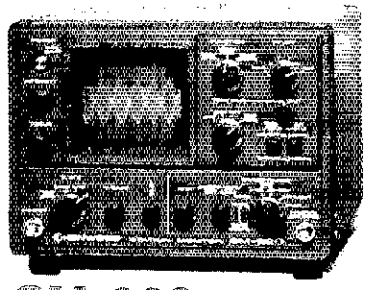


MA-4000

2-m/70-cm Dual-Band Mobile Antenna
5/8λ dB gain for 2-m and stacked 5/8 λ dB gain for 70-cm. Duplexer is supplied.

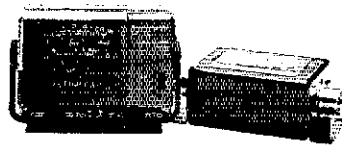
PC-1A

Phone Patch (FCC Part 68 registered)



SM-220

Station Monitor/High-Performance Oscilloscope
Pan-display capability with optional BS-8 (for TS-830S/820S/180S) or BS-5 (for TS-520 series). Transmitted waveforms and/or receiving signal waveform monitor. Built-in 2-tone generator.



SW-100A/B

A: 160-m~2-m, B: 2-m ~70-cm, 150 W SWR/POWER/VOLT Meter
Compact design with separate coupler, ideal for mobile use. Built-in 0-20 V volt meter.

MICROPHONES:
- **MC-60A** Deluxe desk top microphone with UP/DOWN switch, (8-pin) Pre-amplifier, 500/900 Ω
- **MC-60N4** Deluxe desk top microphone (pre-amp. not included), (4-pin) 50 k/500 Ω
- **MC-50** Desk top microphone, 50 k/500 Ω (4-pin)
- **MC-48** 16-key autopatch UP/DOWN microphone, (8-pin)
- **MC-46** 16-key autopatch UP/DOWN microphone, (6-pin)
- **MC-42S** Hand microphone with UP/DOWN switch, (8-pin)
- **MC-35S** Noise-cancelling hand microphone, 50 k Ω (4-pin)
- **MC-30S** Noice-cancelling hand microphone, 500 Ω (4-pin)

MICROPHONE CABLES:
- **PG-4A/4B/4C** For MC-60A/60N4, PG-4A(4-pin)/4B(6-pin)/4C(8-pin)
- **PG-4D/4E/4F** For MC-85, PG-4D (4-pin)/4E(6-pin)/4F(8-pin)

MICROPHONE PLUG ADAPTORS:
- **MJ-48** (4-pin mic to 8-pin XCVR)
- **MJ-84** (8-pin to 4-pin)
- **MJ-86** (8-pin to 6-pin)

HEADPHONES:
- **HS-6** Lightweight headphones
- **HS-5** Deluxe headphones
- **HS-4** Standard headphones

GENERAL PURPOSE DC POWER SUPPLIES:
- **KPS-7A** 13.8 VDC, 7.5A intermittent
- **KPS-12** 13.8 VDC, 12A intermittent
- **KPS-21** 13.8 VDC, 21A intermittent

ANTENNAS:
- **RA-3** 2-m 3/8 λ Telescoping antenna with BNC connector
- **RA-5** 2-m 1/4λ/70-cm 5/8 λ Telescoping dual-band antenna with BNC connector

Other accessories:
- **RD-20** Dummy load, 50 Ω, DC-500 MHz, 50 W intermittent
- **SP-40** Compact external mobile speaker
- **AL-2** Lightning & static protector, 50 Ω 1 KW output
- **PG-3A** DC line noise filter for mobile

SERVICE MANUALS:
- Available for most transceivers, receivers, and major accessories.

NOTE: Prices and specifications of all Trio-Kenwood products are subject to change without prior notice or obligation.

KENWOOD

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

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

TM-201A/TM-401A

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

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

TM-201A/TM-401A FEATURES:

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

TM-201A/TM-401A accessories:

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

TM-401A subject to FCC approval

TW-4000A

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

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

TW-4000A FEATURES:

- **2-m and 70-cm FM in a Compact Package** Covers the 2-m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70-cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).
- **Large, Easy-to-Read LCD Display**
- **25 Watts RF Power on 2-m/70-cm.**
- **Opt. "Voice Synthesizer Unit"** Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Front Panel Illumination**
- **10 Memories with Offset Recall and Lithium Battery Backup**
- **Programmable Memory Scan**
- **Band Scan in Selected 1-MHz Segments**
- **Priority Watch Function**
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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

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

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

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

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

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

Deregulation and Amateur Radio

Most of us approve of the objectives of our government in its current deregulation program: Removal of unnecessary government constraints, smaller government and lower taxes.

However, many — perhaps most — government regulations have come into being as a means of correcting or controlling some condition in which the public interest was at stake. Their removal, therefore, must be accomplished with skill and sensitivity if a net improvement is to be gained. Even those changes we agree are needed will involve adjustment and accommodation, as is apparent from the impact of deregulation upon several areas of industry.

In Amateur Radio, we have seen the effects of deregulation in a number of FCC actions, past and pending: Removal of logging requirements, ten-year licenses, increased flexibility in digital communications and the transfer of license examination responsibilities to volunteers.

The last, in particular, has been regarded with some misgivings and concern by many in the amateur community. A review of the circumstances may be in order.

First, it should be acknowledged that the Amateur Radio license examination program conducted by the Federal Communications Commission once was widely considered to be satisfactory. Although not always convenient for those living in the hinterland, the program generally was regarded as providing adequate examination opportunities.

In recent years, however, opportunities for amateur examinations have steadily declined both in number and location. Inadequate budgets were advanced by FCC as the reason, and efforts to correct that situation have proven unsuccessful.

The possible use of volunteer assistance to fill this growing need led to Congressional action that would enable the Commission to take such a step. ARRL supported the legislation as a means of assuring future flexibility in lending volunteer support in areas essential to the well-being of the Amateur Radio Service, as well as to legitimize the long-standing Novice volunteer examination program, which was under fire as being technically in violation of the Communications Act. It should be emphasized that initiative for the action stemmed from the Commission's growing inability to carry on a satisfactory examination program, rather than from any wish on the part of the League to assume a new burden for the amateur community.

The proposed shift to a volunteer examination program for radio amateurs has prompted widespread anxiety for the continued sanctity of the examination process. Many of us recall abuses perpetrated by a few self-seekers under the old Conditional licensing program, and there is justifiable apprehension regarding prospects for the integrity of a new all-volunteer undertaking. We all share that concern.

During the past few months, through the mechanism provided by FCC PR Docket No. 83-27, ARRL representatives have been working with Commission personnel to develop the framework of a volunteer examination procedure that will (1) respond to the FCC licensing requirements, (2) discourage abuses, and (3) be practical to implement with a minimum cost. At every step along the way, *QST* has reported on the progress being made and has invited member comment on the many thorny issues to be faced. A special committee of the ARRL Board of Directors has been monitoring progress to ensure compliance with the desires of the Board.

The program currently envisioned calls for one or more Volunteer Examination Coordinators (VEC) to oversee details of the program; this will include development and periodic revision of examination questions, printing and mailing of examination documents to the field, maintaining accurate records of certified examiners, and preparing advisory information to enable issuance of licenses by FCC.

As currently administered by FCC, the program costs the taxpayer many hundreds of thousands of dollars. Opportunities for improved efficiency and economies in the overall administration of the program appear to exist. Nevertheless, there will remain certain program administrative costs that cannot be avoided: Postage, paper and printing, in addition to the salary of personnel to oversee and maintain program administration.

If ARRL is to be the Volunteer Examination Coordinator for the new program, it is confronted with the option of absorbing out-of-pocket costs currently estimated at $200,000 *per year* or finding some way to recover at least a portion of them.

The Board of Directors has expressed the view that League members should not be required to bear the entire burden of payment for the examination of all amateurs. The Board has endorsed the concept of the ARRL serving as the VEC, but has called for additional steps to ensure a source of adequate funding.

A nominal charge to each examinee appears to be the most reasonable approach. However, it now appears that the best way to do this is through additional Congressional enabling action. An effort is being made to seek such legislation.

By the time this appears in print, FCC is expected to have issued its Report and Order in PR Docket No. 83-27. This will set forth the rules under which FCC and the Volunteer Examination Coordinator(s) will negotiate agreements covering administration of the program. Once past this hurdle, we can expect implementation of the new program in a matter of weeks. The expanded opportunities thus provided for taking amateur examinations should be a significant boost for Amateur Radio. — *V. C. Clark, W4KFC*

League Lines...

Space Shuttle orbit information! Dr. Owen Garriott, W5LFL, will operate 2-meter fm aboard the Space Shuttle Columbia Mission STS-9 on the following dates and orbits: October 30, Orbits 39 and 40; October 31, Orbit 47; November 1, Orbits 63 and 64; and November 2, Orbits 77, 79 and 80. August QST, page 50, gives details of how to work the first ham operator in space. The exact frequencies are listed in the September and October issues of QST, Amateur Satellite Program News column. A special phone line is being installed at ARRL Hq. to provide daily updates as the mission progresses. The new phone number will be announced on W1AW bulletins and other amateur news sources.

If a TV station plans to cover your attempt to work W5LFL during the STS-9 flight, please ask it to donate a 3/4 inch U-matic copy of the coverage to ARRL for use in the post-flight version of "Amateur Radio's Newest Frontier." Please send the cassette along with a release form to "New Tape," Public Information Coordinator, ARRL Hq.

Harold R. Richman, W4CIZ, of the ARRL RFI Task Group, is revising the RFI Assistance List, which gives points of contact for TV, radio, stereo and other electronic-device manufacturers who are willing to help consumers with interference complaints involving their products. We would like to hear from you if you can provide information that would be helpful in compiling the list. Can you suggest any manufacturer who should be on the list? Do you know a point of contact or phone number of that manufacturer? Write to W4CIZ, either at his Call Directory address or in care of ARRL Hq.

The new Volunteer Examiner Program is coming. The changeover from FCC Field Office test sites to more-local examination opportunities requires plenty of volunteer examiners. Join the hundreds who have stepped forward already. Send nominations (include name, license class, call, full address and phone number) to ARRL Headquarters, Attn: Curt Holsopple, K9CH, Volunteer Examiner Program Manager.

W. Dale Clift, WA3NLO, has been appointed to the position of Assistant to the General Manager. As a member of the General Manager's immediate staff, Dale will have responsibility for projects designated by the General Manager, with particular attention to providing support in the area of Washington representation. Membership Services Manager Hal Steinman, K1ET, has appointed Richard K. Palm, K1CE, to the position of Deputy Membership Services Manager, the position left vacant by Dale's promotion.

Promotions within ARRL Hq. have created an opening in the Membership Services Department for the position of Membership Services Assistant. This is a nontechnical, generalist position requiring excellent oral and written communications skills, an Amateur Radio license and familiarity with FCC rules. Contact Membership Services Manager Hal Steinman, K1ET, ARRL Hq.

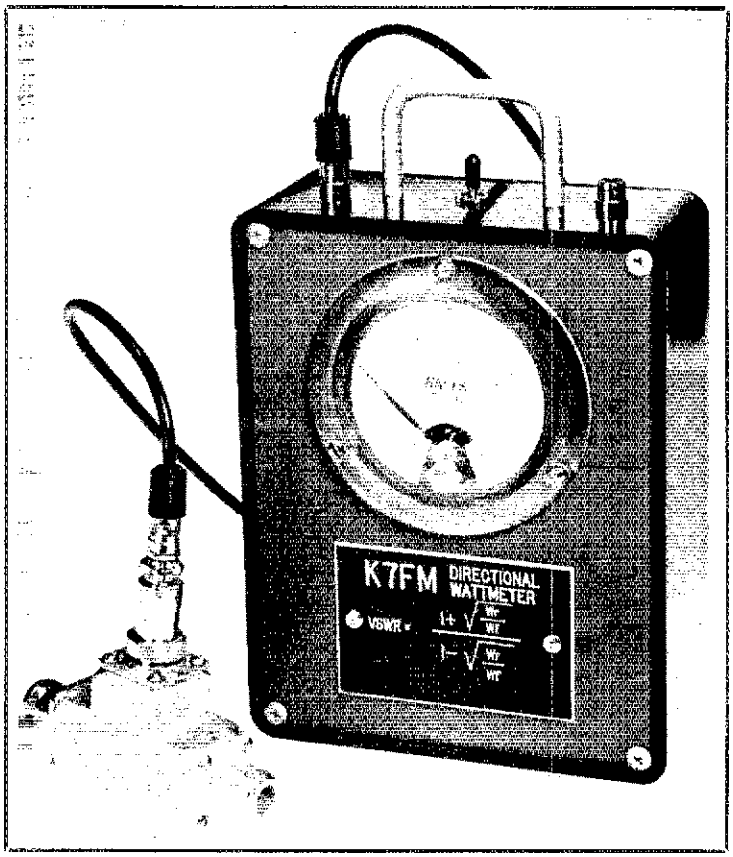
The ARRL Hq. Communications Department has an opening for Assistant Communications Manager for Contests. Organizational and writing skills, coupled with a keen interest in contest operating, are required. Contact Communications Manager John Lindholm, W1XX, at ARRL Hq.

RCA reports an overwhelming response to its free QSL offer. It will fill all requests, but please allow time beyond the four to six weeks specified in the August QST ad.

Attention repeater owners and operators: Register your repeater with Hq. so that it will be listed in the new 1984-1985 Repeater Directory. Entries must arrive at Hq. no later than November 1. Form CD-240 is very convenient for registering, and it's available from ARRL Hq. for just an s.a.s.e.

At Any Moment: Amateur Radio and Disaster Preparedness is a new videotape produced under the auspices of Coronado, California Police Chief Gerald W. Boyd, WA6CUP, and ARRL. If you really want to reach people with the message of Amateur Radio public service, you'll want this tape. Contact the ARRL Hq. Film Library to obtain a copy of At Any Moment (available on VHS or U-Matic format). Please specify which version you want: VT-26-L (appropriate for ham audiences) or VT-26-S (more fitting for the general public).

New Ideas for the VHF Wattmeter



You say that good vhf/uhf wattmeters are expensive? Not this one!

By Colin Lamb,* K7FM

A calibrated, directional wattmeter is treasured by the vhf/uhf enthusiast. Commercial equipment is accurate, but expensive — and most often cannot be used remotely.

The line sampler described over a decade ago in *QST* by McMullen, W1SL, has become a classic in homebuilt directional couplers.[1] It can be built from inexpensive, common plumbing parts, but I decided to construct it differently, avoiding the need for a blowtorch and also to allow for a reversible sensing element. Before attempting to build the unit, you should review McMullen's original article (or a subsequent description in *The ARRL Antenna Book* or *FM and Repeaters*) for construction technique and theory.

Construction

This wattmeter can be built using only simple hand tools, and calibrated to the same accuracy as many commercial units. The line sampler is built around a 1/2-in. *square stock* brass "T" fitting (Fig. 1).[2] This common plumbing item has exactly the same width as the flange of a type N or uhf connector. Since the ID of the T fitting is actually 3/4 in., a piece of 5/16-in.-OD copper tubing is used as the inner conductor, which turns the T into a 50-ohm section of transmission line.

The T should be drilled and tapped to a 4-40 thread for the coaxial connectors (Fig. 1). Use a punch to line up the holes before drilling. When tapping, do not turn the tap more than 1/2 turn without backing it off to clear the threads. After the holes

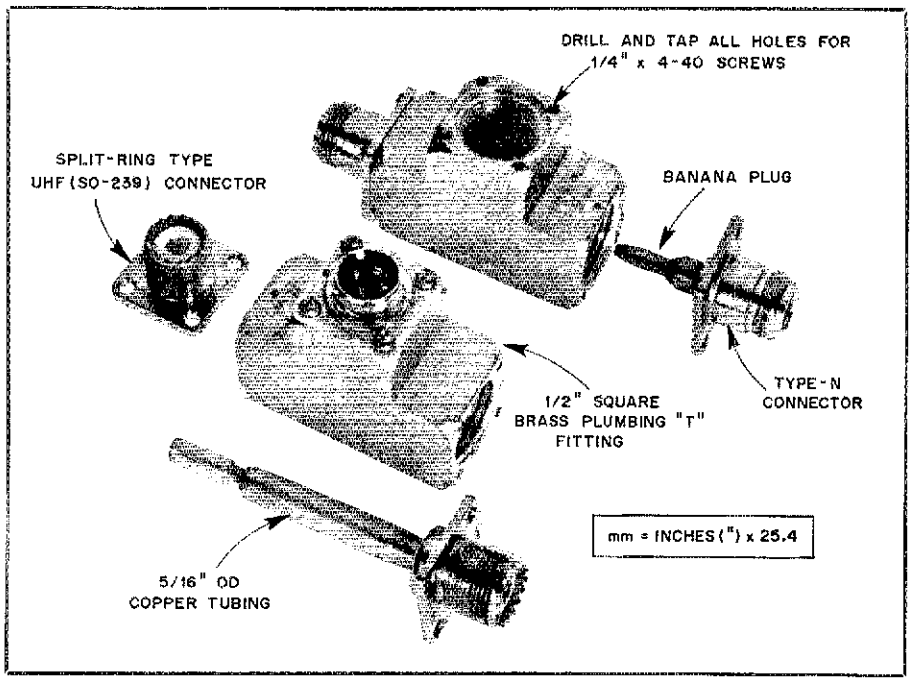


Fig. 1 — Exploded view of two line samplers, illustrating various construction techniques. The sampler at the top uses type-N coaxial connectors, and a banana plug/jack combination for the center conductor. In the bottom sampler, split-ring uhf (SO-239) connectors are used.

[1]Notes appear on page 13.
*Rte. 1, Box 65A, Newberg, OR 97132

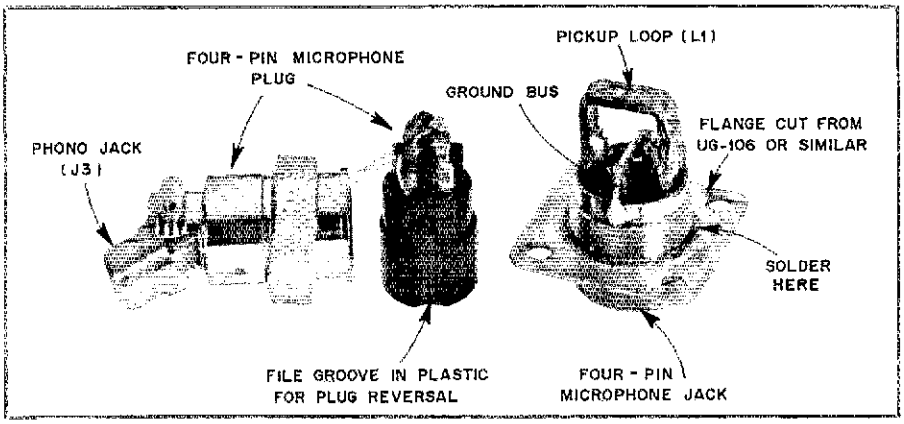


Fig. 2 — Detail of the pickup loop and detector assembly. See text for details.

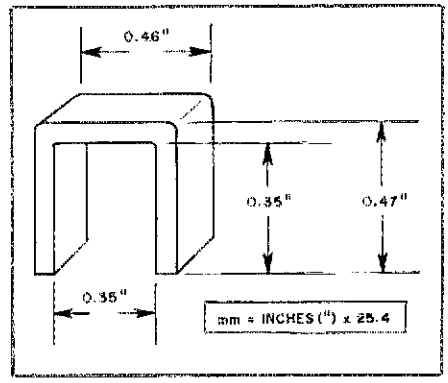


Fig. 3 — Dimensions of the pickup loop, L1. It is constructed from tinned shield braid taken from RG-59/U cable.

are completed, 1/4-in. long 4-40 brass screws are used to hold the connectors in place.

Since the coaxial connectors cannot be soldered after assembly, it is necessary to secure the inner conductor by an alternative method. I prefer to use an N connector that has a removable center pin retained by a split-ring washer. This is the method described in McMullen's article. However, most N connectors available today do not use a split-ring retainer. Fortunately, Amphenol still makes one; the part no. is 82-368. This item is approximately twice the price of a regular N connector, because it is silver plated and has a gold-plated center conductor. If you use the split-ring method of construction, it is only necessary to use one of the special connectors per sampler.

I have found that many of the more common uhf (SO-239) connectors have split-ring retainers. These have been found in surplus stores, and seem to be salvaged from imported CB equipment. If you wish to use these, remove the retainer and center pin. Ream out the dielectric just enough so that the pin can be reinserted from the back. Since the center pin is soldered to the 5/16-in. tubing, this provides a rigid method of construction.

A third method of assembly uses a banana plug and jack along the center conductor. By using this method of construction, any type of coaxial connector can be employed. The banana plug should be installed near one of the coaxial connectors, and you should try to use one with a diameter of approximately 5/16 in. to avoid an impedance bump in the line. I tried this method, and at first considered it inferior because it contained an unsoldered joint. Upon afterthought, I realized that *every* coaxial connector relies on an unsoldered joint, so this method is not such a bad one after all!

Probe and Pickup Loop Assembly

The diode and pickup loop (L1) termination are located inside a nonpolarized plug that allows forward and reflected power readings by merely reversing it (Fig. 2). My first probe assembly was housed in a twin-contact uhf plug and jack set, and worked perfectly. Externally, these plugs and jacks look like standard uhf fittings, but have two small-diameter pins inside. Amphenol still manufactures them, but they must be specially ordered. Because they are difficult to purchase, I substituted a four-conductor microphone connector set — and it also works fine. As purchased, the plug is polarized. To allow reversal, remove the plastic insert and file a groove opposite the existing one. It is wise to use a plug that secures the metal shield to the plastic with a setscrew, avoiding rotation of the shield after assembly. The socket half should be soldered onto a coaxial hood (UG-106, UG-372, or UG-177) that has had the flared portion sawed off.

I constructed the pickup loop (L1) by stretching and flattening out a piece of RG-59/U shield braid and filling it with solder (Fig. 3). This makes a loop that is just a bit wider than necessary, but easy to file down for calibration purposes. The loop is soldered between pins 1 and 3 of the socket, while pins 2 and 4 are soldered to ground (Fig. 4). The plug must be wired with sufficient care so that all the components will fit inside the shield. Miniature capacitors are necessary, and 1/4-W resistors easily fit, although there is sufficient room for 1/2-W types. Pin 2 of the plug must be removed to provide space for the 1-kΩ resistor.

A panel-mount phono jack designed for a 1/4-in. mounting hole is used as J3, facilitating connection of the shielded cable to the meter. All the components are first soldered to the plug, and an insulated wire from C2 is left to connect to the phono jack. The shield is installed and the wire is soldered to J3. Tighten the microphone-

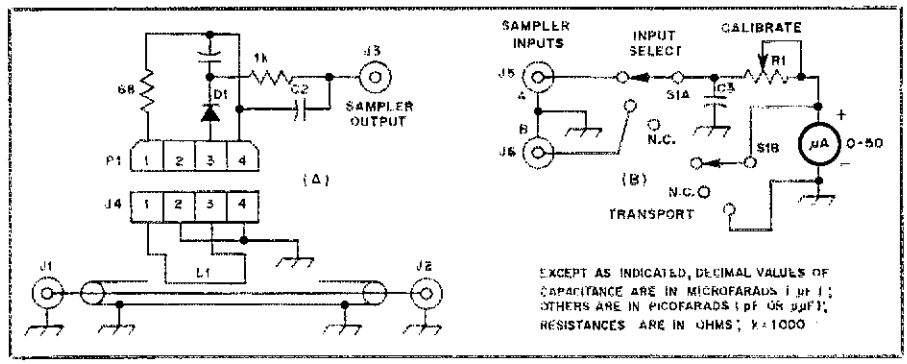


Fig. 4 — Schematic diagram of the complete wattmeter. As wired, the meter will show *reflected* power when the load is at J2.

C1 — 200-500 pF miniature disc-ceramic or Mylar® capacitor.
C2 — 500-1000 pF miniature disc-ceramic or Mylar® capacitor.
C3 — 0.005-μF disc-ceramic capacitor.
D1 — 1N34, 1N60, 1N270 or equiv. germanium diode.
J1-3, J5, J6 — Phono jack (Radio Shack 274-346).
J4 — Four-pin, chassis-mount, microphone socket (Radio Shack 274-002).
L1 — Pickup loop (see text).
P1 — Four-pin microphone plug with setscrew.
R1 — 50-kΩ, linear-taper potentiometer.

plug cable clamp around the threads of the phono jack for a perfect fit.

Calibration

Install the pickup-loop assembly into the T fitting, oriented so that it is parallel to the copper tube. Connect a 50-Ω dummy load to J2 and a vhf transmitter to J1. Orient the microphone plug to read *reflected* power. Set R3 to mid-position, and apply between 10 and 25 W of drive. Note the reflected power reading, and remove the pickup-loop assembly from the T. File the pickup loop a bit narrower, and reassemble. Check the reflected power again, and continue this procedure until the meter reads zero. This operation matches the impedance of L1 to that of the terminating resistor R1.

The easiest way to calibrate for power level is to place a wattmeter of known accuracy in series with your homemade unit. Apply power and adjust R3 until both meters coincide. R3 may then be replaced by a fixed-value resistor. You may calibrate your entire meter scale in this manner. A 2-meter multimode rig is ideal for this operation, since most usually have continuously variable output power.

My meter scale was made photographically, but you can produce one by any method you prefer. I chose 5 W for full-scale deflection, as this permits me to do all my antenna work with a portable 2-meter transceiver. It is a simple matter to increase the meter power range by inserting a spacer between the probe assembly and the T fitting. To determine the proper spacing, thread studs into the 4-40 holes and place nuts on them. Use the nuts to change the spacing until the desired meter power range is reached. Replace the studs and nuts with a permanent spacer. Since voltage at the diode is constant, meter calibration should remain the same, regardless of the power level applied. Just remember that the power reading of this wattmeter will only be correct for the band in which it was originally calibrated, although the linearity will be correct. To change bands, a scale multiplier can be used, or a spacer can be inserted to decrease the sensitivity of the instrument to the next higher calibrated range. The meter can also be used on the hf bands, but sensitivity decreases so that the minimum full scale reading will be considerably greater than 5 W.

Final Notes

The remote meter assembly includes a switch that should be used to short out the meter during transportation. I have also provided switching for the use of two different inputs. By constructing two samplers, you can use both of them simultaneously in remote locations, and switch between them at the meter. When both samplers are used in the forward mode, you can, for example, easily determine transmission-line loss.

The engraved plastic label was obtained because I can never remember the formula for SWR! One can be purchased for a few dollars from an engraver. This adds a final, professional touch to a project that I'm sure you will enjoy. Also, my thanks to Roy Mather, K7DFV, who took the photographs for this article.

Notes

[1]T. McMullen, "The Line Sampler," *QST*, April 1972, p. 21.
[2]mm = in. × 25.4.

Colin Lamb, K7FM, was first licensed as K7GYF at the age of 13. By profession, he is a lawyer and holds BA and JD degrees from Willamette University. Colin serves as president of the Chehalem Valley Amateur Radio Club, and maintains a homebuilt, wind-powdered fm repeater. The rest of Colin's station is also homebuilt and powered by two additional wind generators.

New Books

DISKGUIDE™ SERIES

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The three microcomputer DiskGuides summarize all BASIC and operating system statements, commands and keywords. Apple EXEC files and PEEK and POKE locations, and ATARI 400/800 PEEK and POKE locations and sound and graphics programming are covered in their respective guides. Information concerning EDLIN is included in the IBM PC booklet.

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Apple II DiskGuide by Zelda Gifford, $7.95; *IBM PC DiskGuide* by David A. Wilson, $8.95; *CP/M DiskGuide* by Curtis Ingraham, $8.95; *VisiCalc DiskGuide* by David A. Wilson, $6.95; *ATARI 400/800 DiskGuide* by John Taylor, $7.95. — *Paul K. Pagel, N1FB*

A Tunable CW Filter

Cascaded band-pass filters with voltage controlled center frequencies yield a cw filter with high selectivity and low ringing.

Richard A. Nelson,* WBØIKN

The benefits of an outboard audio filter in improving cw reception have been documented during recent years, and several designs have been examined in the literature.[1] Unfortunately, most of these filters suffer from at least one of two drawbacks: ringing and a fixed center frequency. Among the simple band-pass filter designs, the state-variable filter (also known as the biquad filter) is particularly useful because of simple construction, ease of tuning and stability (even at high Q).[2] High values of Q result in a tendency toward ringing, thus limiting the maximum usable selectivity of the filter. Ringing may be minimized by connecting low-Q filter sections in series. But to tune the filter requires the use of ganged, closely matched potentiometers.

I built a filter that utilizes a pair of two-pole, state-variable sections with voltage-controlled center frequencies. This design permits tuning with a single potentiometer while providing four filter poles for high selectivity with reduced ringing. An audio amplifier stage allows the filter to be used as an outboard accessory to an existing receiver, or as a complete audio section for a home-built receiver.

At the heart of this filter is the National Semiconductor LM13600 dual operational transconductance amplifier (OTA). OTAs are a specialized family of op amps that exhibit a transconductance (conductance being the inverse of resistance) that is programmable, generally by means of an external bias current. The OTA has a current-controlled gain stage that may be incorporated into a variety of useful circuits. Current-controlled amplifiers, multipliers, multiplexers, oscillators and a variety of filter designs are easily realized through the use of OTAs.

The LM13600 (Fig. 1) contains a pair of identical OTAs, each with an associated Darlington buffer stage and linearizing diodes at the input. The linearizing diodes, (not used in this design), are included to compensate for the logarithmic characteristics of the OTAs, enabling them to pass larger signals without distortion. With the output buffers, they represent a significant improvement over earlier OTA ICs.

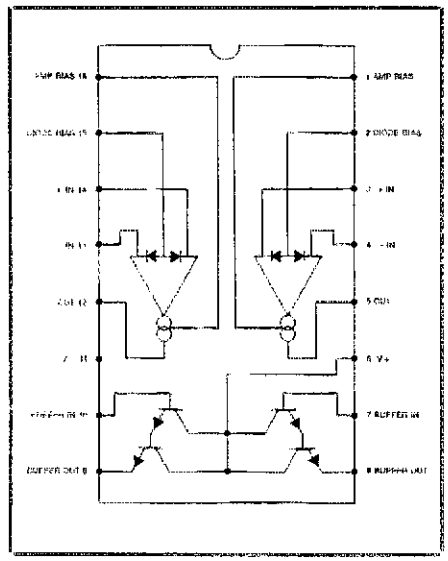

Fig. 1 — Pinout and internal block diagram of the LM13600. Each IC contains two identical sections, each with an operational transconductance amplifier stage and its associated buffer.

The tracking linearity of the LM13600 gain stages is accurate over a range of several decades. This allows two or more LM13600 gain stages to be configured as current-controlled integrators in a series of cascaded, state-variable filters. The filters, therefore, will track within close tolerance over a wide frequency range in response to a control current connected to each OTA bias input pin. The result is a tunable filter with high selectivity and low ringing.

Circuit Description

Refer to the block diagram (Fig. 2). You will notice that the current-controlled filter circuit consists of two major sections: a signal path and a control-current path. The audio signal is fed through the two series connected state-variable filter sections, while the control current pins are connected in parallel to a common variable current source. Although two filter sections are used in this design, any number of similarly connected filters may be used, limited only by the signal-to-noise characteristics of the circuit.

With this design it is possible to obtain two bandwidths simply by tapping the circuit at the output of each filter section. The output from the selected tap is fed to an audio power-amplifier stage that is capable of driving a loudspeaker or headphones. A bypass switch has been included to allow the operator to remove the circuit from the audio line when desired.

The schematic diagram (Fig. 3) shows the filter and amplifier circuits. The filter design is adapted from information found in the LM13600 data sheet.[3] Varying the bias current applied to the transconductance control pin changes the integrator time constant, shifting the band-pass center frequency. Since the frequency-control potentiometer will be supplying a variable voltage, it is necessary to convert this voltage to a variable current capable of biasing the transconductance stages. This is achieved by a voltage-to-current converter, R5, which is connected directly to the wiper of R7. Connect all control-current pins in parallel and route them to R5, which is located off the pc board. Note that the value of R5 will have to be scaled to maintain the same frequency range if more sections are added. The frequency range with the values shown is 350 Hz to 2800 Hz.

The Q of each filter section is determined by R8 (or R9). Larger values at R8 (or R9) will yield higher Q, but the gain at resonance will also increase. To maintain unity stage gain you must increase the value of R1 (R3) or decrease the value of R2 (R4), or both. I found that a Q of about 5 provides the best compromise between selectivity and ringing. R8 and R9 could be replaced by a ganged potentiometer to provide variable Q if desired. I made the selectivity switchable by means of a panel-mounted switch (S1). This switch taps the output of the first or second filter section and provides bandwidths of approximately 200 Hz and 120 Hz, respectively (– 3 dB with a center frequency of 1000 Hz), with the values shown.

The audio signal from the selectivity switch is fed through volume control poten-

[1]Notes appear on page 16.

*3640 Juanita Rd., Fort Collins, CO 80524 .

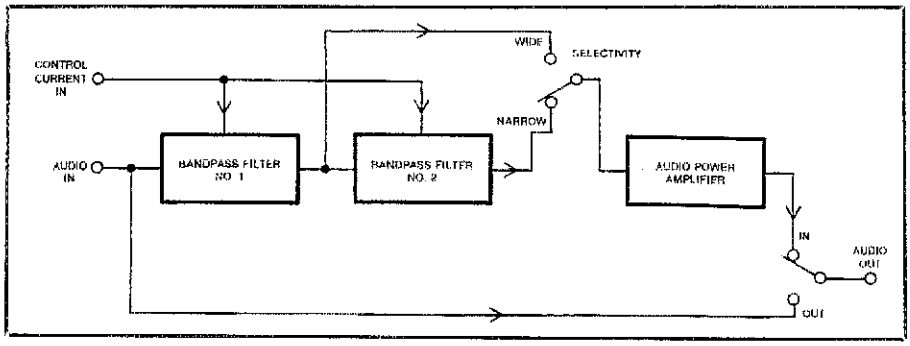

Fig. 2 — Block diagram of the tunable cw filter.

tiometer R10 to the audio amplifier. The amplifier uses the LM386 IC, chosen for its low external parts requirement and low idling current. It can supply up to 600 mW of audio — enough to drive most loudspeakers to a reasonable volume level. The amplifier audio output is connected to a spdt switch on the front panel (S2) that selects the filter circuit or the audio signal from the receiver.

Construction

A pc-board etching pattern (Fig. 4) is provided to speed construction and minimize wiring errors. Notice that the pc pattern is divided into two functional areas. One side of the pattern contains two state-variable filter sections, while the other side of the pattern contains the audio amplifier section. This allows the filter circuit or the amplifier to be used alone or incorporated into other designs, as well as permitting the use of an additional board to provide two more filter sections. The pattern fits nicely on a 3- × 4-inch pc blank. However, you may increase the width to 3.6 inches to conform to the standard suggested by Grabowski.[4,5]

Assembly of the board is straightforward, and with the exception of four jumpers on the foil side, all parts are top-mounted. These jumpers are used to connect the transconductance control pins on each board in parallel, and to route the output of one filter into the input of the next. Regardless of how many filter sections you use, remember to parallel all of the control-current pins, and connect them to the control-voltage source through a voltage-to-current converting resistor.

To assure proper matching of the filter sections, use only high-quality components. Use 5%-tolerance or better resistors and capacitors, if available, and avoid parts of unknown reliability. In particular, be sure the capacitors in the integrators (C1 through C4) are high-quality mica or polystyrene types and are as closely matched as possible.

A parts-placement diagram is shown in Fig. 5; Fig. 6 shows the locations of the foil-side jumpers. Use of IC sockets is recommended; it prevents damage during soldering and greatly speeds trouble-shooting. Be sure to double-check IC orientation when inserting them into the sockets.

The printed-circuit assembly should be mounted in a shielded enclosure to avoid rf pickup during transmit. All leads entering the enclosure should be bypassed as shown in the schematic diagram. If you plan to include a power supply, be sure to

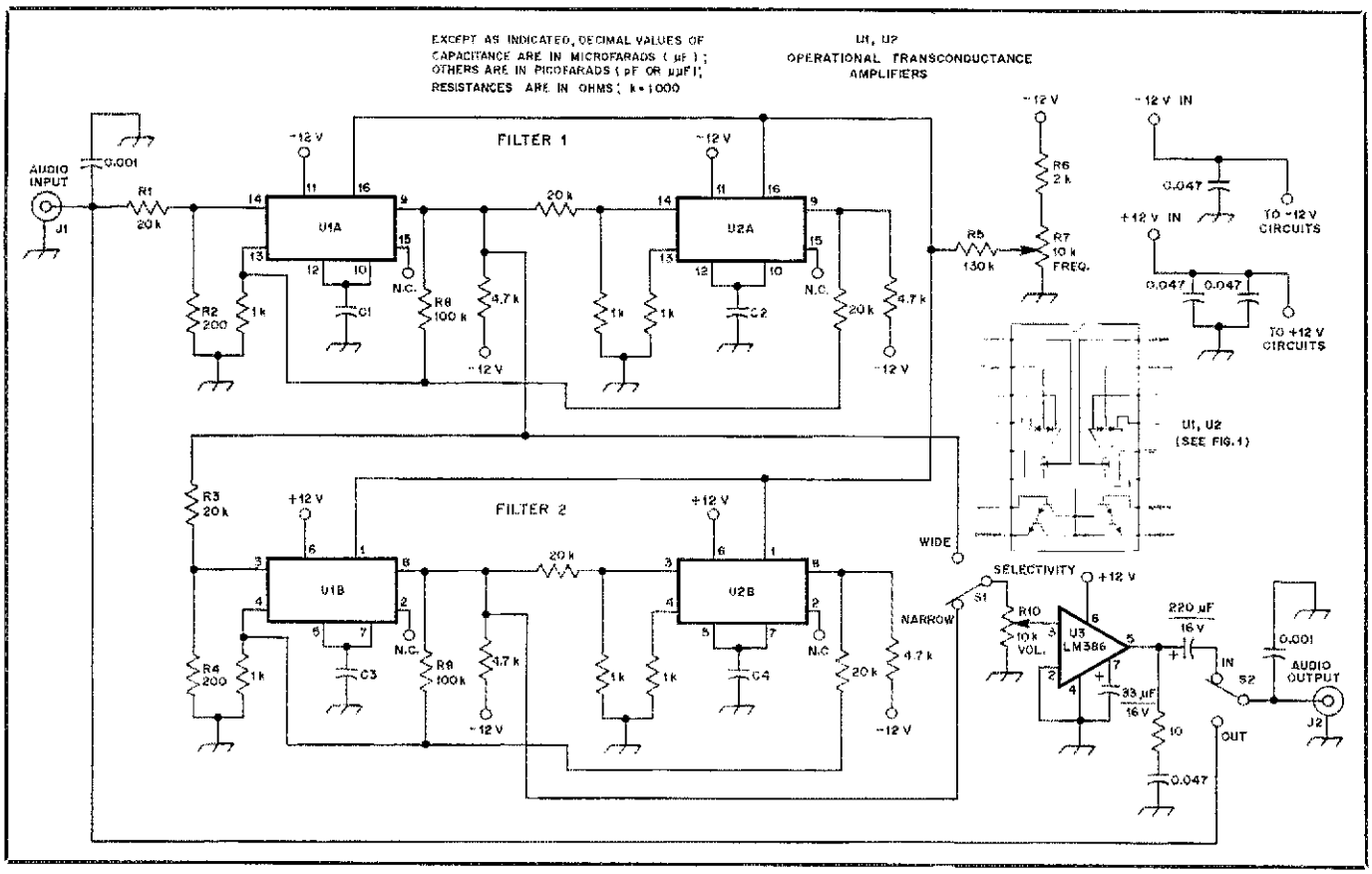

Fig. 3 — Schematic diagram of the tunable cw filter. All fixed-value resistors are 5%-tolerance types.
C1-C4 — 0.001-μ F, 5%-tolerance polystyrene or mica capacitor.
R7 — Linear-taper potentiometer.
R10 — Audio-taper potentiometer.

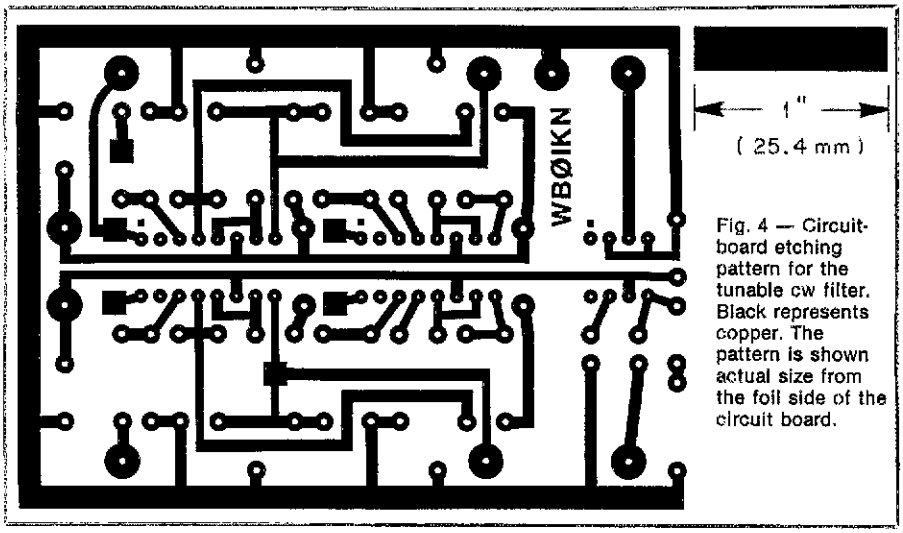

Fig. 4 — Circuit-board etching pattern for the tunable cw filter. Black represents copper. The pattern is shown actual size from the foil side of the circuit board.

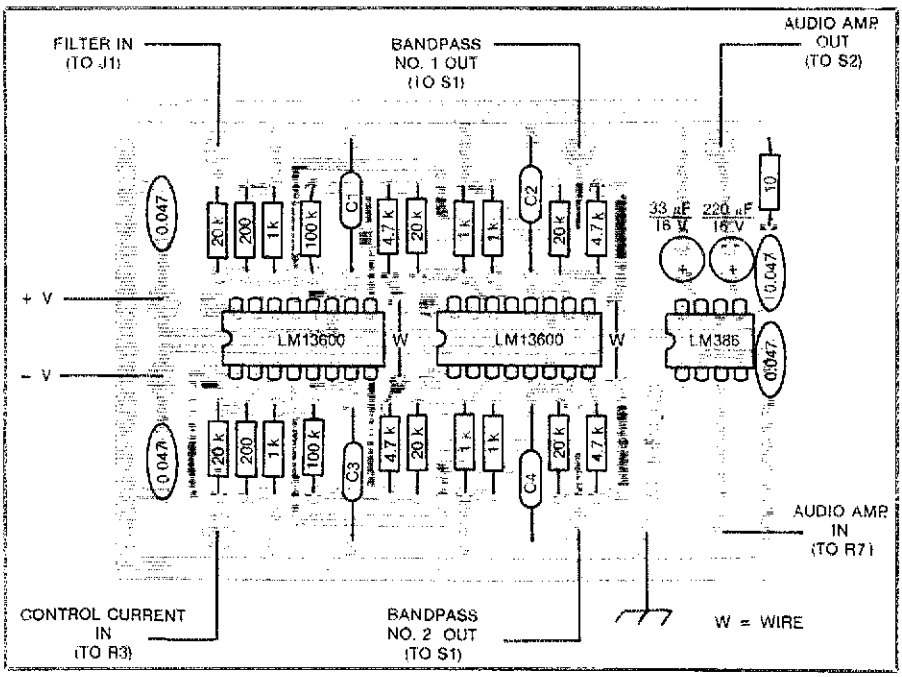

Fig. 5 — Parts-placement guide for the tunable cw filter. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

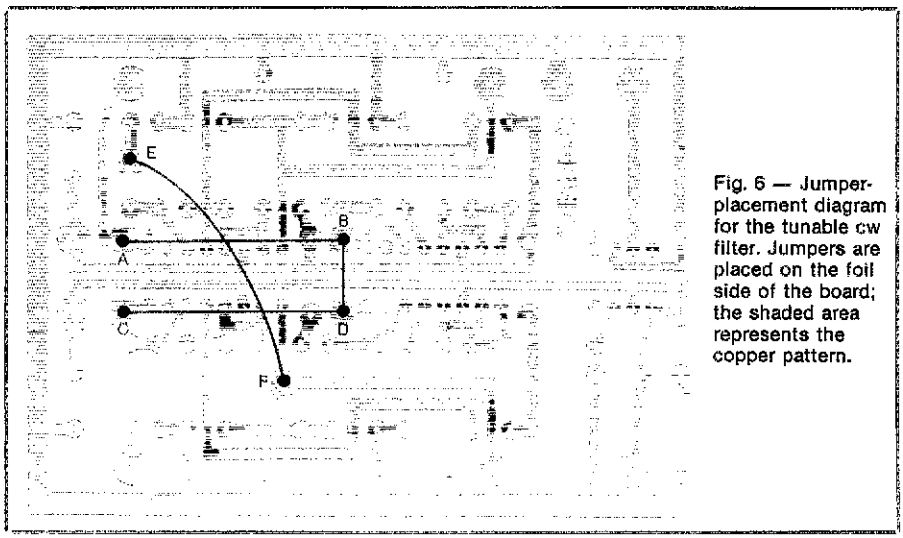

Fig. 6 — Jumper-placement diagram for the tunable cw filter. Jumpers are placed on the foil side of the board; the shaded area represents the copper pattern.

allow sufficient room and provide for air circulation: The transconductance stages will drift with temperature changes.

The layout and dress of interconnections is not critical, although some basic precautions should be observed. Be sure to keep all inputs and outputs as far apart as possible, particularly those associated with the amplifier circuit. Pay special attention to the possibility of ground loops. It is advisable to use a "star ground" technique wherever possible, returning all ground connections to a common point on the chassis. This will help to keep hum from creeping into the audio.[6]

Operation

To install the filter, connect the input jack to the loudspeaker or headphone jack on your receiver using a patch cord. Connect the filter to a regulated power supply capable of providing +12 V at 250 mA and −12 V at 100 mA (I use a pair of rechargeable batteries to eliminate any chance of hum in the audio amplifier). Then connect a loudspeaker or headphones to the output jack and apply power to the filter. Flip the IN/OUT switch to OUT (direct audio) and tune in a cw signal on your receiver. Now flip the IN/OUT switch to IN and the SELECTIVITY switch to wide and tune the filter frequency control until the desired signal is peaked. Adjust the VOLUME control to equalize the direct and filtered amplitudes, and then try the NARROW selectivity position. You will notice that off-center signals are reduced significantly, with no increase in ringing on the desired signal. You may now peak any signal within the receiver passband without changing the receive frequency, simply by tuning the audio filter.

This filter has brought new life to my aging Drake R4B receiver. Not only does it provide a significant improvement in selectivity, but it removes hiss (wideband noise) and hum from the audio (much needed). Whether your receiver is a vintage tube-type, or is state-of-the-art, this filter will help you dig out the weak ones.

First licensed in 1969 as WB2IQF, Richard A. Nelson joined the ARRL that same year. Richard has worked as an audio recording engineer, and as chief engineer and station manager of KCMK-FM, Glenwood Springs, Colorado. He is the founder of Analog Technology, Fort Collins, Colorado, manufacturers of Amateur Radio and professional audio products. Currently, Richard is majoring in engineering physics at Colorado State University in Fort Collins. His Amateur Radio interests include receive and transmit signal processing, and contesting. Other hobby interests include microcomputers, sports cars, building and playing electronic music synthesizers, and collecting gemstones.

Notes

[1]Bloom, "Active Filters," *QST*, July, 1980, p. 17.
[2]Berlin, "The State Variable Filter," *QST*, April 1978, p. 14.
[3]"LM13600/LM13600A/LM11600A Dual Operational Transconductance Amplifier with Linearizing Diodes and Buffers," National Semiconductor, July 1978.
[4]Grabowski, "PC Board Standards Can Speed Experiments," *QEX* (ARRL), May 1982.
[5]mm = in. × 25.4
[6]The author will answer your questions about this article; please include a business-size s.a.s.e. when you write.

High-Pass Filters for Receiving Applications

Is your 160-meter hearing impaired by strong local broadcast stations? Here are some filter designs to help keep your receiver from being "crunched."

By John K. Webb,* W1ETC

High-pass filters are often needed for eliminating broadcast-band signals (0.54 to 1.6 MHz) from the input circuits of amateur receivers. Strong signals may come from local stations, or be propagated over long distances at night. Interference and other effects of circuit nonlinearity can result, especially in receivers without preselectors. In an earlier article, I described an interference-reduction system that employs a phase-canceling technique.[1] This system involves an antenna-pattern null that can be directed toward the interfering signal. My null steerer required the addition of a high-pass filter to reject strong broadcast signals.

A 3.4-MHz-cutoff, five-section high-pass filter for the broadband null steerer is shown in Fig. 1. Correspondence about 160-meter operation of the null steering device led me to consider high-pass-filter designs for that band. This is a more stringent filter requirement than that of the 80-meter filter because the separation between the passband and stopband of the 160-meter filter is only 200 kHz.

The five-section, elliptic, 3.4-MHz filter design achieves 60 to 70 dB of attenuation below 1.6 MHz with 1.0 dB of passband ripple. The stopband is shown in Fig. 2, and the passband is shown in Fig. 3. Photographs are from a Hewlett-Packard network analyzer. This work shows that readily available powdered-iron toroidal cores are very suitable for this type of filter, and that adjustment of shunt-branch resonant frequencies assures achieving desired filter characteristics without a complete dependence on component tolerances.

Filter designs using five sections and providing lower ripple and SWR are available, but these provide less attenuation of the bc signals. Attenuation would be about 10 dB less with a passband ripple of 0.1 dB and a SWR of 1.3 (see Technical Correspondence, March 1983 *QST*).

A filter stopband of about 70 dB starting at 1.6 MHz is required for receiver front-end protection against strong broadcast-band signals. If the five-section elliptic filter is scaled from 80 to 160 meters, the 70-dB stopband does not start until 1.0 MHz, and only 30 dB is available at 1.6 MHz. This prompted me to examine more-complex filters for 160-meter operation.

My reference for elliptic filter parameters was "Simplified Modern Filter Design" by Philip R. Geffe, John F. Rider Publications, 1963. Tables for elliptic filters are given in Appendix 4 of that book. These filters provide extremely sharp transitions from the passband to the stopband, as well as resonant frequencies at which the attenuation exceeds the minimum stopband value. They are well-suited for amateur builders because filter properties are assured by measuring and trimming branch resonant frequencies. Tests on these filters using powdered-iron toroidal inductors showed that the predicted performance can

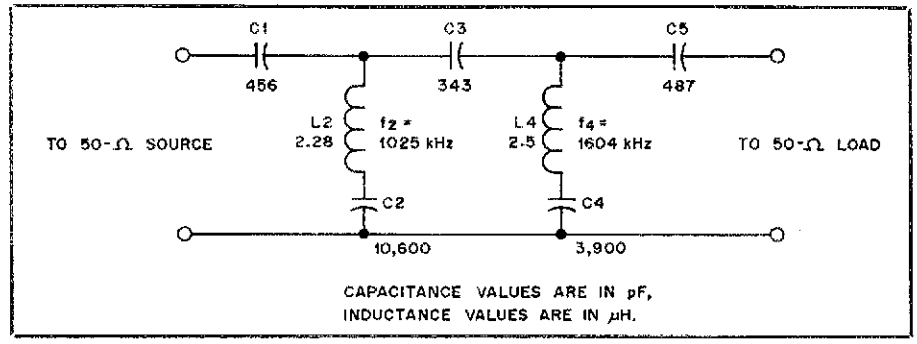

Fig. 1 — Schematic diagram of a five-section, 80-meter filter. L2 = 24 turns no. 26 wire on a T37-2 or T50-6 core. L4 = 25 turns no. 26 wire on a T37-2 or T50-6 core.

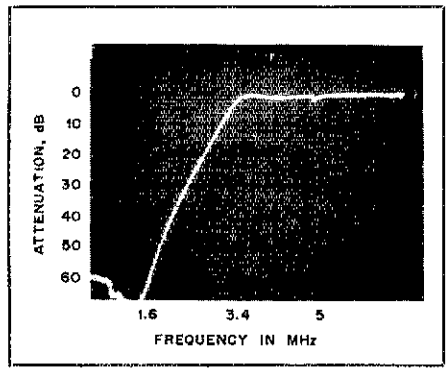

Fig. 2 — Stopband of the five-section filter, as measured on a Hewlett-Packard network analyzer.

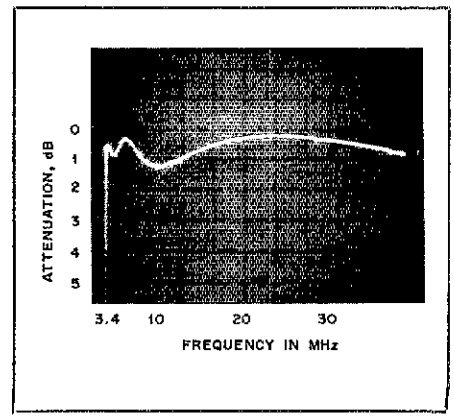

Fig. 3 — Passband of the five-section filter.

[1]Notes appear on page 19.

*P.O. Box 747, Amherst, NH 03031

Table 1

160-Meter High-Pass Filter Alternatives

From Geffe's Tables, Appendix 4

Table	Sections	Ω_s	Components	Calculated Min. Atten., A_s, Below 1.6 MHz
A4-8	6	1.124	8	32 dB
A4-9	7	1.122	9	45 dB
A4-11	8	1.120	11	52 dB
A4-12	9	1.122	13	65 dB
A4-14	10	1.124	14	73 dB

be approximated in practice, but as more sections are added the deviation from theoretical results will increase. It should be noted, however, that the theoretical filter performance for these or other filter designs cannot be guaranteed simply by buying components and assembling the filter. At the very least, it is important to select actual component values that are as close as possible to the theoretical values. To optimize filter performance, more sophisticated measuring techniques may be required. You should also be aware that there can be some variation from the published inductance-versus-turns values for a given batch of iron-powder material used to make the toroidal cores. A few turns more or less may be required on the core to achieve the desired inductance.

Table 1 lists the number of sections, the parts count and the calculated minimum attenuation below 1.6 MHz for several filters, all with 0.18 dB of passband ripple, an SWR of 1.5 and a cutoff frequency of 1.8 MHz. The normalized frequency (Ω_s) at the start of the stopband is equal to 1.8/1.6 = 1.125. Geffe's designs having Ω_s values closest to 1.125 are listed. Geffe does not provide prototype tables for the more complex filters with larger ripple values; however, as the complexity of the filter grows, component-tolerance variations will moderately increase the ripple from the nominal value.

Table 2 lists calculated inductance and capacitance values for seven- and nine-section filters. It includes the number of turns of wire for Micrometals powdered-iron toroidal cores.[2] Inductance turns were rounded up or down to the nearest integer. I chose toroids because of their self-shielding properties and good Q with small size. The wire size is not critical, but should allow neat, single-layer windings. No. 30 wire is suitable for the size 37 core while No. 26 wire fits well on the size 50 core. One inductor required 75 turns. I used a size 68 core with No. 30 wire. Winding the coils is not difficult, but good lighting and vision aid quality workmanship. Capacitors should be selected to resonate with the companion inductance at the frequency specified for each resonant branch. Filter characteristics are best assured by using measured capacitors and inductors. A small

Table 2

Parameters for Seven- and Nine-Section High-Pass Filters

f_{co} = 1.80 MHz; Ω_s = 1.122; R = 50Ω

Figure	*4*	*4*		*5*
A_s (dB)	*45*	*65*		*65*
Number of Sections	*7*	*9*		*9*
C1	1530 pF	1433 pF	L1	3.58 μH 27 Turns (no. 26 wire)
C2†	7950 pF	13041 pF	L2	32.6 μH 75 Turns (no. 30 wire on 68-2 core)
L2	3.8 μH 31 Turns	3.50 μH 30 Turns (no. 28 wire)	C2†	1400 pF
F2	918 kHz	745 kHz	F2	745 kHz
C3	1230 pF	1090 pF	L3	2.72 μH 24 Turns (no. 26 wire)
C4†	1480 pF	2097 pF	L4	5.24 μH 33 Turns (no. 26 wire)
L4	6.8 μH 41 Turns	5.38 μH 37 Turns (no. 28 wire)	C4†	2152 pF
F4	1587 kHz	1498 kHz	F4	1498 kHz
C5	1490 pF	1532 pF	L5	3.83 μH 28 Turns (no. 26 wire)
C6†	2110 pF	1531 pF	L6	3.83 μH 28 Turns (no. 26 wire)
L6	6.0 μH 39 Turns	6.52 μH 40 Turns (no. 30 wire)	C6†	2606 pF
F6	1418 kHz	1593 kHz	F6	1593 kHz
C7	2270 pF	1355 pF	L7	3.39 μH 26 Turns (no. 26 wire)
C8†	U	3430 pF	L8	8.58 μH 42 Turns (no. 26 wire)
L8	N U	4.75 μH 34 Turns (no. 28 wire)	C8†	1898 pF
F8	S E	1247 kHz	F8	1247 kHz
C9	D	1860 pF	L9	4.64 μH 31 Turns (no. 26 wire)
Cores	50-6	50-6		50-2 except L2

†resonate with L at f

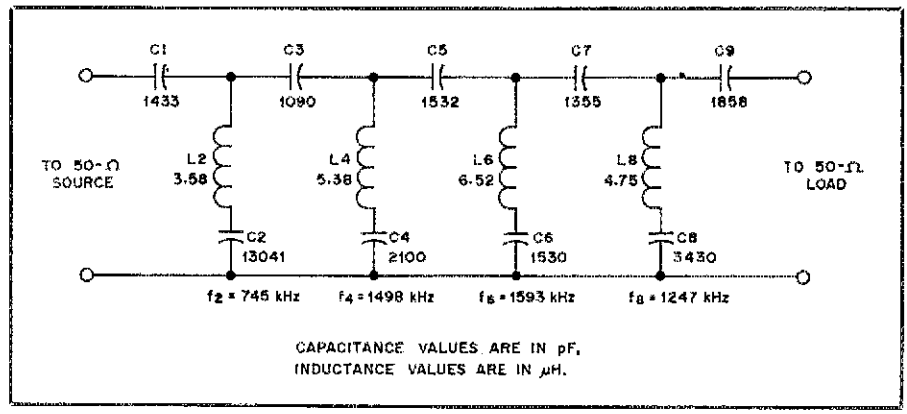

Fig. 4 — Schematic diagram of a nine-section 160-meter filter using four inductors.

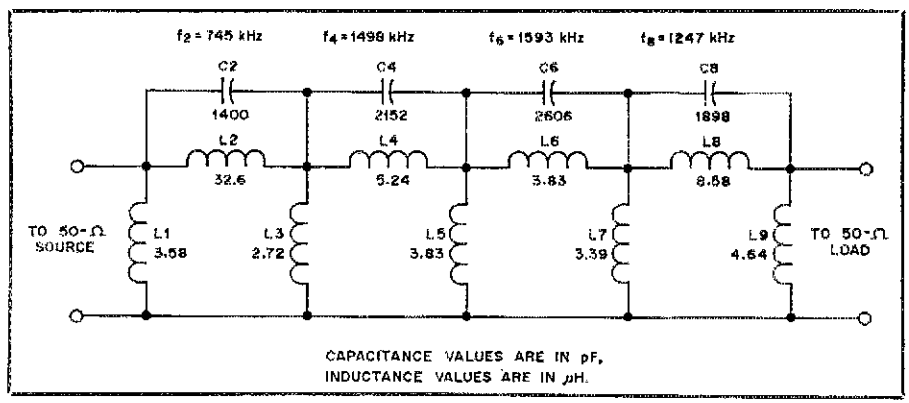

Fig. 5 — Schematic diagram of a nine-section 160-meter filter using nine inductors.

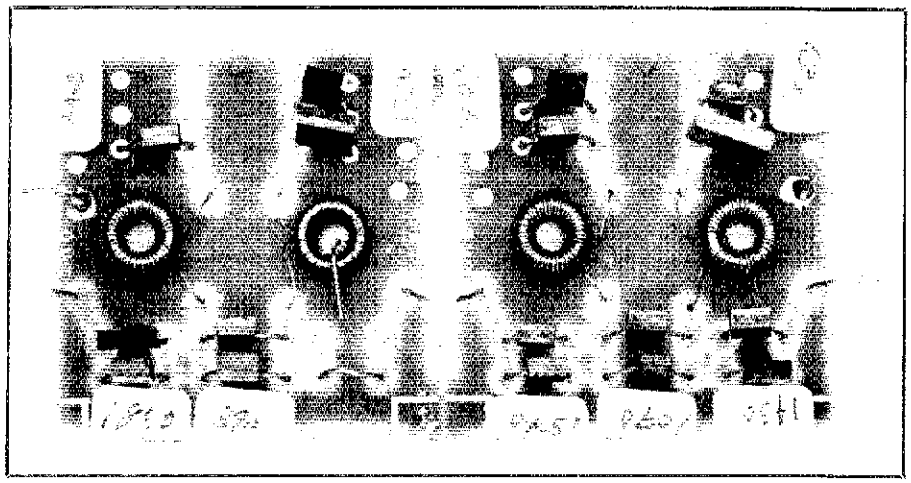

Fig. 6 — The nine-section, 160-meter filter with four inductors. The ground foils on the two boards are connected by means of copper strips soldered across the foils on the underside. This provides mechanical strength as well as good electrical contact.

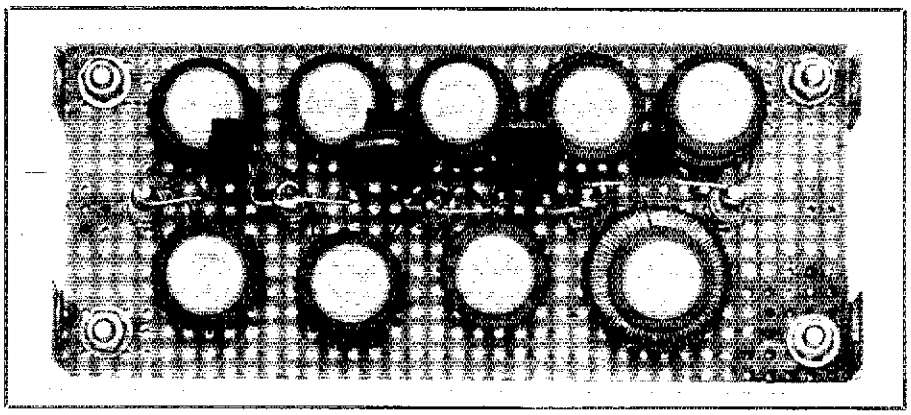

Fig. 7 — The nine-section, 160-meter filter with nine inductors.

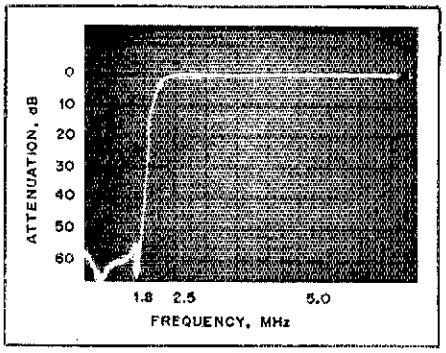

Fig. 8 — Stopband spectral display of the nine-section, 160-meter filter using four inductors.

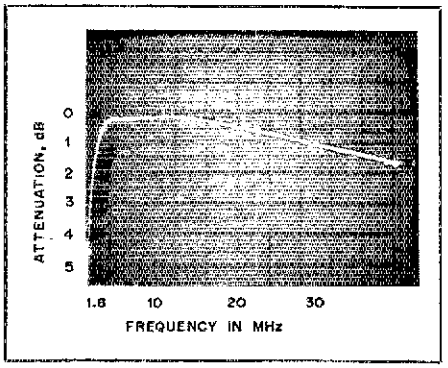

Fig. 9 — Passband spectral display of the nine-section, 160-meter filter using four inductors.

degree of inductance adjustment can be effected by compressing or spreading turns on a core. However, I did not use this fine-adjustment technique with the filters I built. These filters use paralleled standard-value NP0 ceramic capacitors selected to within 1% of the target values.

Two nine-section filters are listed in Table 2. They are "duals," which means they have an alternate configuration that theoretically has the same attenuation response. The first, shown in Fig. 4, uses nine capacitors and four inductors; the second, in Fig. 5, uses nine inductors and four capacitors. The second configuration was built after the first because I found that the accuracy of the calculated toroid inductance values was very good. When the target value required a fractional turn, the measured inductance value was below or above the target value, depending on whether the number of turns was rounded up or down. Each prototype filter has a theoretical passband ripple (A_p) of 0.18 dB and a stopband attenuation (A_s) of 65 dB. The stopband frequency (f_s) is 1604 kHz, and the cutoff frequency (f_{co}) is 1800 kHz. Each filter has a rejection notch just below f_s, and there is a different rejection-notch notch frequency for each shunt branch.

The nine-section filter in Fig. 4 was constructed on two circuit boards, each designed for a five-section filter with three parts locations for series capacitors and two for capacitors in the shunt branches. This filter is illustrated in Fig. 6. I used T50-6 cores for the inductors in this filter. T37-2 cores are specified to have the same A_L value, so they should work with the same number of turns. The second nine-section filter (Fig. 5) was built on a perforated circuit board with standoff terminals. The construction is shown in Fig. 7.

The passband and stopband data for the filter of Fig. 4, as measured on a Hewlett-Packard network analyzer, are shown in Figs. 8 and 9. The filter shown in Fig. 5 provides about 10 dB less stopband attenuation and about the same passband attenuation at 30 MHz. Both filters have a more gradual cutoff than expected, probably a result of the Q of the inductors. Attenuation at 1.8 MHz is about 3 dB, and a passband ripple of 0.18 dB is not realized below about 2.0 MHz.

The filter of Figs. 4 and 6 provides the better stopband performance of the two versions. The ease of building the two types of filters is about the same; one requires more inductors, while the other requires more capacitors. Either filter has its characteristics determined largely by resonant frequencies of L-C branches, which may be measured and adjusted.

I would like to thank ARRL TA Ed Wetherhold, W3NQN, for his correspondence and suggestions. This led to further review of the subject and construction of the nine-pole, 160-meter filters.

Notes

[1]J. Webb, "Electrical Antenna Null Steering," *QST*, Oct. 1982, pp. 28-32.

[2]Micrometals toroidal cores are available from Amidon Associations, 12033 Otsego St., North Hollywood, CA 91607, and from Palomar Engineers, 1924-F West Mission Rd, Escondido, CA 92025.

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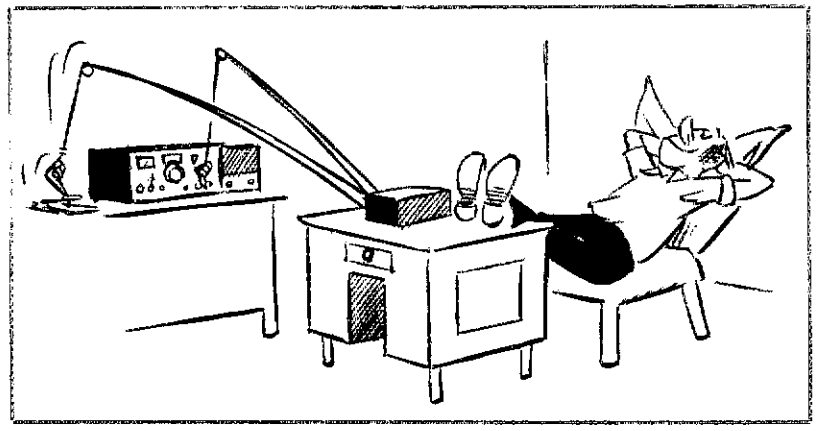
The Would-Be Contest Killer

Use your "micro" to gain an edge over the hotshot contesters.



By Jerry Hess,* W9KTP

Until 1982, the only contest I had entered was Field Day. Contests didn't interest me; when I encountered one, I changed frequency or went QRT. During the 1981 Field Day one of our contest pros issued a challenge: "You oughta try some contestin', kid."

That challenge was still echoing in my head a few weeks later, so I decided to give contesting a try. Working DX was lots of fun, particularly using cw, so I decided to take a shot at the ARRL International DX competition. Boy, what a shock! There are *expert* operators out there! A comparison of past scores with my effort was a real ego deflater. Those operators with thousands of QSOs must have four arms and two heads!

After a good sulk, I formulated a plan for the upcoming CQ World Wide DX contest. Why not outsmart those hotshots by

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Table 1
BASIC Program Listing

```
1 DIM A (50), B (50)
2 DIM C$(100), E$(50)
3 C = 0
4 TI$ = "000000"
5 DATA 6, 204, 5, 136, 6, 64, 5, 144
6 DATA 5, 240, 5, 120, 5, 56, 5, 24
7 DATA 5, 8, 5, 0, 5, 128, 5, 192
8 DATA 5, 224, 5, 240, 1, 0, 1, 0
9 DATA 1, 0, 1, 0, 1, 0, 6, 48
10 DATA 1, 0, 2, 64, 6, 128, 4, 160
11 DATA 3, 128, 1, 0, 4, 32, 5, 192
12 DATA 4, 0, 6, 0, 4, 112, 3, 160
13 DATA 4, 64, 6, 192, 2, 128, 5, 224
14 DATA 4, 96, 4, 208, 5, 64, 5, 0
15 DATA 1, 128, 5, 32, 4, 16, 3, 96
16 DATA 4, 144, 4, 128, 4, 192, 1, 0
17 DATA 1, 0, 1, 0
20 FOR I=1 TO 50
21 READ A(I), B(I)
22 NEXT I
50 PRINT:CLS
51 PRINT
52 PRINT "              OPTIONS"
53 PRINT
54 PRINT " E=ENTER CALL          U=DELETE CALL"
55 PRINT " C=CALL HIM            S=SEND EXCHG"
56 PRINT " A=CALL CQ             R=RSL HIM"
57 PRINT " B=REPEAT              Z=QRZ"
58 PRINT " T=TUNE HIM            K=KEYBOARD"
59 PRINT " P=PRINT               X=CODE PRAC"
60 PRINT " N=NTO QSO             D=SET CLOCK"
61 PRINT
62 PRINT
63 PRINT "          WHICH OPTION=";
65 INPUT A$
66 PRINT
70 IF A$="E" THEN 100
71 IF A$="B" THEN 110
72 IF A$="A" THEN 120
73 IF A$="C" THEN 130
74 IF A$="K" THEN 135
75 IF A$="Z" THEN 145
76 IF A$="S" THEN 155
77 IF A$="L" THEN 160
78 IF A$="N" THEN 165
79 IF A$="P" THEN 170
80 IF A$="X" THEN 180
81 IF A$="R" THEN 190
82 IF A$="B" THEN 195
99 GOTO 50
100 PRINT
101 PRINT
102 PRINT "HIS CALL-10 CHARS";
105 INPUT B$
106 GOTO 50
110 B$=""
111 GOTO 50
120 C$="CQ CQ CQ DE W9KTP/3 W9KTP/3 K"
121 M=LEN(C$)
122 FOR N=1 TO M
123 D$=MID$(C$,N,N)
124 GOSUB 1000
125 D$=""
126 NEXT N
127 GOTO 50
130 C$=B$+" DE W9KTP/3 K"
131 GOTO 121
135 T=INP(0)
136 IF T=164 THEN 50
137 IF Y<32 THEN Q$=" "
138 IF Y > 221 THEN 135
139 IF Y < 172 THEN 135
140 C$=Q$+CHR$(Y-128)
141 GOSUB 6000
142 GOTO 135
145 C$="QRZ DE W9KTP/3 K"
146 GOTO 121
150 C$="BK QSL 5 NN 5 NN 05 05 BK"
151 GOTO 121
155 C$=B$+" DE W9KTP/3 5NN 5NN 05 05 BK"
156 GOTO 121
160 C$="QSL 73 DE W9KTP/3 QRZ K"
161 GOTO 121
165 C$="? BK"
166 GOTO 121
170 PRINT " SIGNAL REPORT ";
171 INPUT H$
172 PRINT "ZONE";
173 INPUT J$
174 E$=TI$+" "+B$+" "+H$+" "+J$+" "
175 GOSUB 5000
176 GOTO 50
180 T=INT(100*RND(0))
181 IF T < 44 THEN 180
182 IF T > 90 THEN 180
183 IF T > 64 THEN 185
184 IF T > 57 THEN 180
185 B$=CHR$(T)
186 GOSUB 1000
187 GOTO 180
190 C$="TNX FER RPT-UR RST 579 BS QTH JOHNSTOWN, PA-NAME
    JERRY-HW?"
191 GOTO 121
195 GOSUB 7000
196 GOTO 50
1000 L=ASC(D$)
1001 GOSUB 4000
1002 GOSUB 6000
1003 P=128
1004 R=L-65
1005 IF R < 1.0 THEN 1018
1006 L=A(R)
1007 B=B(R)
1008 FOR J=1 TO C
1009 T=INT(B/P)
1010 IF T < 1.0 THEN 1012
1011 B=B-P
1012 P=P/2
1015 IF T < 1.0 THEN 1016
1014 GOSUB 6000
1015 GOTO 1017
1016 GOSUB 2000
1017 NEXT J
1018 PRINT D$;
1019 RETURN
2000 OUT 5, 1
2001 GOSUB 4000
2002 OUT 5, 0
2003 GOSUB 4000
2004 RETURN
3000 OUT 5, 1
3001 GOSUB 4000
3002 GOSUB 4000
3003 GOSUB 4000
3004 GOSUB 4000
3005 OUT 5, 0
3006 GOSUB 4000
3007 RETURN
4000 FOR K=1 TO 5
4001 U=1
4002 NEXT K
4003 RETURN
5000 LPRINT E$
5012 RETURN
6000 M=LEN(C$)
6001 FOR N=1 TO M
6002 D$=MID$(C$,N,N)
6003 GOSUB 1000
6004 D$=""
6005 NEXT N
6006 Q$=""
6007 RETURN
7000 PRINT "INPUT HOURS";
7001 INPUT H$
7002 PRINT "INPUT MINS";
7003 INPUT E$
7004 TI$=H$+E$+"00"
7009 RETURN
```

Note: Program line 135 is a call to the keyboard; line 1014 calls the dash routine, while line 1016 calls the dot routine. Lines 2000, 2002, 3000 and 3005 are machine specific (see text).

Table 2
Assembly-Language Routines

Loc.	Data			Comments
7172-076		Timer:	LDA 20	; major loop constant
7173-020				
7174-006		Y:	LDB 377	; minor loop constant
7175-377				
7176-000		X:	NOP	
7177-000			NOP	
7200-020			DJNZ X	; dec B until zero
7201-374				
7202-107			LDB, A	; dec A until zero
7203-075			DEC A	
7204-020			DJNZ Y	
7205-366				
7206-311			RTN	
7207-076		Dots:	LDA 2	; set port-3 bit 1 to 1
7210-002				
7211-323			OUT 3	
7212-003				
7213-315			CALL TIMER;	one time interval for dot
7214-172				
7215-007				
7216-076			LDA 0	; reset port
7217-000				
7220-323			OUT 3	
7221-003				
7222-311			RTN	
7223-076		Dash:	LDA 2	; set port-3 bit 1 to 1
7224-002				
7225-323			OUT 3	
7226-003				
7227-315			CALL TIMER;	3 time intervals for dash
7230-172				
7231-007				
7232-315			CALL TIMER	
7233-172				
7234-007				
7235-315			CALL TIMER	
7236-172				
7237-007				
7240-076			LDA 0	; reset port
7241-000				
7242-323			OUT 3	
7243-003				
7244-311			RTN	

Table 3
Commands

D-Delete call	Deletes the entered call after transmitting and recording or if you decide to work someone else.
S-Send Exchange	This is used to answer a call to your station. It sends the contest exchange.
A-Call CQ	Calls CQ and signs your call.
Q-QSL Him	Does a break and gives the contest exchange.
R-Repeat	Sends a "?" and "K."
Z-QRZ	Sends your call, "QRZ" and "K."
L-Log Him	Sends "QSL," your call and "QRZ."
K-Keyboard	Allows free-form input from the keyboard. A "$" will return you to the menu.
P-Print	Request signal report and the other station's exchange, and prints the time, call, report and received exchange on the printer.
X-Code Practice	Randomly generates code practice.
N-Standard QSO	Sends a standard QSO message.
B-Set Clock	Allows you to input the current time.

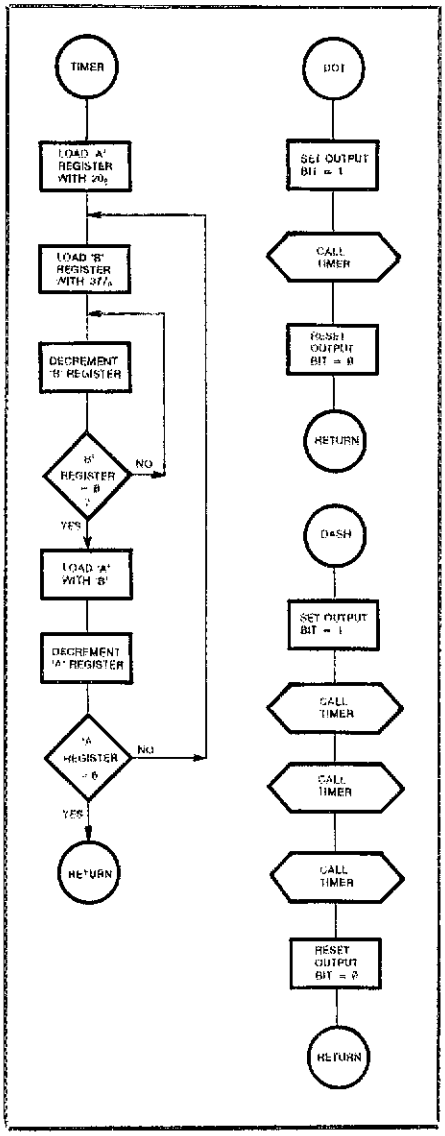


Fig. 1 — Flowchart of the assembly-language cw-timing subroutine.

logging and sending the contest information with my microcomputer? This article describes the result of my efforts. Now that I have the program operating, the only thing holding back my QSO rate is my ability to locate new stations quickly.

Background

My contesting program is written in BASIC, with the cw-timing subroutines written in Z80 assembly language. The BASIC dialect should be adaptable to any microcomputer BASIC, and the machine-language subroutine uses no absolute addresses, so they should be adaptable (relocatable) to any hardware configuration or processor. A parallel I/O port or peripheral interface adapter (PIA) is the only program hardware requirement — it is required for sending cw.

Basically, the program generates several "canned" messages and sends them, using the machine-language subroutine, to one bit of a parallel port. In my version of the program, exchange information for the CQ World Wide DX contest is included. The user can change messages easily as a particular contest dictates. In addition, a subroutine generates random code for practice purposes.

Inside the Program

The BASIC program listing is given in Table 1; refer to it while reading the text. Morse code (cw) elements — dots and dashes — are generated with the use of a *lookup table.* The lookup table is located on lines 5 to 17 of the listing. Dots are represented by "0"s and dashes are represented by "1"s using the binary number system (base 2). There are actually two lookup tables in the program, A and B (line 21). Table A values represent the length of the Morse character in elements, and Table B values represent the decimal (base 10) equivalent of the binary value of the Morse character. For example, the letter "A" has a length of 2 elements — a dot and a dash — therefore, the value in Table A for the letter "A" will be 2. The equivalent binary number for the letter "A" is 0100 0000, or 64 in decimal form.

A simple index for the two tables allows the ASCII value of any character to be used as a pointer for the tables. The table index value is equal to the ASCII value of a character minus 43. For example, the ASCII value for the letter "A" is 65; the data for the letter "A" will be in position 22 in Tables A and B.

Machine-Language Subroutine

BASIC is an interpreted computer language, which means that it is very slow (as far as computing is concerned). The timing routines for my program were originally written in BASIC (as they appear in the listing), which limits the maximum sending speed to approximately 15 wpm. During contests, the cw sending speed varies between 20 and 50 wpm; therefore, I decided to write a machine-language subroutine to generate the dot and dash timing elements. The Z80 assembly listing is given in Table 2. Address and data values are given in octal (base 8); memory locations 7172 through 7244 were used because my machine (a Digital Group unit) had free memory in that area. All of the program is relocatable; find a free space in your computer's memory and go to it! Of course, the number used in the OUT statement will depend on your hardware con-

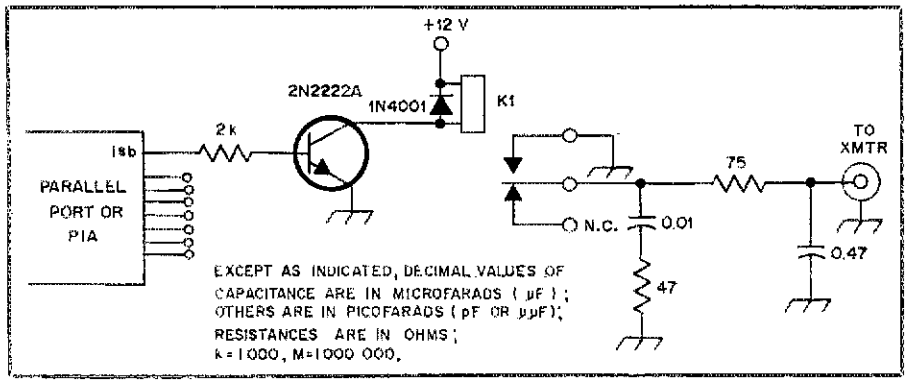


Fig. 2 — Schematic diagram of the interface circuit. The relay has a 12-V coil and 1-A contacts.

figuration. Flowcharts for the machine-language routines are given in Fig. 1. If your computer does not use the Z80 μP, these should aid in designing a subroutine for your machine. Cw sending speed can be adjusted by altering the constant in location 7173. My computer has a clock rate of 2.5 MHz, which yields a speed of approximately 25 wpm with the constant given.

Hardware Requirements

The machine-language program assumes that the parallel port latches to a particular state (0 or 1; "on" or "off") when an OUT statement is executed. Many computers do not have a latched port, but a simple RS flip-flop IC can provide the function. My transceiver-interface circuit is shown in Fig. 2.

Running the Program

Lines 52 through 60 in the program are the "menu"; the program is "menu driven." Each command is executed by typing one letter; after each command has been executed, the menu reappears on the screen. Table 3 describes each command function in detail.

I've learned a lot about operating in the past few months. It will be a long time before I'm able to beat the contest pros — even with a computer! Please drop me a note if you have any comments on the program. Special thanks to my wife who helped with the editing, and to John Rogers, W3IW, for his assistance with DX contests. QST

Strays

THE FOX FIXER

☐ Are you tired of perennial second-place finishes in your club's fox hunts? Like the Boston Red Sox, do you disappoint your fans, family and friends when you snatch defeat from the jaws of victory? If this description fits you, consider building the Fox Fixer, and throw your competitors for a loop!

The brainchild of Dave Baysinger, WBØBAE, the Fox Fixer doubles as a Turkey Tracker. Malicious interference on local repeaters is a serious problem affecting many public-service-minded fm clubs. This loop antenna is the perfect answer to an interference committee looking for effective methods of direction finding.

For the benefit of the uninitiated, a fox (or bunny, in some circles) hunt is a competition or exercise where a member of a ham group is designated "the fox." The fox makes its way to an undisclosed position hidden from the hunters' view. The fox then makes intermittent transmissions for the purpose of providing clues as to whereabouts. The hunters employ various contraptions to be the first to find the fox's lair. The Fox Fixer is one such contraption, and a good one!

Construction

The mast is a piece of steel tubing with a diameter of 5/8 in. and a length of 35 in. The bottom 12 in. are covered with electrical tape to provide a comfortable handle for the antenna. A small hole drilled 1 in. below the top of the mast provides access for the feed line, RG-58/U. The upper terminus of the mast should be slotted and crimped in the manner shown in Fig. 1 to allow attachment of the antenna loop.

The antenna loop consists of two separate pieces of 1/4-in. copper tubing — the first 9 in. long, and the second 9½ in. long.

The loop attaches to the mast as shown in Fig. 1, and is tuned by C1, a 15-20 pF variable capacitor. The antenna is fed with the inner conductor soldered at approximately 1½ in. from the mast on the 9-in. element, and the outer conductor braid is soldered to the mast itself. An 8-ft (2.4-m) length of RG-58/U is sufficient for most applications. A PL-259 connector makes the feed line compatible with most 2-meter rigs. For others, a BNC adaptor may be required.

Operation

In the field, most fox hunters will use a hand-held 2-meter fm rig with an S meter that indicates relative signal strength. With the Fox Fixer connected to the rig, listen for the fox on its transmitting frequency. Note the signal strength level. A 10-70 dB step attenuator should be used.[1] While keeping your eyes on the S meter, slowly rotate the loop to determine signal peaks and nulls. Signal peaks will occur when the fox is in the same plane as the loop. A null will occur when the fox is in a plane perpendicular to the loop.

Choose the direction of maximum signal and make your way toward the fox. The closer you get, of course, the stronger the signal will be, so you may have to step up the attenuation with the use of a 10-70 dB step attenuator to allow the S meter needle to retreat from the "pinned" position. A little practice will make you an expert, and you'll be able to invite your fans, family and friends into your trophy room to show off your collection of *vulpeus fulva!* — *Richard Palm, K1CE*

[1]See "Knock-It-Down and Lock-It-Out Boxes for DF," April 1981 *QST*, p. 41.

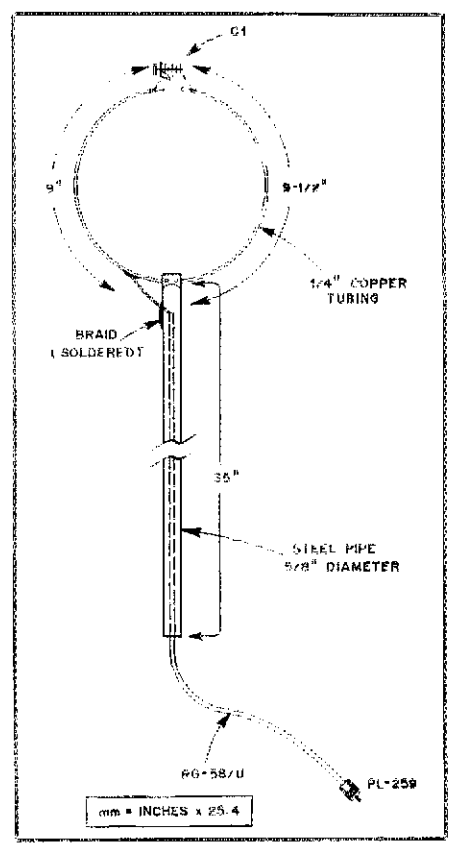
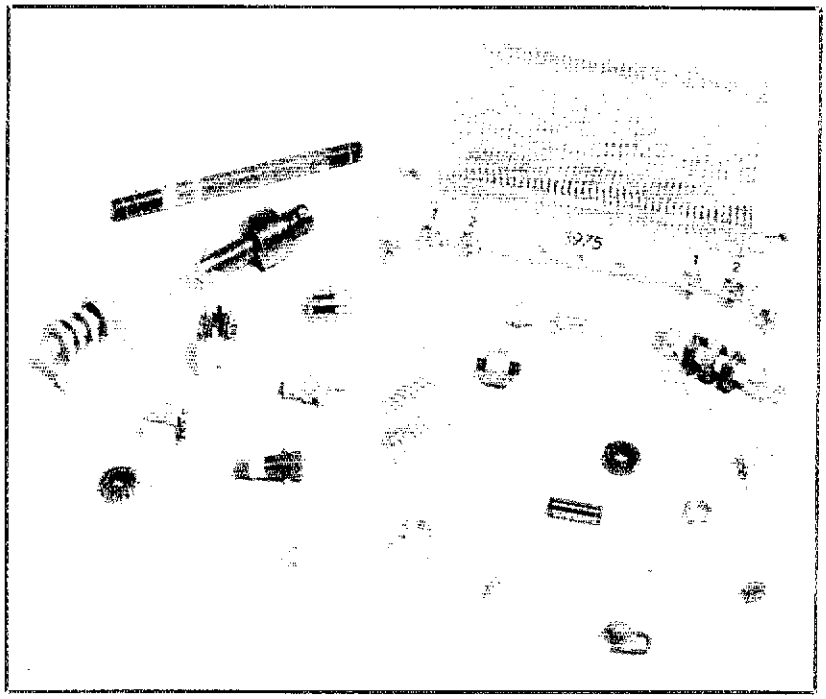


Fig. 1 — Construction of the Fox Fixer.

BEGINNER'S BENCH

Understanding Coils and Measuring Their Inductance



Winding your own rf coils or selecting good ones from the surplus market is easy when you understand the basics of inductors. Let's discuss selection and simple methods for measuring inductance in the ham workshop.

By Doug DeMaw,* W1FB

How many times have you bought a surplus or unidentified coil for use in a homemade circuit, only to discover it wouldn't function properly in your project? Or, how about all the head-scratching you've done while perusing bargain inductors at ham radio flea markets? It's not uncommon to see a dozen or more nice-looking slug-tuned inductors or small rf chokes for as little as $1. But, what are the coil characteristics? Is the Q high enough for our proposed circuits? What is the fixed-value inductance, or what might be the tuning range of the slug-adjusted inductor?

Unfortunately, that valuable information can be gotten only by means of measuring equipment. If no measurements are possible in your workshop, you could be buying the oft-mentioned "pig in a poke" when acquiring assorted coils.

I would never discourage anyone from buying bargain components. The cost of any commercial coil of recent production (new, that is) is enough these days to make one consider a less-expensive hobby — such as carving artifacts from wood! The economical alternative to purchasing new, expensive coils is to wind our own, or to acquire them at flea markets or from surplus outlets. The various coils or rf chokes can be graded out at home and labeled with their approximate characteristics for use later on.

We can apply simple techniques in our workshops to learn easily what the coil inductance is, and what the relative Q of the inductor might be. We'll discuss those approaches later. But first, let's talk about coils and chokes in general.

The Fundamental Nature of Coils

The word "coil" is self-explanatory. That is, it is a length of conductor — generally wire — that has been formed into a multiturn coil. Some coils are solenoidal (single-layer winding), while others have two or more layers of wire. These are often referred to as "pi-wound" or "bank-wound" inductors. The layers of wire are laid rather precisely on top of each other by means of machinery. We hams might simulate this winding style by using what is called "scramble winding." The coil Q (figure of merit) may not be quite as high when we scramble-wind, at least with respect to a machine-wound multilayer coil, but it will usually be adequate for our needs.

A thorough treatment of the subject of inductors and inductance can be found in *The Radio Amateur's Handbook* (ARRL), Chapter 2. We will not delve into the theory of inductance here, but shall look at some practical aspects of the subject.

For example, a given length of conductor will have a particular inductance value when stretched out. All conductors have *some* value of inductance (Fig. 1). That same length of wire will exhibit increased inductance when it is formed into a coil. The greater the number of turns, the higher the inductance. We can observe also that the greater the spacing between the coil turns, the lower the inductance. Maximum inductance for a given coil winding will occur when the coil turns are immediately

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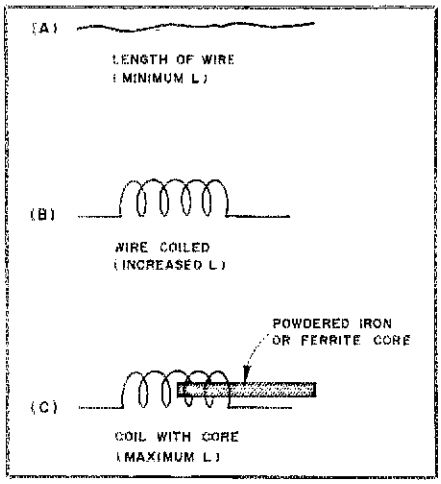

Fig. 1 — Even a straight piece of wire has an inductance value (A). The same wire formed into a coil (B) will have considerably more inductance. When a powdered-iron or ferrite core is inserted into the same coil (C), the inductance increases markedly.

adjacent to one another, or when the windings are stacked atop one another.

The inductance of a coil can be increased further by inserting a magnetic core inside it. Such core materials (suitable for rf work) are ferrite and powdered iron. Some coils contain brass cores or slugs rather than ferrite or iron ones. Brass has the opposite effect on coils: it decreases the coil inductance over that which exists when no core is used. Slug-tuned coils that contain brass cores are used mainly at vhf. The iron or ferrite cores are employed in circuits from vhf down to the low frequencies (broadcast band and lower). We must be aware, however, that the right core material must be used for a particular operating range. This and the general subject of ferrite and iron-core materials are discussed in plain language in the reference cited at note 1.[1]

The Wrong Core Material

I have witnessed a lot of frustration among inexperienced amateurs when they bought slug-tuned coils, blank forms and toroids at flea markets or from surplus dealers. Such vendors rarely provide the electrical characteristics of the coils or the core material. We may have the "gut feeling" that a particular coil looks great for that neat circuit we're putting together, but after installing it (even though the inductance value may be correct), that part of the circuit performs poorly, or not at all! How can this be? Ah, ha! The core material is wrong for the operating frequency!

Let's suppose our circuit is an oscillator and the operating frequency is 7 MHz. Our bargain coil has a core meant for use at, say, 500 kHz. At 7 MHz, the core has spoiled the Q of the inductor. Because of this low Q, our oscillator won't function, or if it does it will operate in a very sluggish manner (hard to start and keep oscillating). The irony is, if I may resort to still another pun, that the coil might have a marvelous Q — perhaps 400 — at 500 kHz, whereas it could drop to as low as 10 at 7 MHz. This phenomenon can occur with ferrite or powdered-iron cores.

The lower the intended operating frequency of the proper core, the greater its permeability. Permeability (μ_e) is the trait that determines the effect of the core material on the inductance. That is, the higher the permeability of the core, the greater the inductance for a specified number of coil turns. This can provide an excellent clue to the relative characteristics of an unknown core. Specifically, if a coil has only a few turns but has a large value of inductance, the core material is probably designed for use at medium or low frequencies. Conversely, if the inductor has many turns but the inductance seems low for a coil that contains a core, the slug is probably ideal for high-frequency use. In fact, it may be suitable into the vhf region. Many cores and toroids have a color coding that indentifies their optimum frequency ranges. The J. W. Miller Co. coil catalog lists the color codes versus frequency (given also in the reference cited in note 1).[2]

The improper core material can be identified readily when it is used in an rf-amplifier stage. If the stage gain seems too low and if the tuning is very broad, it's likely that the Q of the tuned circuit has been degraded seriously by the core in the coil. A sharp-tuning circuit is indicative of high Q (usually desirable).

Other factors that affect the Q of a coil are the wire size, the form factor, the insulating material used in the coil form and the proximity of the completed coil to nearby conductive objects. The larger the cross-sectional area of the wire, the greater the coil Q. This is because the current will flow more easily through the larger conductor (reduced I^2R losses). The form factor is the ratio of the coil diameter to the winding length (Fig. 2). For example, if our coil was 3 inches long and 1½ inches in diameter, the form factor would be 2.[3] I have found during laboratory measurements that a form factor of 1 to 1.5 yields the best unloaded Q for a particular coil, although the Q does not deteriorate seriously with form factors as great as 3. These values of Q are for an "unloaded" condition, or more commonly specified as the Q_u value of a coil. Once the inductor is installed in a circuit, this value of Q becomes rather insignificant, since the other circuit elements change the Q to some lower value through loading effects. The value of greatest interest to us is the "loaded Q," or Q_L. The Q_u value is of importance when designing a circuit, however. For instance, we may design a VFO tuned circuit for a Q_L of 15. The Q_u of the coil should be somewhat higher to ensure that the design Q is realized. I like to select a Q_u that is three

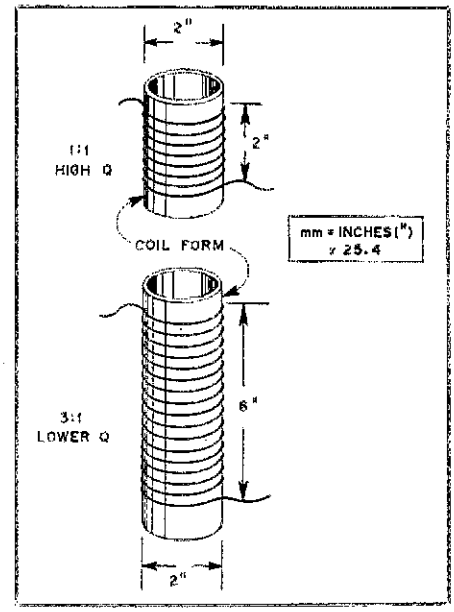

Fig. 2 — Illustration of form factor for coils. The highest Q should result with a factor of 1 (A). As the coil is lengthened (B), the Q will decrease somewhat.

times or greater than the required Q_L.

The coil form can affect the Q of the inductor, also. The better the dielectric material (insulating properties), the higher the Q. An air-wound coil will have the best Q, of course, but coils of this type are seldom practical below vhf because they are too floppy and unstable. So, our choice is to use a coil form. Ceramic or steatite forms are very good in terms of Q. Phenolic forms are fine for hf and lower, and there are a variety of modern materials (plastics) that are satisfactory, also. PVC tubing is not recommended in circuits that handle rf power at high impedances. In the presence of high levels of rf voltage, the PVC tubing may heat, break down and melt; likewise with nylon.

Earlier, we mentioned the proximity of nearby conductive objects and their effect on the coil Q. A good rule of thumb is to keep your coil (toroids excepted) at least one coil diameter away from nearby conductors, such as chassis, shield plates, variable capacitors, and the like. Iron will have a significant effect on the coil Q and inductance. Iron will increase the inductance, whereas aluminum and brass will decrease the inductance. Since a toroidal coil is self-shielding in nature, it will not be affected particularly by nearby metal objects and other coils.

Types of Coil Wire

You may have wondered why some coils, especially the smaller ones, have stranded wire that has insulation (silk, cotton or enamel) on each strand. Other coils simply used plain enameled wire, which was a lot easier to solder! Well, the multistrand wire is capable of providing a much higher Q than the single strand winding of enameled

[1]Notes appear on page 26.

wire. The former is known as *Litz wire*. By combining many individual insulated strands of wire to form a single conductor effectively, the I^2R losses are reduced dramatically and the Q increases accordingly. This is because the rf currents flow on the surface of a conductor, for the most part. They do penetrate the conductor to some degree, and the penetration becomes more pronounced as the operating frequency is lowered. The higher the operating frequency, the more troublesome the I^2R losses. This phenomenon is called "skin effect." The use of Litz wire greatly increases the effective conducting surface of the winding (many skins, so to speak, in parallel) and enhances the Q.

When you are shopping for surplus coils, it is a good idea to watch for Litz wire inductors. This wire can be taken from the coil form and used when winding new coils. Litz wire is especially useful in the hf range, where high Q becomes more difficult to realize with small wire. Litz wire (new) is *very* expensive. We can fabricate our own Litz wire by weaving several strands of no. 30 enamel wire together with a hand drill and a vise. Larger gauges of enameled wire can be treated in a like manner for heavier "Litz" conductors. Each strand of wire must be stripped properly at the ends of the coil winding so that they may be soldered in parallel. Otherwise, the good effects of the Litz winding will be lost.

Measuring Unknown Inductance Values

Perhaps one of the most common methods of learning the inductance value of an unknown coil is to use a dip meter. Although this is a rather unsophisticated procedure, compared to the use of high-cost lab equipment for precise measurements, it is suitable for us hams. When using a dip meter, we must also have a calibrated receiver with which to monitor the dip-meter signal (unless your dipper has a very accurate dial scale). The remaining ingredient is a collection of high-quality, known-value capacitors. Silver-mica capacitors are my preference for doing this type of testing.

Fig. 2 illustrates the test procedure when using a dip meter. A known-value capacitor is placed in parallel with the unknown value of inductance. The dipper is swept through its tuning range until a dip (resonance) is observed on the meter. Next, the dip meter is moved farther and farther from the coil until the dip is just discernible. Now we remove our hands from the dipper and tune the monitor receiver to find the dipper signal. This will give us the approximate resonant frequency of the coil and capacitor. The inductance value can then be determined quickly by using the ARRL L/C/F Calculator, Type A. If you prefer to find the inductance value mathematically, you can use the following equation:

$$L(\mu H) = \frac{X_L}{2\pi f(MHz)} \qquad \text{(Eq. 1)}$$

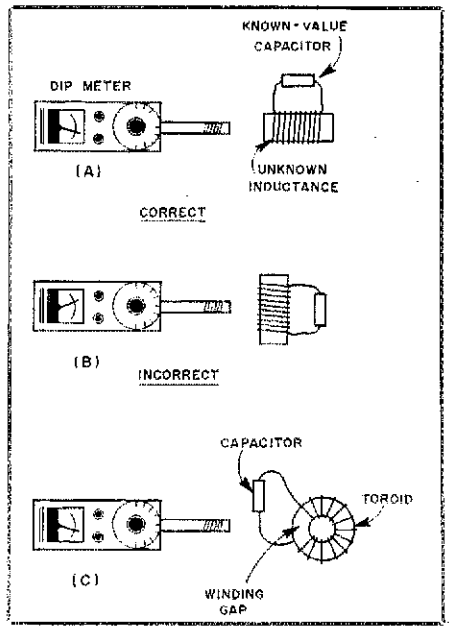

Fig. 3 — Correct coupling between the dip meter and the test coil is shown at A, where the axis of the dipper coil matches that of the test coil. Incorrect placement of the test coil is shown at B. The toroid at C can be dipped if the dipper probe coil is inserted into the capacitor leads at the winding gap.

where X_L is equal to X_c (resonance) and is expressed in ohms.

The reactance (X) of the capacitor connected across the coil can be found from

$$X_c = \frac{1}{2\pi f(MHz) \times C(\mu F)} \qquad \text{(Eq. 2)}$$

Let's take an example and work it out to help you understand the progression of the equations. Suppose we placed a 100-pF silver-mica capacitor across our unknown inductance. The dip meter and the receiver told us that the resonant frequency of the LC combination was 3.9 MHz. First, we will find the reactance of the 100-pF capacitor.

$$X_c = \frac{1}{6.28 \times 3.9 \times 0.0001} \qquad \text{(Eq. 3)}$$

$$(2\pi) \quad (MHz) \quad (\mu F)$$

hence $X_c = 408\Omega$

Note that pF has been changed to μF for this equation.

Now that we know the X_c we can proceed with Eq. 1 to learn the inductance of our coil. Remember that the coil reactance (X_L) is equal to the X_c (408 ohms) because X_c and X_L are equal at resonance.

$$L(\mu H) = \frac{408}{6.28 \times 3.9} \qquad \text{(Eq. 4)}$$

hence $(L\mu H) = 16.65$

If the coil were the type that has a movable slug, we could learn the tuning range by obtaining a dip reading with the core at each end of its travel. The Q would be highest with the core material inside the coil winding.

When using a dip meter, we can get a feel for the relative Q of a coil by noticing how far from the coil we must put the dip-meter probe to obtain a meter reading (dip). The farther we move from the coil under test (still observing a dip), the higher the Q. If we must couple the dipper probe very tightly to the test coil, the Q is quite low. Fig. 3 shows the correct way to couple to an unknown coil. The axis of the dipper-probe coil must match that of the coil being tested. No dip will occur if we approach the test coil from its side.

We will experience a similar difficulty when attempting to measure a toroidal inductor with a dip meter. This is because of the inherent self-shielding nature of the toroid, as mentioned earlier. However, by probing the gap on the toroidal coil (Fig. 3C) it should be possible to find a dip. This is because the discontinuity of the self-shielding at the winding gap permits some coupling to the dipper. The capacitor leads become part of the overall inductance and provide a coupling point.

A Homemade Inductance Meter

Wouldn't it be convenient to have a homemade instrument that could be used to measure small values of inductance? Such a device can be made from ordinary components, and it need not be complex. The two most important parts of the unit would be the tuning capacitor and the indicating meter. The variable capacitor (C1 of Fig. 4) needs to be calibrated in picofarads through its tuning range. This can be done with the aid of a dip meter, a calibrated receiver and a known-value inductance. Coarse calibration can be achieved by checking the resonant frequency of the test circuit (coil and variable capacitor) at 5° settings of C1. A dial scale can be plotted as we proceed with the resonance checks. A vernier drive with a 0-100 dial scale is ideal for use during this exercise. Once the capacitance per 5° increment is known, the value of an unknown inductor can be calculated by means of the equations given earlier, or we may use the ARRL L/C/F slide-rule calculator. Greater sophistication can be had by developing a chart that compares the tuning-dial readings with inductance values.

A suitable circuit is given in Fig. 4. Q1 is a crystal oscillator that operates at 5 MHz. Y1 can be for some other frequency in this general range; it is not a magic number. Q2 is lightly coupled to the output of Q1, and it operates as a broadband amplifier with feedback. Output from Q2 is sampled lightly by means of a 5-pF capacitor, then fed to a voltage-doubler diode detector, D1 and D2. The resultant dc voltage is supplied to a microampere meter, M1. As C1 is tuned through resonance with the test inductor (plugged in at J1 and J2), a peak meter reading will

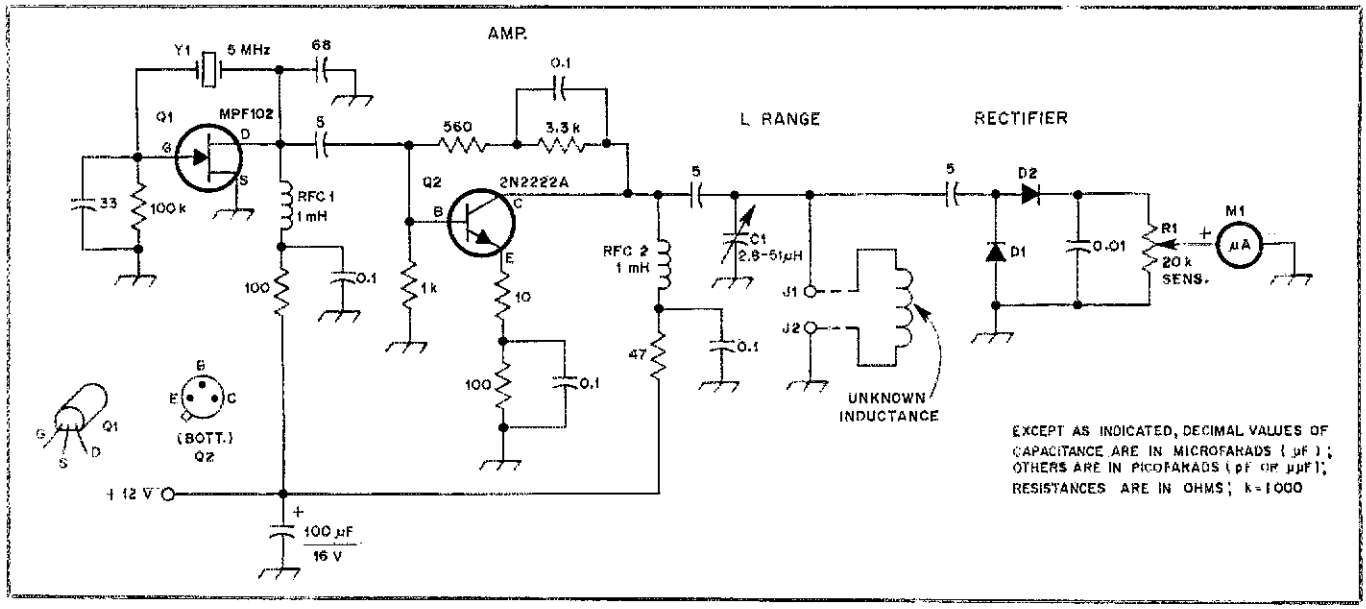

Fig. 4 — Schematic diagram of a test instrument for measuring inductance and relative Q. Fixed-value capacitors are disc-ceramic. The capacitor with polarity marked is tantalum or electrolytic. Fixed-value resistors are 1/4- or 1/2-W carbon composition. J1 and J2 can be plastic binding posts. RFC1 and RFC2 are miniature rf chokes (2.5 mH also suitable). R1 is a linear-taper carbon control.

be noted. The inductance or capacitance can then be read from the C1 tuning dial, depending on whether you calibrate your dial for picofarads or microhenrys.

The circuit shown will measure inductances from approximately 2.8 to 51 µH when C1 is a 365-pF broadcast-radio variable capacitor. Minimum capacitance for these units is approximately 20 pF, according to measurements I have made on a number of them. But, other values of tuning capacitance can be used if desired. The lower the maximum capacitance of C1, the more restricted the inductance range of the instrument.

The range of the circuit in Fig. 4 can be extended upward and downward by switching the crystal at Y1 to a higher or lower range. This could be done manually or by means of a wafer switch. For example, if we change Y1 to 10 MHz, the circuit of Fig. 4 will have an inductance-measuring range of 1.4 to 25 µH. Changing Y1 to 2 MHz, the range would be 7 to 127 µH.

The relative Q of the coil under test can be observed by the meter deflection versus the setting of the sensitivity control, R1. The higher the meter reading as R1 is turned down, the greater the unloaded Q.

For best sensitivity of the test instrument, I would suggest using germanium diodes at D1 and D2. But, good results can be obtained when silicon switching diodes, such as 1N914s, are used. M1 can be a 50- or 100-µA meter. The 50-µA movement will provide the better sensitivity. You may want to try one of the low-cost edgewise fm tuning meters that are available on the surplus market. Most of them are in the low microampere range. Meters and tuning capacitors are available from Surplus Electronics Corp.[4]

A Way to Measure the Q

A colleague of mine, W7ZOI, who is an ARRL Technical Advisor, described a simple method for the measurement of tuned-circuit Q. It is a technique he uses in his home workshop. The circuit under test, which consists of a parallel combination of L and C, with L being the unknown inductor in our case, is swept with a signal generator or low-power amateur transmitter. The tuned circuit is sampled lightly with a scope or VTVM (vacuum-tube voltmeter or FET VOM) and rf probe. The 3-dB points on the tuned-circuit response curve are noted in terms of signal frequency. From this information we can calculate the unloaded Q of the circuit. This is explained in detail on page 29 of the *ARRL Electronics Data Book*. A circuit diagram and pertinent equations for Q calculations are included.

Some Final Thoughts

Simple measurements of the kind discussed in this article are not beyond the beginner. The methods and circuits for simple measurement of inductance should not be difficult for you, either. We can learn far more by *doing* than by simply reading or thinking about these projects. A basic knowledge of coils and their properties will help you to save a lot of money when buying parts for new circuits.[5] You will know how to select surplus or flea-market inductors if you remember the simple guidelines of this article. Winding your own coils should be easier, too!

Notes

[1] D. DeMaw, *Ferromagnetic Core Design & Application Handbook* (Englewood Cliffs, NJ: Prentice-Hall, Inc.).
[2] 19070 Reyes Ave., Compton, CA 90221.
[3] mm = in. × 25.4.
[4] 7294 N.W. 54th St., Miami, FL 33166. Catalog available.
[5] Circuit boards and parts kit are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*.

Advisory Committee Members	Oct. 1982, p. 46
Amateur Radio Station Call Sign Assignment System	June 1983, p. 61
ARRL QSO Party Rules	Sept. 1983, p. 75
FCC Wrap-Up	Sept. 1983, p. 65
License Renewal Information	Jan. 1983, p. 53
Major ARRL Operating Event and Conventions — 1983	Jan. 1983, p. 54
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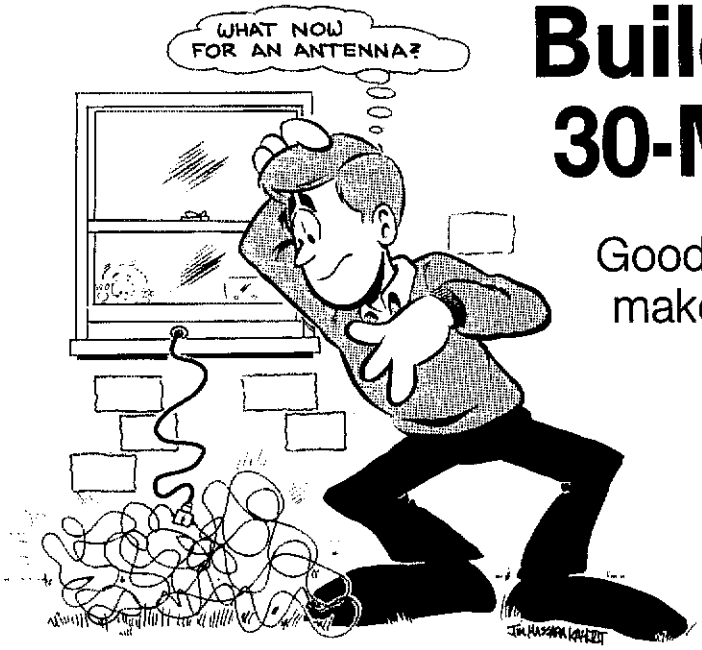
Third-Party-Traffic Countries	April 1983, p. 81
U.S. Amateur Frequency and Mode Allocations	Jan. 1983, p. 53



Building and Using 30-Meter Antennas

Good propagation and minimum QRM make 30 meters a great band for the DX hunter and ragchewer. Good results are possible without elaborate antennas. Let's review some simple ones and scale them to the new WARC band.

By Doug DeMaw,* W1FB

What makes 30 meters so interesting and unique? Perhaps the most outstanding virtue of 10.1 MHz is the propagation characteristic found there. In a nutshell, it is a pleasant combination of the good features we've learned to enjoy on 40 and 20 meters. For the most part, 30 meters is open to some part of the USA or world most of the time. The skip is generally longer than it is on 40 meters, and when 20 is dead, 30 is often open. I'll always recall how amazed I was during my first weeks on the new band, when in Connecticut I was able to hear JAs, ZLs, Europeans and U.S. stations at the same time! I don't remember having that happen on the other hf bands.

Another nice aspect of 10.1 MHz is the present lack of recognition for states or countries worked. At this time, there are no WAS or DXCC awards being issued for 30 meters, and there are no contests being staged. That, plus the 250-W input power limit, cw and RTTY only, make the band a delight to work if you enjoy chewing the rag or operating QRP. The band is not infested with operators who seek to pile up high contest scores or garner new states and countries for the purpose of acquiring an award. The 10.1-MHz band has proven ideal for many of us who have regular schedules with friends.

The U.S. frequency allocation is 10.100 to 10.109 MHz. A second segment exists from 10.115 to 10.150 MHz. *Beware: 10.109 to 10.115 MHz is a "no-man's land" for U.S. operators!* It is illegal for us to operate in that portion of the band. Don't be misled by VE signals in that part of the band: Canadians are allowed to use 10.109 to 10.115 MHz.

The Fine Art of Antenna Selection

I have observed some interesting practices, respective to antenna use, since becoming active on 30 meters. Many amateurs who are trying the band for the first time are using antennas that are cut for other bands — at least until they decide if they wish to stay active on 10.1 MHz. I went through a similar exercise during my first month on the band. I was surprised to find that any hf band antenna would bring reasonable results if the SWR was disguised by means of a Transmatch. Of course, the feed-line losses varied with the antenna being used, since different lengths and types were involved. For example, I had good luck with a 40-meter 5/8-λ sloping vertical, even though I was brute-forcing rf energy through a tapped-coil matching network at the base of the antenna. I was pleased to learn that my Cushcraft A4 triband Yagi would radiate well when using a Transmatch at the transmitter end of the feeder. I had reasonable success when feeding my shunt-fed 50-ft tower, which was resonant at 80 meters.[1] Each antenna enabled me to work DX and local (USA) stations, but the tribander for some reason had the advantage of reduced QSB. I hasten to state that there appeared to be no directional characteristics when using the A4.

If you have a center- or end-fed Zepp antenna, or a dipole with tuned feeders, chances are that you will find that antenna to be ideal on 30 meters. Many stations I have worked displayed strong signals when using that style of antenna. I had no antennas with tuned feeders, so I finally erected a sloping dipole with 50-ohm coaxial feed line, and it worked very nicely for all-round QSOing. But, let's consider some antennas that are designed for 30-meter dedicated use.

Effective Wire Antennas

I find it surprising that a number of amateurs have written to me and asked, "What shall I put up for 30 meters? Can you give me a set of dimensions?" Cutting an antenna to the proper length is perhaps the easiest task we hams must face. Yet, there are many who lack the confidence or knowledge to tackle that simple job. *The ARRL Antenna Book* should become a standard reference for those amateurs.[2]

Fig. 1 shows some basic wire types of antennas that should yield good results on 30 meters. The antenna at A is the popular, easy-to-erect drooping doublet, drooping dipole or inverted-V. This antenna and the others we will consider in this article can each be supported by a single mast or tower. That simplifies the installation. The inverted-V exhibits an omnidirectional radiation pattern. The enclosed angle should be about 90 degrees, but angles up to 120 degrees provide good results.

The length of the inverted-V legs do not become the exact length obtained from the ft = 468/f(MHz) formula. Cut them a trifle long to permit trimming the length for an SWR of 1:1. The final length will depend on the proximity of the wires to nearby conducting objects. The height of the lower ends above ground will also affect

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[1]Notes appear on page 29.

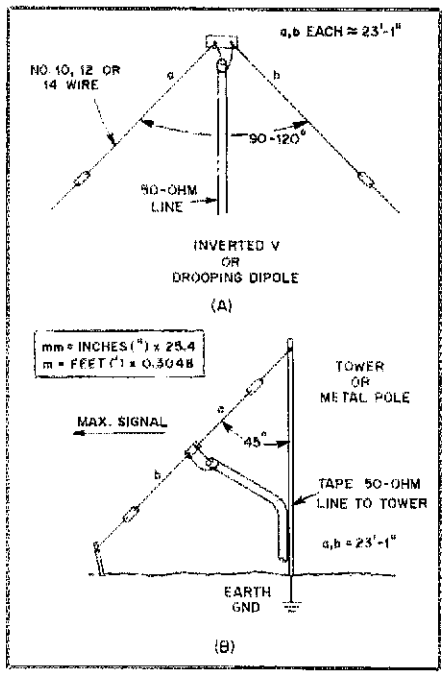


Fig. 1 — Good all-round results can be expected when using the inverted-V antenna shown at A. For successful DX work, the center of the dipole should be at least 0.5 wavelength above ground. The sloper seen at B will serve nicely for local and DX work on 30 meters. The arrow indicates directivity off the slope of the antenna when the supporting structure is metal.

the final length. Trim equal amounts of wire (1/2 inch at a time) from the ends of the dipole until the SWR will decrease no further. Although the SWR may not drop to as low as 1:1, it should be close to that ratio when using 50-ohm feed line. The height above ground for the center of the antenna should be as high as practical. Ideally, the feed point would be a half wavelength (48 feet) above ground, or greater. But, lower heights will permit good operation, too. The higher the antenna, the better the low-angle radiation and, of course, the better the DX results. This rule applies to operation on any hf band.

The antenna seen at B of Fig. 1 is excellent for DX and local use. By "local," we may consider a distance of a few miles out to a couple of thousand miles or more. This sloping half-wave dipole is commonly referred to as a "sloper" or "full sloper." If the antenna is supported from a grounded metal structure as shown, there will be directivity (not gain) in the slope of the dipole, as we have indicated by the arrow in Fig. 1B. A slope angle of 45 degrees is generally used for this radiator, but larger angles can be employed without significant change in performance. Any convenient size of wire can be used for the legs, a and b, provided the wire is strong enough to support the overall dipole. If you have a short mast, causing the lower end of antenna-leg b to be near the ground, some trimming of the antenna length may be required in order to reduce the SWR to near 1:1. Best results will be had if the lower end of the dipole is at least 6 feet above ground. If a tall wooden support is used for the antenna, you may want to erect the radiator as a vertical dipole (perpendicular to the ground). This will yield a good low-angle radiation lobe, which will be ideal for DX work. The pattern will then be omnidirectional. As many as four slopers are used by some amateurs (spaced at 90-degree intervals around the tower). The feed lines are switched by remote means to provide directivity in four directions.

Effective Wire Loop Antennas

Some advantages are possible if we configure our 30-meter wire antenna as a closed loop. If a full-wave loop is erected (Fig. 2A), we will realize increased aperture (called *capture area* by some hams), and there can be a marked reduction in local man-made noise during receive. A full-wave loop is seen as a triangle in Fig. 2A. Again, a single support is specified. The triangle has sides of equal length, although some disparity in the equality will not spoil the antenna performance. As shown, the loop is equal to the driven element of a Delta Loop beam, but with the feed point inverted.

Although top feed is shown in Fig. 2A, the antenna could be fed at the center of one of the sides or at one of the lower corners. You may wish to experiment with the feed point to learn which one provides the best results for your type of operation. Shifting the feed point will change the polarization of the signal and will also have some effect on the radiation angle. I prefer top feed, but have also fed this type of antenna at the center of the bottom leg.

Tuned feeders (open-wire line or 300-ohm TV ribbon) are specified in the interest of reducing feed-line losses (especially if a long run of coaxial cable would be required). The tuned transmission line will permit this loop to do a good job on 10 meters, too. Although it is not exactly related in terms of the third harmonic, it will radiate well on 28 MHz. It also should work well on 20 and 15 meters.

Coaxial cable can be used to feed the loop in Fig. 2A, but a quarter-wave matching transformer will be needed in order to obtain a low SWR. The feed impedance of the full-wave loop is approximately 115 ohms. A section of 72-ohm coaxial cable, 16 feet 1/2 inch long, can be inserted between the loop feed point and the 50-ohm line to the shack when coaxial-cable feed is desired. The piece of RG-59/U or RG-11/U cable will then serve as a matching transformer to convert the feed impedance to that of the 50-ohm line. A low SWR should result. The size specified for the 72-ohm section is a quarter wavelength for 10.125 MHz, and the 0.66 velocity factor of the cable has been included in the dimension. The exact length will depend on the type of 72-ohm line you use; the velocity factors differ slightly with respect to the insulation used. The ARRL's *Handbook* and *Antenna Book* list the velocity factors for the various popular coaxial cables. The formula is 246/f(MHz) × 0.66 when using solid polyethylene insulation.

Height factor h of Fig. 2A is of importance if we are to have good DX results with the loop. Ideally, dimension h would be 35 feet or greater to ensure a low angle of radiation. But, good results can be had with much lower antenna height. I enjoyed very good DX results with a 40-meter version of this antenna, even though the lower leg was just 4 feet above ground. I was able to work 22 countries with a 2-W QRP cw

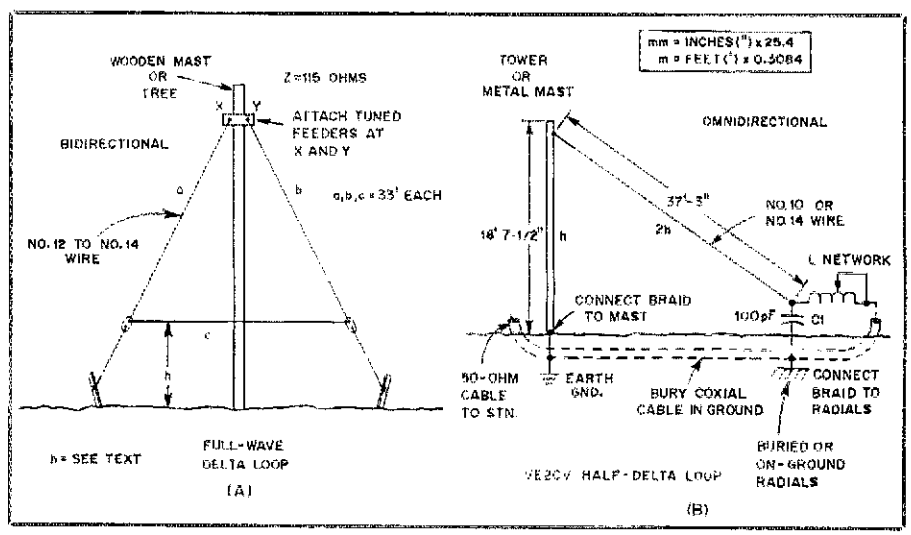


Fig. 2 — The full-wave loop at A can be thought of as the driven element of a Delta Loop beam antenna. It is capable of yielding excellent results on 30 meters, but maximum directivity is at right angles to the plane of the loop, making it a bidirectional radiator. A 30-meter version of the VE2CV Half-Delta Loop is shown at B. This is a highly effective DX antenna, but is practical also for "local" communications. Ground radials are needed with this antenna.

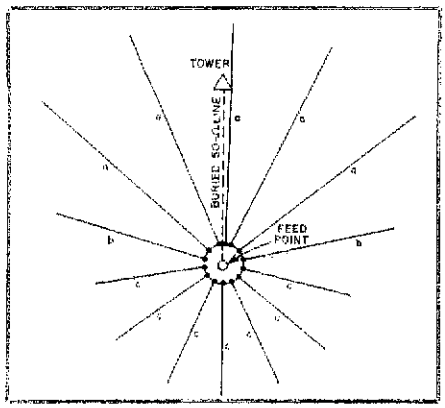


Fig. 3 — Looking down on the Half-Delta Loop, we envision the layout for a suitable radial system. The greater the number of radials, the better the effective ground under the antenna. Radials "a" should extend slightly beyond the vertical element of the loop, as shown. Depending on the ground conductivity in a given region, fewer radials than those shown may be ample. Good results have been reported by some amateurs who used only ground rods at each end of the loop.

rig during a three-month period when I lived in Connecticut. The loop was broadside east and west.

There is no reason why the loop of Fig. 2A could not be erected in a square, or even a slightly rectangular format if your property requires it. Irrespective of the antenna shape, the radiator will be a full-wave loop if the overall length is taken from 1005/f(MHz), which provides the answer in feet. The sides of the loop should not be too close together (long, narrow rectangle), lest performance be impaired. Such a format would approach that of a folded dipole. The radiation from the loop will be bidirectional off the broad side of the antenna.

The Half-Delta Loop for 30 Meters

The complete story about the Half-Delta Loop was carried in *QST* and other literature.[3] Therefore, we won't delve too deeply into the theory of operation. In effect, our loop conductor (tower and slant wire) is 0.5 wavelength long, plus a k factor of 1.15. Again, a single support structure is needed (h of Fig. 2B), and that section of the system must be conductive, since it is an electrical part of the loop. There should be *nothing* atop the mast or tower, because any additional conductors will seriously affect the antenna resonance and performance. This means that a tower with guy wires or additional antennas can't be used for the Half-Delta Loop. A tree or wooden mast can be used, however, provided a vertical wire (h) is added to take the place of the missing tower or metal mast. So, you need not have a tower to use this excellent antenna.

Electrically, the antenna of Fig. 2B functions as a full-wave loop by virtue of the missing half of the loop appearing in the ground as an image. The polarization is vertical, and the radiation pattern is principally omnidirectional. The angle of radiation is very low, which makes the loop excellent for ground-wave communication and DX.

A feed impedance of approximately 100 ohms will result if the dimensions are correct and when a reasonable ground system is used with the loop (radials). A matching transformer made from 72-ohm coaxial cable (described for the antenna of Fig. 2A) could be used if the L network of Fig. 2B was not desired. A low SWR would result. The simple L network will, however, permit precise matching to 50- or 72-ohm line.

The feed line is buried a few inches in the ground to keep it from being a physical hazard to people. The performance will be just as good if the feed line is simply laid on the ground. In either event, the shield braid of the feeder should be connected to the radial wires at one end of the loop and to the base of the tower at the remaining end.

Good results can be obtained with a few in-ground or on-ground radial wires. A suggested minimum number is illustrated in Fig. 3. A ground rod, or a group of rods tied together electrically and spaced 3 feet apart, should be located at the feed point and at the base of the tower or mast.

The L network of Fig. 2B may contain a coil that can be tapped during the SWR adjustment. For 30 meters, I use a hand-wound inductor that has 20 turns of no. 14 copper wire. The coil diameter is 1-1/2 inches, and the length is 6 inches. C1 should have 1/8-inch plate spacing for power levels up to 250 W — the maximum dc-power input allowed in the USA for 30 meters. C1 and L1 are varied until the SWR is 1:1. The bandwidth of the L network will be great enough for coverage of the entire 30-meter band when the SWR is adjusted at 10.125 MHz.

Vertical Antennas

A ground-plane vertical will generally give better performance results when it is used in preference to a ground-mounted vertical at 30 meters. As we approach the upper end of the hf spectrum, the signal is affected more and more by nearby conductive objects (power lines, downspouts, plumbing, fences and even large, dense trees with foliage). Absorption and pattern distortion can result when the antenna is obstructed by such things. Better performance will result if the vertical is elevated above the nearby clutter. Another advantage to the above-ground installation is the reduced number of radial wires required. A system of four "floating" radials will permit the system to do a good job for DX work.

A simple ground-plane vertical is shown in Fig. 4. The vertical portion consists of aluminum tubing. To ensure ample rigidity and longevity, I use telescoping sections of tubing (3), starting with a 1-1/2 inch diameter piece at the bottom. The sections

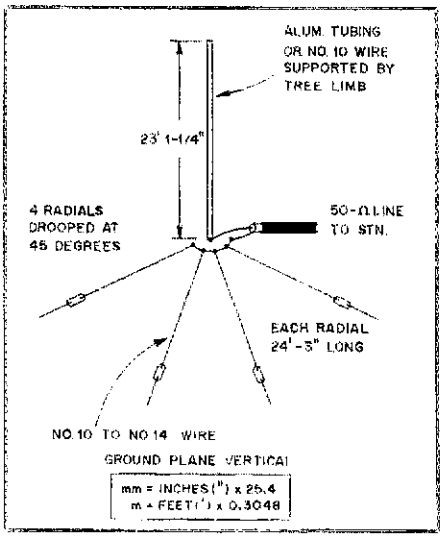


Fig. 4 — Details of a ground-plane vertical antenna for 30 meters. This omnidirectional, low-angle radiator will do a fine job for DX and local operations. See the text for information on construction methods.

slide into one another for a length of 12 inches. Four slots are sawed in the outer tubing at each joint to permit a good bond between the sections when using a stainless-steel hose clamp. A short piece of dowel rod inside the inner tubing at each joint will permit the clamps to be drawn up tight without distorting the tubing.

The radials can serve as guy wires for the support mast. If they are drooped as shown in Fig. 4, the feed impedance will closely approach 50 ohms. If they are at right angles to the vertical element, the impedance will be on the order of 30 ohms, thereby requiring a matching section.

An antenna of this type can be made entirely from wire if you have a tall tree from which to hang it. The vertical element would then be made of wire and would require an insulator at the top end. Irrespective of the construction method used, this style of antenna provides low-angle radiation and has an omnidirectional pattern.

Tag Ends

We did not get into a treatment of gain types of directional antennas in this article. Certainly, Yagis, quads, ZL Specials and other types of antennas are worth considering if you want a single-band beam antenna. The intent here was to describe some simple, inexpensive wire antennas that are capable of delivering good performance at 30 meters. Needless to say, these antennas can be scaled to other bands of operation, and should provide equally good results. Good luck and happy DXing!

Notes

[1]m = ft × 0.3048; mm = in. × 25.4.

[2]The greatly revised 14th edition is now available from ARRL.

[3]J. Belrose, "The Half-Delta Loop: A Grounded, Vertically Polarized Antenna," *Ham Radio*, May 1982. Also, J. Belrose and D. DeMaw, "The Half-Delta Loop: A Critical Analysis and Practical Deployment," *QST*, Sept. 1982.

The Noise Maker — An Aid to Learning the Morse Code

Using a keyed white-noise generator in place of a conventional code-practice oscillator may prove to be an advantage when learning to copy cw.

By Don E. Hildreth,* W6NRW

Code-practice oscillators have always been pretty much the same, it seems. I was about 12 when I first used one to learn the code — and that was 50 years ago! More often than not, the tone employed is somewhere between 500 and 1000 Hz, and is relatively pure (narrow band). In addition, well-designed tone generators provide smooth keying with a minimum of starting and stopping transients, or "clicks" (clicks are not only annoying to listen to, but over time they can cause hearing damage). Thousands, perhaps millions, of people have learned the Morse code using these simple and effective devices.

So why change something that has worked so well, for so many, for so long? Actually, what I am describing here is not a change but an alternative. Why bother? Well, consider the fact that there are many would be "brass pounders" who just can't seem to learn the code. Why should this be? The spectrum of speech frequencies is immensely more complex than the simple on-and-off pattern of Morse code. Still, there are those who have great difficulty with cw communication. Could it be that the hearing process for some of us just "doesn't like" a single tone going on and off all the time?

While teaching the code, I have encountered those who would start making headway when the keyed tone was lowered to around 300 Hz or less. Some of these people had hearing problems, usually a high-frequency hearing loss, that also made speech comprehension difficult. But this was not always the case. I have also encountered those with normal hearing who claim to experience a ringing that seems to fill the off periods in a code letter. For these people, learning the code is difficult indeed. Others with normal hearing, as measured by an audiologist, just can't seem to learn code even though they have an intense desire to do so, and they cannot describe their problem. Since none of us can experience the senses of another, it is very difficult to learn how to be of assistance.

Keyed Noise Generator

Recently, I tried keying a noise generator in place of an oscillator for code practice, and the results were good. Based on past experience in teaching the code, I feel certain that this technique could help some of those with defined hearing loss — and perhaps others, as well. I don't have a hearing problem for code, but I just like the sound of this keyed noise generator. I wouldn't think of going back to the old tone-generator system.

But what would be the use of learning with this device when almost all ham gear produces a beat note for cw? The answer to this would depend on your specific problem. If you have a high-frequency hearing loss that makes the typical 750-Hz beat note difficult to hear, you can use the electronic switch included in this article. This will work in cases where QRM is not too bad and for casual use. There is also a more sophisticated process called Tone-Tag, which is designed to tone modulate a cw signal with 100 Hz only when it is tuned to a beat note range of 700 to 800 Hz.[1] This can operate, and even provide benefit, under extreme QRM and poor signal-to-noise ratio conditions. But in many cases (perhaps most), as you become proficient with the code, you will develop the ability to handle adverse conditions unaided. It seems clear that it is mostly when you are first learning that you can use all of the help you can get! The Noise Maker may help you get over the hump.

Circuit Description

The basic circuit, which uses very low cost components, is shown in Fig. 1. It is designed so that low-impedance stereo headsets or the older, 2-kΩ monaural headsets can be used without circuit changes. Although the output level is partially dependent on the headset efficiency, most units will provide sound levels of 60-70 dB (A), which is usually adequate for comfortable listening. [Editor's Note: The dB (A) is a unit of sound-level measurement that uses "A weighting." This is a frequency-dependent scale on a sound-level meter, adjusted to approximate the way your ear responds to different frequencies. The 0-dB reference level is the minimum sound level that your ear can detect at its most sensitive frequency, about 1 to 2 kHz. Normal conversation is in the range of 50-70 dB (A).]

Q1, connected as a Zener diode through R6 to +9 V, is the noise source. The noise signal is coupled through C2 to the high-impedance noninverting input of the opera-

*Hildreth Engineering Co., P.O. Box 60003, Sunnyvale, CA 94088

[1]Notes appear on page 31.

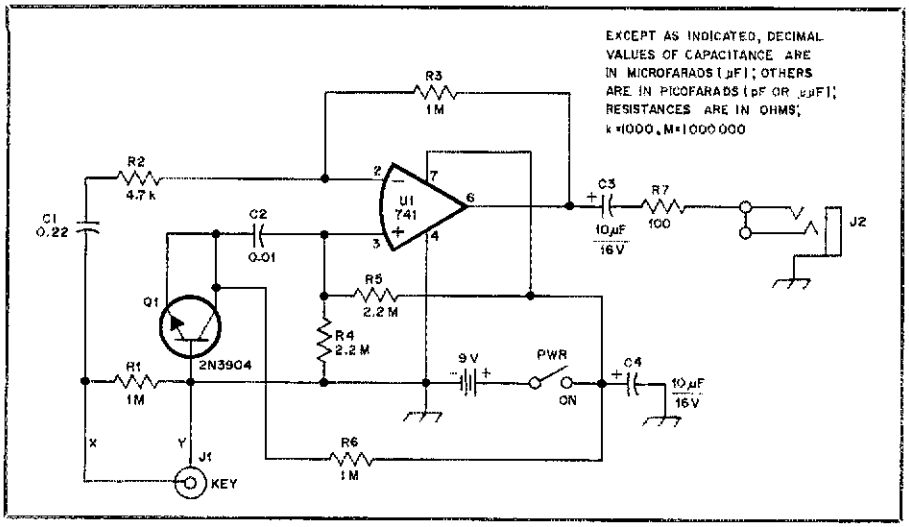


Fig. 1 — Schematic diagram of the Noise Maker. All resistors are 1/4-W, 5%, carbon types. Capacitors are disc ceramic unless otherwise noted. Polarized capacitors are electrolytic.

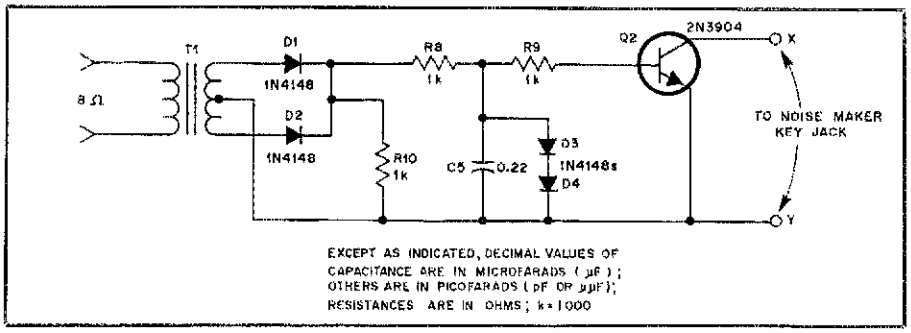


Fig. 2 — Transistor switch for keying the Noise Maker from a receiver speaker output. T1 is a miniature 8-Ω to 1-kΩ audio transformer. All resistors are 1/4-W, 5% carbon types.

tional amplifier (op amp), U1. R4 and R5 serve as a load resistor and set the op amp output to one half the supply voltage. The amplifier voltage gain is approximately 2 when the key is open, as determined by the gain equation 1 + R3/(R1 + R2). When the key is closed, the gain goes up to about 1 + R3/R2, which results in a 34-dB on/off ratio. Using this circuit arrangement, C1 is forced to mirror the nominal +4.5-V level at the amplifier inverting input, thus eliminating occasional keying transients. Using this design, the key is making and breaking only a few millivolts of noise signal. This results in smooth and clickless keying. C3 eliminates dc from the load, and R7 is included to avoid overloading the op amp when 8-Ω headsets are used, and to establish the condition such that the sound level is about the same whether you plug in high- or low-impedance headsets. With the component values given, the noise band produced will be from approximately 150 Hz to 10 kHz.

Construction

In general, construction is not critical. It may be prudent, however, not to use key leads of more than two or three feet in length and to keep the leads associated with pin three of the op amp to an inch or less in length.[2] This will reduce the possibility of picking up a local broadcast station or other strong local fields.

I just stuck the parts down on the back of the panel with Silastic® and then used point-to-point wiring. Avoiding a circuit board cuts the parts cost almost in half, and direct wiring only takes a few minutes.[3]

Alternative Uses

Quite naturally the question will arise: What if I want to be able to listen to code from my receiver or code practice tapes, etc. through this thing?

Fortunately, the switching needed to make Noise Maker function without a key is simple. Adding an ordinary transistor switch assembly, as shown in Fig. 2, will allow your receiver or other code producing device to operate the Noise Maker very nicely. With this circuit addition, T1 connects to your receiver speaker output and the Q2 collector and emitter leads connect to the Noise Maker key terminals. When a cw signal is tuned in, the nominal 750-Hz signal is increased in voltage by the transformer and rectified by D1 and D2. R10 is a load resistor. The combination of R8, C5, D3 and D4 filters and limits the resulting signal to a suitable level for driving the base of the transistor switch (Q2) through current-limiting resistor R9. An electronic switch of this type is far from perfect, but it is more than adequate in this case.

There are other uses for white noise. Just short the key terminals and use headsets plus noise to reduce and mask outside interference when trying to study, concentrate, meditate, or whatever. Most white-noise generators on the market cost a lot more than this unit — and you can't key them very well either.

Notes

[1]D. E. Hildreth, "Communications Audio Processor for Reception," *Ham Radio*, Jan. 1980, pp. 71-79.
[2]mm = in. × 25.4; m = ft × 0.3048.
[3]Complete units are available from the author for $12.95 plus $2 to cover shipping. The ARRL and *QST* in no way warrant this offer.

Next Month in QST

November's the month for a full report on June 1983 Field Day and rules for some future operating activities. You'll also read about a new nationwide program designed to attract youngsters into ham radio.

For technical articles, "A DTMF 'Easy-Controller' — With Security" describes a security system for repeaters, and a Beginner's Bench article gives some simple ways to test your transmitter.

This is just a taste of all of the interesting tidbits coming in the next issue; it promises to be the largest issue so far this year.

Strays

SSC LOGO CONTEST

☐ Are you or any of your club members artists? If so, you have an opportunity to design a logo for the new Special Services Club program. Here's what's involved.

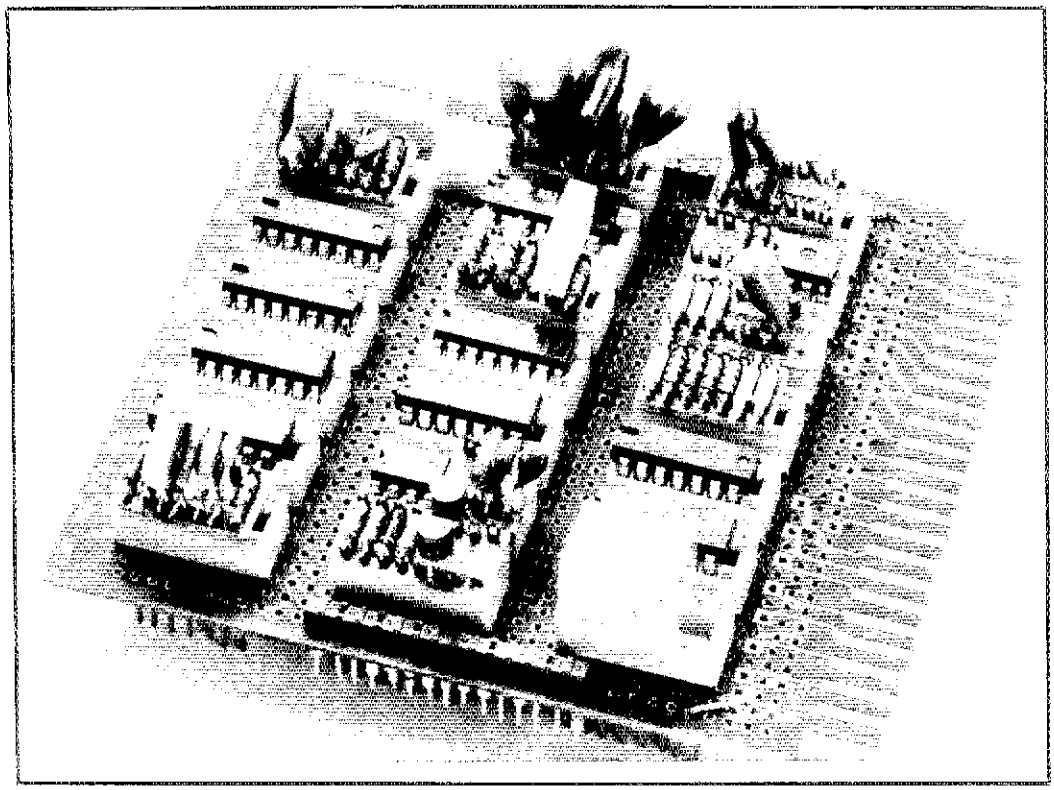
Your work will be judged on how well it
a) symbolizes Amateur Radio clubs
b) expresses superior achievement
c) is aesthetically pleasing.

Your design must
a) incorporate the ARRL logo in a prominent location
b) spell out "Special Service Club"
c) be legible when reduced and embroidered in a size of roughly 4-6 inches.

All designs will be submitted anonymously to the ARRL Membership Affairs Committee and the Board of Directors for a final decision. The winning designer will receive an engraved plaque, a cloth-bound *Handbook* and photo coverage in *QST*.

Submit your original design on 8½- × 11-in. white paper to Special Service Club Logo Contest, ARRL Hq., 225 Main St., Newington, CT 06111. Include your name, call sign and address. Your entry must arrive at ARRL Hq. no later than January 15, 1984. *This contest is for ARRL members only.*

Build an Amateur Radio Modem



Want to use your computer on the air? This explanation of the RS-232 interface, and a modem you can build, will help you do it.

By Reed Valleau,* N1BEG

Amateurs have used digital data for years. Until recently, this meant attaching an RTTY (radioteletype) unit to a transceiver and using the 5-bit Baudot code. A couple of changes in recent years have altered this picture. Because of integrated circuits (ICs), sophisticated communications and computer equipment is available at reasonable prices. In fact, computers have become so inexpensive that many are dedicated to trivial tasks — something unheard of a few years ago. Also, the FCC now allows amateurs to use ASCII in addition to the Baudot code. Since this is the code used by most computer hobbyists, the FCC has made it easier to send computer data over the air.

A typical modern digital communications setup is shown in Fig. 1. The source of digital data is no longer a teleprinter unit, but could be an ASCII terminal or a terminal and computer combination. If only the terminal is used, ASCII data would be transmitted as the operator typed at the keyboard. Add a microprocessor to this setup and more options become available, such as:

1) ASCII-to-Baudot conversion: The operator enters ASCII data; the computer changes this data to Baudot and sends it to the transceiver at any speed.

2) Protocol implementation and error detection: Messages can be communicated between computers within an envelope. This envelope can contain enough redundant data to let the computer detect errors. If errors are detected, the computer can request retransmission. Only correct messages would be displayed to the operator.

3) Packet Switching: Once an error-free protocol is implemented, the computer can act as a store-and-forward device to transfer error-free packets within a network.

Similarly, the computer could be programmed to receive all messages, but save only those sent to a particular station. Most home computers can be programmed to implement any of these functions.[1-4]

Whatever the source of data, one problem must be addressed before digital data can be sent over the airwaves. Computer information is stored digitally and transferred in serial binary format, while radio transceivers can communicate analog signals only. The device that merges these two incongruous worlds is the *modem* (for MOdulator/DEModulator). Modems have application in areas other than communications over the airwaves. They are used in telecommunications to provide data-links between computers over telephone lines. Another type of modem is used to store and retrieve digital data using an analog tape recorder. Modems may be purchased from a number of manufacturers or they may be built easily.

The modem presented here conforms to the EIA RS-232-C standard for half-duplex communication over a dedicated line and will operate reliably at speeds up to 300 bauds. Half duplex is the mode normally used in amateur communications. It means that only one party is transmitting at a time. (Full duplex allows for simultaneous bidirectional communications, such as

*25 Walnut Hill Rd., Newton, MA 02159

[1]Notes appear on page 36.

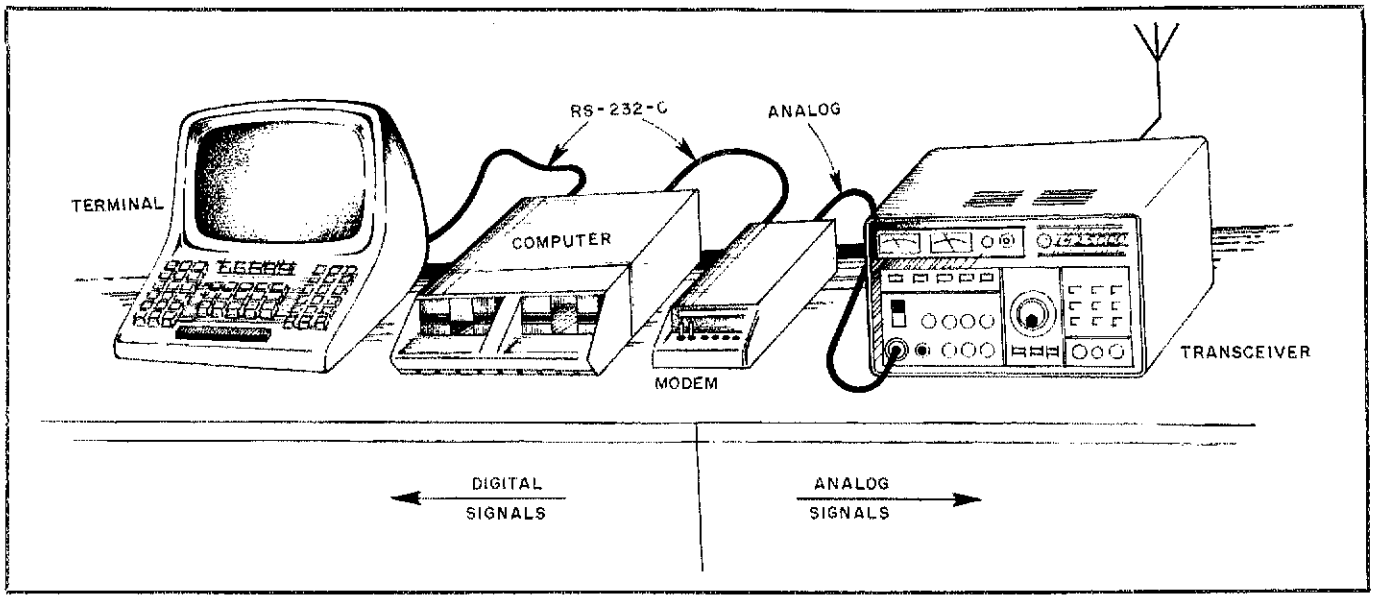


Fig. 1 — A modem set up for communicating digital data might use an ASCII terminal, a computer, or both to generate the digital data. The digital signals are converted to analog signals by the modem and are fed into the transmitter microphone input. Received data goes from the receiver to the modem, where the analog tones are changed into digital data that the terminal or computer can use.

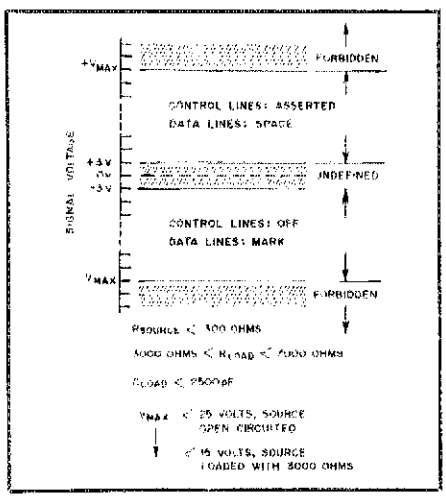


Fig. 2 — Voltage levels on RS-232-C data and control lines are between 3 and 15 V or between −3 and −15 V, as shown in this figure. Also shown is the meaning of these two ranges for the data lines (RxD and TxD) and the control lines (RTS, CTS, DCD, and DSR).

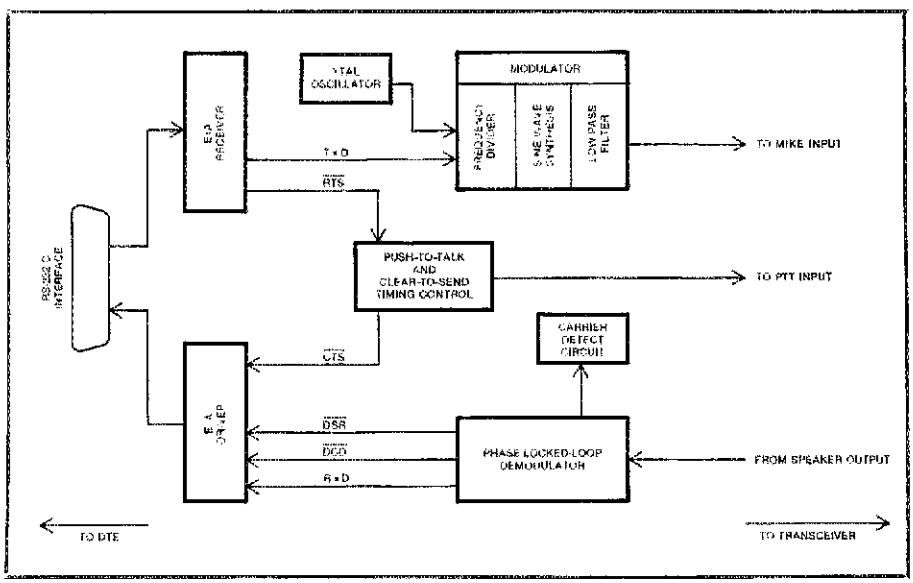


Fig. 3 — A block diagram of the modem. Connected to the left side is a terminal or computer with an RS-232-C connection. The right side connects to a transceiver.

normal telephone communications.) This modem can be used to connect any standard terminal or computer, equipped with an RS-232-C interface, to a transceiver or transmitter/receiver pair. The modem changes serial digital data to audio tones and audio tones into digital data. The tones produced by the modem are fed into the transmitter microphone input. This produces F1 or A2 emissions when used with an ssb or an a-m transmitter, respectively. Tones received from the transceiver speaker output are demodulated by a phase-locked-loop circuit to produce a serial data stream that is sent to the computer or terminal for interpretation.

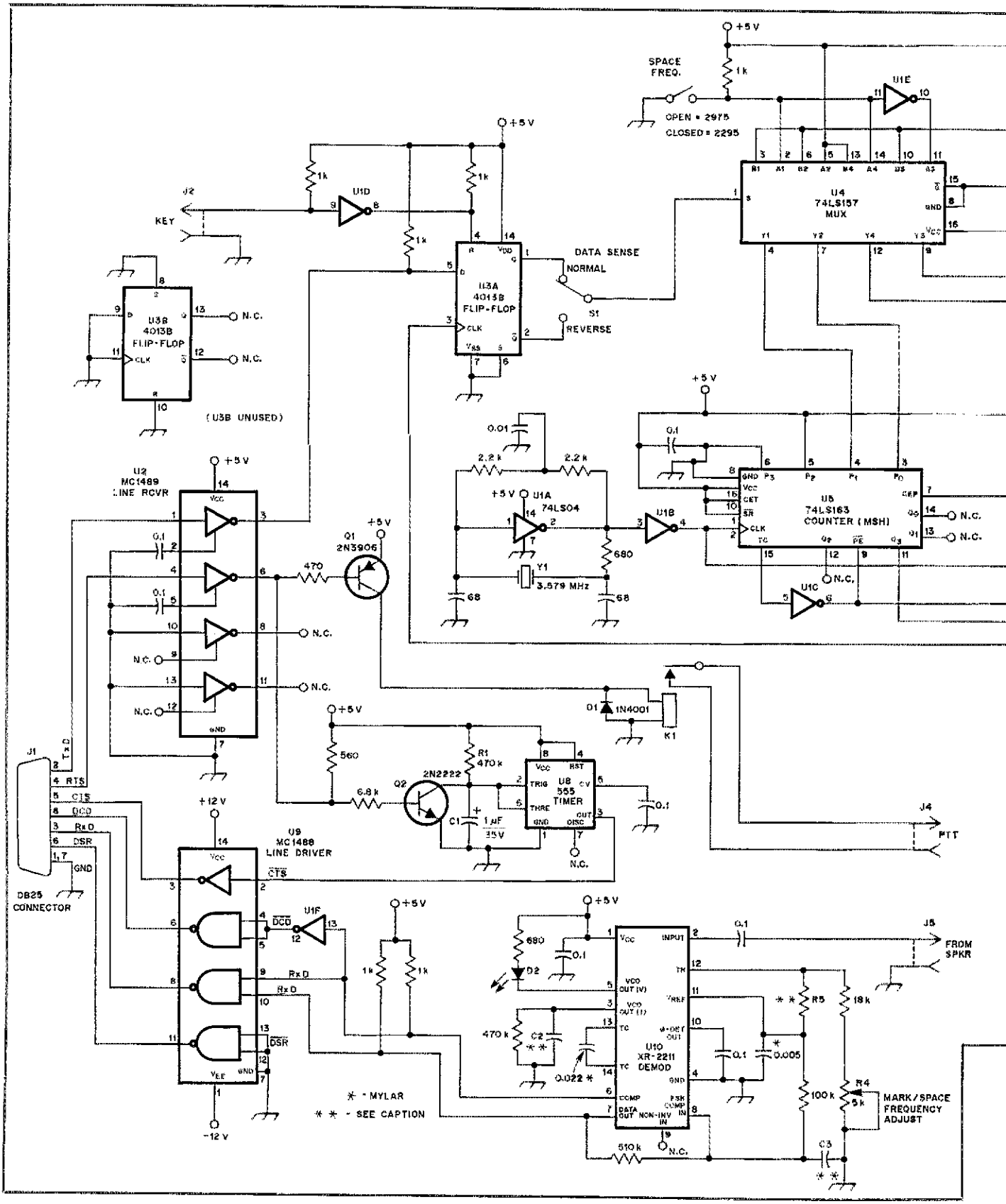
What is RS-232-C?

The RS-232-C interface standard was designed years ago to reduce the problem of interconnecting computer equipment made by different manufacturers. The standard separates equipment into two broad categories: Hardware that is the source and/or destination of communicated data, and hardware used to perform the communication process. The first category is known as Data-Terminal Equipment (DTE) and is usually a terminal or a computer. The second category is referred to as Data-Communication Equipment (DCE), and generally refers to modems. In Amateur Radio applications, DCE includes not only the modem but also the transceiver.

The RS-232-C standard is comprehensive in scope, but remains general-purpose in nature — which accounts for its wide acceptance. This standard describes the electrical characteristics of the interface, including voltage levels (Fig. 2), impedances and capacitances. It also specifies which data and handshaking signals are required for different types of communication. The electrical specifications are numerous and have caused many headaches for engineers throughout the years. Fortunately, Motorola has designed a pair of moderately priced ICs that take care of these electrical requirements for most applications.

Handshaking Signals

The data and handshaking signals for a half-duplex line may seem complicated at first, but are easy to understand with a little scrutiny. For a half-duplex communication channel, the standard requires two lines into, and four lines out of, the modem. Since the computer "sees" these connections as the communications channel (and



since many applications don't follow the letter of the standard), it is worth spending some time discussing these signals and their relationship to one another.

The first signal required by the standard is known as Data-Set-Ready (DSR). It is used by DTE to determine whether or not there is DCE attached to the RS-232-C port and if that equipment is ready to accept control and data information. When the DTE is ready to send data, it "tells" the modem to go into transmit mode by asserting the Request-To-Send (RTS) control line.

This causes two things to happen: First, the modem places the transceiver in transmit by activating the push-to-talk (PTT) relay, causing the mark frequency to be sent. RTS is also used to start a programmable timer, the output of which is used as the Clear-To-Send (CTS) signal.

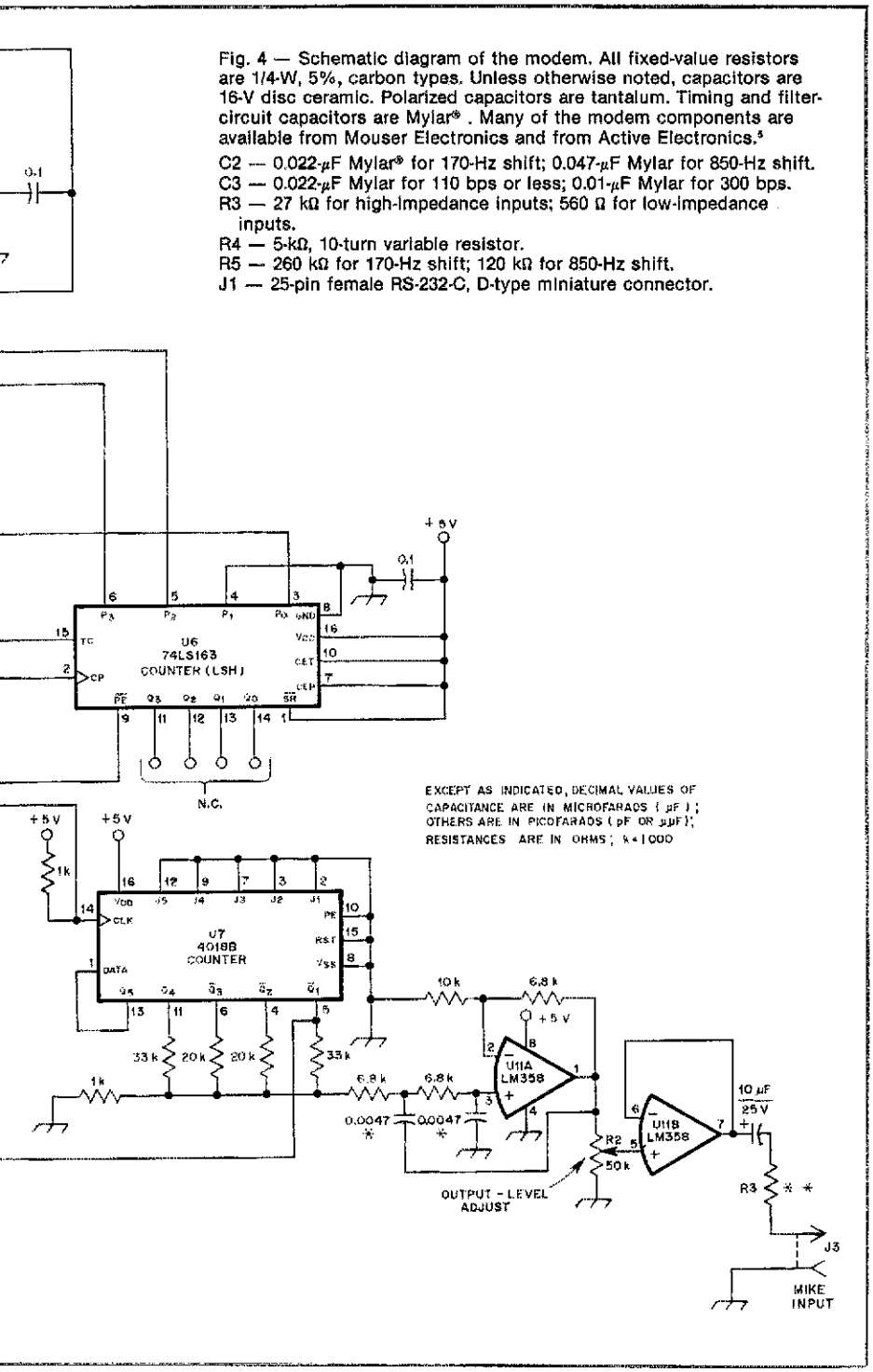


Fig. 4 — Schematic diagram of the modem. All fixed-value resistors are 1/4-W, 5%, carbon types. Unless otherwise noted, capacitors are 16-V disc ceramic. Polarized capacitors are tantalum. Timing and filter-circuit capacitors are Mylar®. Many of the modem components are available from Mouser Electronics and from Active Electronics.[5]

C2 — 0.022-μF Mylar® for 170-Hz shift; 0.047-μF Mylar for 850-Hz shift.
C3 — 0.022-μF Mylar for 110 bps or less; 0.01-μF Mylar for 300 bps.
R3 — 27 kΩ for high-impedance inputs; 560 Ω for low-impedance inputs.
R4 — 5-kΩ, 10-turn variable resistor.
R5 — 260 kΩ for 170-Hz shift; 120 kΩ for 850-Hz shift.
J1 — 25-pin female RS-232-C, D-type miniature connector.

The RTS-to-CTS delay ensures that the transmitter relays have enough time to switch, and that the receiver has time to lock onto the carrier before data is sent. The exact length of the RTS-to-CTS delay is not specified by the standard and may vary from almost no delay at all to a second or more, depending on the application. A delay of 500 ms is reasonable for most amateur work, but it will depend on the circumstances. For example, if two computers are connected through all solid-state equipment, with fast switching times, the delay can be reduced. When the DTE receives CTS, it is allowed to start sending data immediately. As long as the CTS control line remains asserted, the DTE is free to send data in serial form to the modem over the Transmit-Data line (TxD).

When the DTE has completed sending the data, it puts the modem into the receive mode by dropping the RTS line. The modem responds by turning off the PTT relay and by immediately dropping the CTS control line. The transceiver then goes to the receive mode and the modem monitors the speaker output for a carrier sent by another modem. When a carrier is detected, the modem activates the Data-Carrier-Detect (DCD) control line to the DTE. It then allows any received data to be transferred from the demodulator circuit to the DTE by way of the Received-Data line (RxD).

While the preceding description is technically accurate, not all control lines will be used for all applications. For example, many terminals sold today assert the RTS line as long as they are powered. This problem can be overcome by disabling the push-to-talk control circuit and switching the transceiver manually.

About the Circuit

Fig. 3 is a block diagram of the modem, and the schematic diagram is shown in Fig. 4. The modulator circuit is a sine-wave synthesizer driven by a crystal-controlled, 3.579-MHz oscillator. The oscillator signal is divided by one of the two preset divisor values before being applied to the synthesizer. One divisor results in the generation of the mark frequency while the other produces the space frequency. A multiplexer (U4) is used to select the correct divisor, depending on the state of the serial TxD input. The oscillator output is divided by 168 for the 2125-Hz mark frequency, by 156 for the 2295-Hz narrow-shift space frequency or by 120 for the wide-shift space frequency of 2975 Hz. The oscillator signal is further divided by 10 in the CMOS (complimentary-symmetry metal-oxide semiconductor) sine-wave synthesizer (U7). The synthesizer is a 10-step Johnson ring counter that generates a five-level sine-wave approximation.

The synthesized sine-wave is routed through a low-pass filter to remove high-frequency harmonics, and buffered before being applied to the transceiver microphone input. The first significant harmonic from the synthesizer is the ninth (about 19 kHz), so the two-section, low-pass filter has been designed to attenuate frequencies higher than about 5 kHz. This means that the audio signals produced by the synthesizer will experience no appreciable phase shift, but harmonics are effectively removed. The result is a pure sine wave with little phase distortion. R2 is used to set the output level to the transmitter and should be adjusted so the modem does not overload the transmitter audio amplifier. U3 ensures that data transitions occur only at sine-wave zero crossings, thus reducing unwanted adjacent-channel splatter. The modulator circuit requires no frequency adjustments and output frequencies are accurate to within 0.25%.

The demodulator circuit is designed around the EXAR-2211 IC (U10), which is specifically designed to demodulate afsk tones. This IC uses phase-locked-loop techniques and incorporates many circuit enhancements to ensure reliable operation. The IC outputs are used to drive the DCD control line and to provide the demodulated data to the RS-232 interface

IC. As mentioned earlier, the RS-232-C drivers (U2 and U9) are a pair of Motorola ICs that translate the EIA-specified levels to TTL-compatible levels. The RTS-to-CTS delay circuit is a one transistor unit that charges C1 through R1 when the RTS line is asserted and discharges the same capacitor, through Q2 when RTS is dropped. The RTS-to-CTS delay time can be adjusted from a few milliseconds to several seconds by changing the value of R1. The greater the resistance the longer the delay time. The exact value of R22 can be found for this time range by using the formula

R1 (ohms) = delay time (seconds) × 945,000 (ohms/second) (Eq. 1)

A 555 timer (U8) is used as a threshold detector and comparator. The U8 output serves as the CTS signal.

Construction

The construction of this modem is generally noncritical, but a few precautions should be followed to ensure proper and long-lasting operation. My prototype unit was constructed from wire-wrap components on a Radio Shack 4.5- × 6.0-inch wire-wrap board and cost about $30 (using all new parts).

The crystal-oscillator components should be mounted close to each other to ensure frequency stability. Make sure that the unit is housed in a metal container to prevent RFI from being generated by the oscillator. The crystal is a standard television color-burst type and should be available at any TV repair shop or Radio Shack store. All TTL parts should be of the LS or HC variety for low power consumption.

Adjustments

After the unit is constructed, remove C2 and connect U10 pin 2 to pin 10. Attach a frequency counter to U10 pin 3 and adjust R4 so that the frequency counter indicates a frequency halfway between the mark and space frequencies (2210 Hz for 170-Hz shift, or 2575 Hz for 850-Hz shift). Reconnect capacitor C2. Check the output of the Johnson ring counter (U11, pin 7) with a frequency counter or an oscilloscope to ensure proper operation. As a final check, connect the modulator output to the demodulator input and attach an ASCII terminal to J1. Asserting RTS should cause CTS to be asserted after the proper delay. Data sent to the modem on the TxD line should be echoed to the terminal on the RxD line.

For final adjustment, connect the modem to a transceiver and tune to a RTTY transmission. The Carrier-Detect indicator will be brightest when the signal is tuned correctly. An oscilloscope connected to the RxD output will show the received data as it would be presented to the DTE. Remember that this type of unit will produce a 100% duty cycle when transmitting, compared to a duty cycle of about 25% for unprocessed ssb voice communication. Be sure your final amplifier can stand this type of workout, or reduce the drive to the amplifier so that it will not overheat.

Televideo 920, 925, Most ASCII Terminals

(Input) Pin	Name		Name	Pin (Modem)
2	TxD	———	TxD	2
3	RxD	———	RxD	3
1,7	GND	———	GND	1,7
4	RTS	———	RTS	4
5	CTS	———	CTS	5
6	DSR	———	DSR	6
8	DCD	———	DCD	8

(A)

Altos 8000-15D Computer, or a computer whose RS-232-C connections are configured as DCE

(Input) Pin	Name		Name	Pin (Modem)
3	RxD	———	TxD	2
2	TxD	———	RxD	3
5	CTS	———	RTS	4
4	RTS	———	CTS	5
			DSR	6
20	DTR	———	DCD	8
1,7	GND	———	GND	1,7

(B)

IBM Personal Computer, or a computer whose RS-232-C connections are configured as DTE

(Input) Pin	(Name)		Name	Pin (Modem)
2	TxD	———	TxD	2
3	RxD	———	RxD	3
4	RTS	———	RTS	4
5	CTS	———	CTS	5
6	DSR	———	DSR	6
8	DCD	———	DCD	8
1,7	GND	———	GND	1,7

(C)

Fig. 5 — Typical connecting cables to go between three types of DTE and the modem.

Typical Connections

Three cable configurations are shown in Fig. 5 for connecting the modem to:

1) A typical ASCII terminal (Televideo 920 or 925).

2) A computer RS-232-C port configured as DCE (ALTOS 8000-15D).

3) A computer RS-232-C port configured as DTE (IBM Personal Computer).

I chose these three connections because they cover about 95% of the cases encountered when connecting DTE to DCE. In the first case the output of the Televideo, like most ASCII terminals, is wired as DTE, so the connection is straight through on all lines except RTS (Fig. 5A). As mentioned earlier, RTS is usually always held asserted on terminals. This problem is overcome easily by simply routing RTS to CTS on the terminal and switching the transceiver manually. The second case shows a computer RS-232-C connection that looks like DCE, even though computers are often thought of as DTE.

This situation is a little confusing but very common because it requires the simplest cable to connect a terminal to the computer. The cable shown in Fig. 5B is known as a crossover cable, because it crosses TxD to RxD and RTS to CTS. The last case (Fig. 5C) shows a computer output that is wired as DTE. Note that this cable configuration is identical to 5A with the exception that RTS and CTS are fully implemented and under computer control.

A word of caution: As anyone who has ever connected two pieces of computer equipment together will tell you, there is usually some snag that prevents the connection from working the first time. The best way to get your connection working is to read the manuals for the equipment you are using, understand just what is required by both sides of the connection, and work on one signal at a time. A patch box or "break-out box" is frequently helpful for stubborn connections. This method takes time, but persistence will always solve the problem. Start building your modem now and soon you'll be able to enjoy using your computer for RTTY communications.

Notes

[1]P. L. Rinaldo and D. W. Borden, "The Making of an Amateur Packet-Radio Network," *QST*, Oct. 1981, pp. 28-30.

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

[3]G. McIntire, "Designing a Microprocessor-Based RTTY Speed and Code Converter," *QST*, Jan. 1982, pp. 18-21.

[4]E. Kalin, "A Programmable Serial-Communication Interface," *QST*, Sept. 1982, pp. 18-24.

[5]Mouser Electronics, 11433 Woodside Ave., Santee, CA 92071; Active Electronics, P.O. Box 8000, Westborough, MA 01581.

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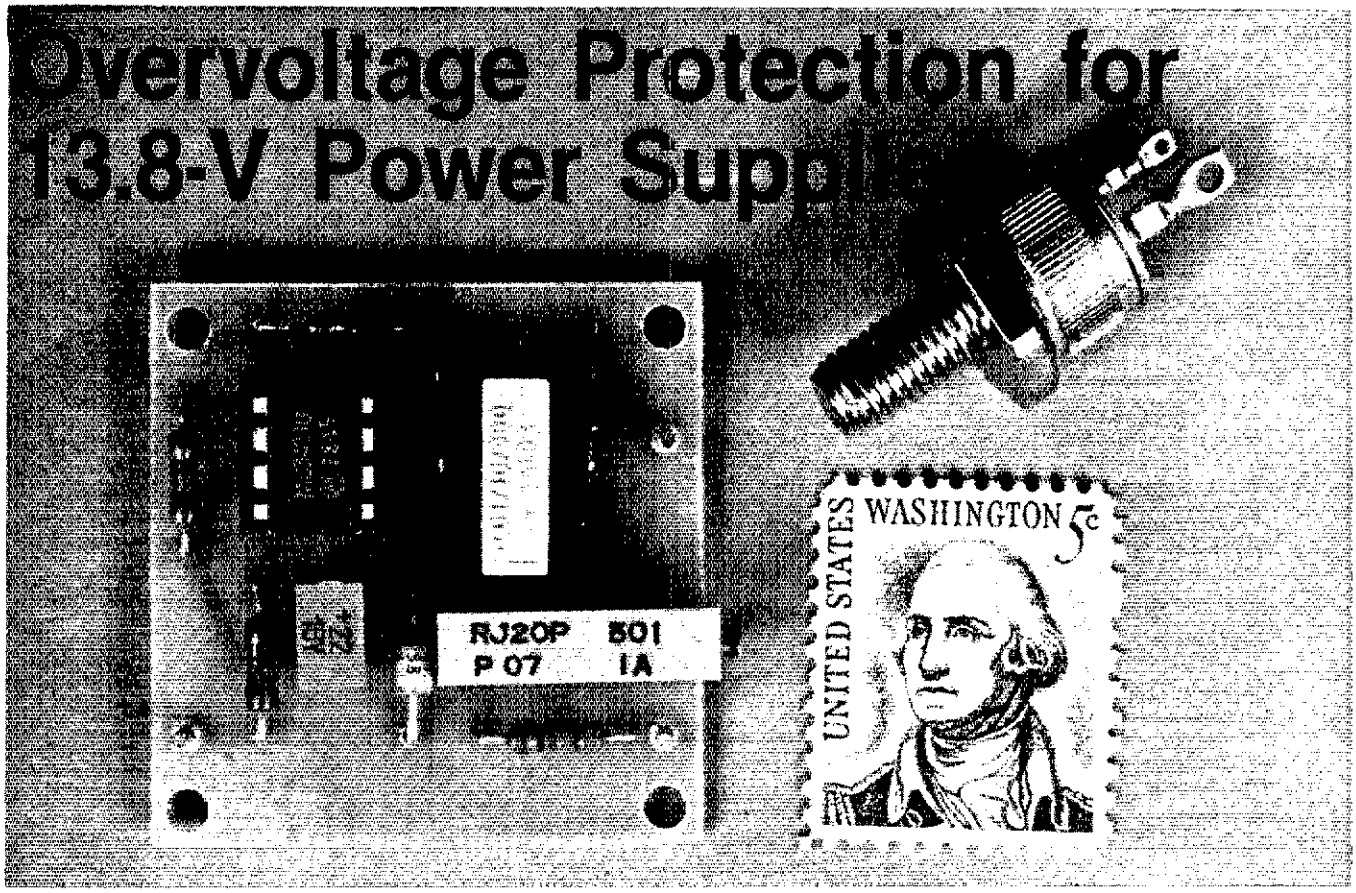
Overvoltage Protection for 13.8-V Power Supplies



Failure of the series pass transistor in regulated power supplies can put a destructively high voltage across the load — your rig! Here's how you can avoid that situation.

By Ian N. Cousins,* VK5IK

I used to think that power supply faults causing an overvoltage at the output terminals were simply the result of poor components or workmanship. Time has proved me wrong!

My first introduction to the problem came when I received a call telling me that a power supply had "gone high" and worked a nasty mischief on a remote base-station transceiver operated by our State Police. To further compound the indignity, the service technician hadn't checked the power-supply output voltage before he connected a brand new transceiver to the power source! The power supply very quickly administered the coup de grace to the second transceiver. Both radios required extensive rebuilding of the final and driver stages. In this case, the failure was caused by a Darlington driver transistor that developed gross collector-to-emitter leakage, effectively turning the series transistors "full on," regardless of the control signals from the regulator IC.

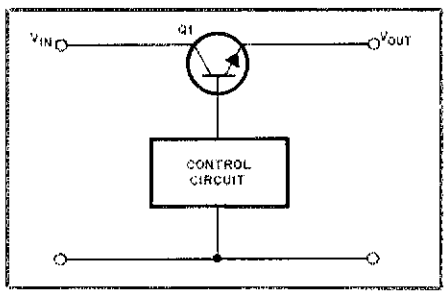


Fig. 1 — The basic series voltage regulator used in most power supplies.

To prove that my troubles were not isolated, we had two other base-station-supply failures caused by lightning strikes. In each case, the output voltage went high, gassed the parallel battery dry and eventually damaged the base station.

What Causes This Problem?

Refer to Fig. 1. This is the basic diagram of a series voltage regulator. Q1 stands between the input voltage and the regulated output voltage. The control circuit drives Q1 so as to "soak up" the difference in voltage between V_{in} and V_{out}. It's easy to see that a short circuit in the transistor will put unregulated voltage where there should be regulated voltage! (Most practical supplies will have a low-value resistive component or two between V_{in} and V_{out}, but their contribution to minimizing damage is negligible.)

Since the potential results are likely to be so nasty, what's the chance of a short circuit in the series transistor? To make a start in finding the answer, I consulted that archive of failures — my transistor graveyard. Of 44 silicon power transistors collected during power-supply work over the past decade, one was completely open-

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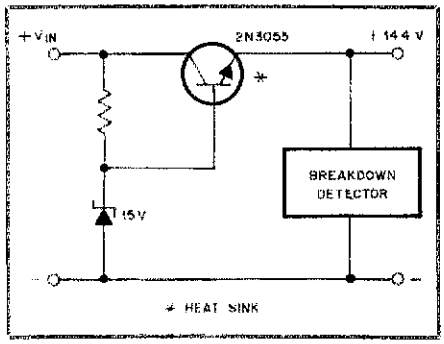


Fig. 2 — A simple regulator circuit used for transistor stressing.

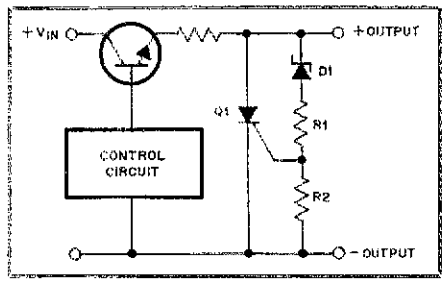


Fig. 3 — A common overvoltage-protection circuit.

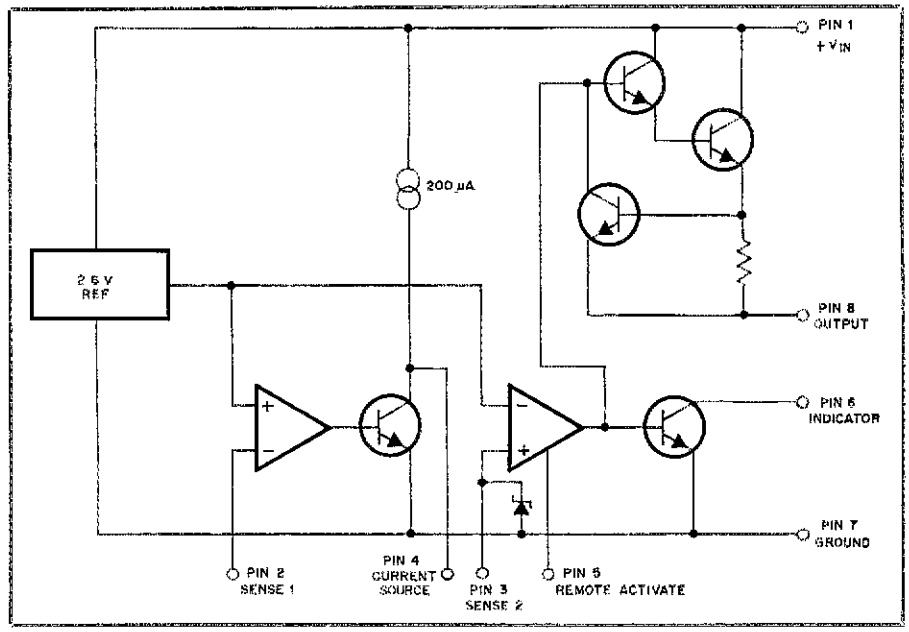


Fig. 4 — Block diagram of the MC3423 overvoltage- protection IC.

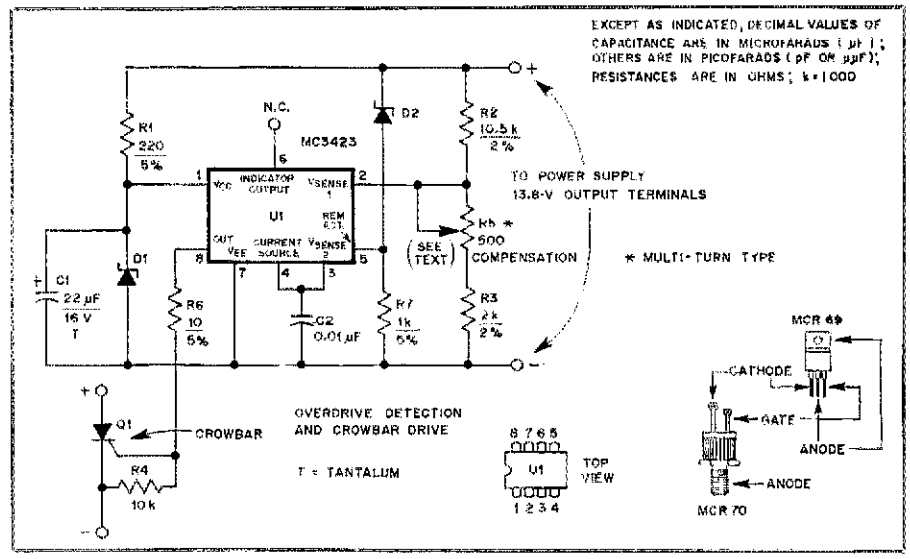


Fig. 5 — Schematic diagram of the overvoltage-protection circuit described in the text. Resistors are 1/4-W, 5% film types, except for R2 and R3, which are 2% metal-film units. R4 is mounted close to the SCR terminals. It reduces the possibility of Q1 triggering because of noise or leakage.

C2 — 0.01-µF, 50-V polyester film.
D1 — 8.2-V, 1-W, 5%-tolerance Zener diode. Motorola 1N4738A, Philips BZX87-C8V2 or equiv.
D2 — 15-V, 400-mW, 5%-tolerance Zener diode. Motorola 1N5245B or Philips BZX79-C15 or equiv.
Q1 — Crowbar SCR, Motorola MCR70-2, 50-V, 850-A peak discharge current metal-can SCR or equiv. If the power supply unregulated input voltage exceeds 50 V, use an MCR70-3, which is rated at 100 V. Alternatively, the MCR69-2 (50-V, 750-A peak) or the MCR69-3, rated at 100 V, can be used. A more expensive alternative is the MCR71-3, rated at 100-V, 1700-A peak discharge current.
U1 — Overvoltage-protection IC. The MC3423P (Motorola and Texas Instruments) and SG3423M (Silicon General) are in plastic eight-pin DIL packages. The MC3423U (Motorola), MC3423JG (Texas Instruments) and SG3423Y (Silicon General) are in ceramic eight-pin packages.

circuited, nine medium-power transistors used in inverters were shorted between collector and base, and the remaining 34 devices were shorted between collector and emitter. This was an indication that short-circuit failures from collector to emitter were fairly common.

To try to better understand the likely nature of transistor failure in amateur service, I constructed the simple regulator circuit shown in Fig. 2. The transistor is an amateur favorite (the 2N3055), although it seems reasonable to expect that other high-power, low-frequency devices would behave similarly.

The 2N3055 was mounted centrally on a piece of 14-gauge (1.6 mm) aluminum measuring 8.3 × 4.8 inches (210 × 123 mm), suspended on nylon line. I then set out to thermally overload the transistor to the point of failure. Clearly, overvoltage punch-through will produce a short circuit, so the collector-to-emitter voltage was kept low for these tests. I was more interested in what happens when the transistor fails than the processes leading to failure.

Four 2N3055 transistors of different manufacture were abused. All failed with collector-to-emitter short circuits after periods ranging from two minutes to over five hours. Interestingly, during the test several devices tripped the detector circuit, indicating failure. But the transistors tested okay after cooling to room temperature. Complete failure occurred shortly after resuming operation.

It seems reasonable to conclude that if a series transistor fails, it is likely to fail as a short circuit, putting unregulated input voltage on the supply output terminals. In addition, failure of voltage regulator ICs or driver transistors can also lead to an output overvoltage condition.

How Do We Protect Our Radio Equipment?

The common ("crowbar") overvoltage-

protection circuit (OVP) is shown in Fig. 3. D1 is a low-power Zener diode, chosen to have a voltage rating a little above the power-supply output, say 15 V. R1 limits the current through the Zener diode, and R2 bleeds off any leakage through it. If the power-supply output voltage exceeds the Zener diode voltage plus the gate-to-cathode voltage of Q1, Q1 fires and short circuits the output, eliminating the overvoltage by clamping the output terminals. A typical Zener diode/SCR combination will give a trip level of about 15.5 V, a fairly satisfactory figure, being well above the normal 13.5- to 13.8-V power-supply output level and a little below the normal damage threshold for radio gear. Unfortunately, the difficulty with this circuit is that of predicting the voltage level at which all likely combinations of Zener diodes and SCRs will cause a "trip." Even assuming the tightest commercially available tolerance for the Zener diode (5%), the permissible variation of SCR trigger voltage means that some combinations will trip as low as 14.0 V, probably operating every time the power-supply load changes, to as high as 19.2 V — so high that it may not even operate in the event of a shorted series transistor, providing only falsely based peace of mind. We have not considered the effects of the variation of SCR trigger current or turn-on speed, so this circuit is probably best avoided unless the load to be protected is of little value, or if equipment exists to measure actual operation.

A Comprehensive Overvoltage-Protection IC

The MC3423 has been around for a few years, but seems to have been largely overlooked in amateur applications. This IC was developed specifically as an overvoltage-protection device. Fig. 4 shows a block-diagram of the MC3423. It contains a precision 2.6-V reference, two comparators and an SCR "crowbar" driver.

Fig. 5 is a circuit diagram of a complete overvoltage-protection system designed around the MC3423. R1, C1 and D1 develop a regulated and transient-free supply of about 8.2 V to the IC, so that the internal reference sees a stable input voltage. The internal reference voltage of the IC, the point at which it starts to "do its stuff," is nominally 2.6. So we divide the power supply terminal voltage with R2 and R3 so the normal level at pin 2 is slightly less than 2.6 V. R5 allows compensation for the IC reference voltage production tolerance.

We have to select a voltage at which the protection circuit will operate. This voltage should be sufficiently above the normal power-supply level so that the circuit doesn't operate every time there's a "hiccup" — turning the main switch on or off, etc. — but the voltage has to be sufficiently low to provide meaningful protection.

For a power supply with a 13.8-V output, an overvoltage protection operating point of 14.75 V is ideal. If the sample of the output voltage applied to pin 2 exceeds the reference voltage, indicating an output voltage in excess of 14.75, an internal circuit starts a time delay, determined by C2. This time delay gives the circuit an amount of noise immunity — it ignores insignificant hiccups. A value of 0.01 μF for C2 gives a delay of 0.1 ms, 0.1 μF provides 1 ms, and so on. If the overvoltage condition disappears during this time delay, the circuit resets itself.

If the overvoltage is still present after the time delay, a fast-rising, high-current pulse is sent from pin 8 to the gate of a crowbar SCR. The SCR is capable of passing large pulse currents and, once triggered, will stay turned on as long as current flows through it.

D2, connected to pin 5, provides a bypass of the time-delay function. If the power-supply voltage reaches approximately 16.4, the circuit operates immediately, firing the crowbar.

Component Selection

This circuit performs an important protective function, so use the best available components during construction. Metal-film, 2%-tolerance resistors for R2 and R3 and a good quality Cermet or wire-wound trimmer for R5 should be used; avoid old-style surplus trimmers. Supplying a socket for IC1 will prevent exposing it to soldering temperatures.

A number of SCR types can be used, but the Motorola MCR69, MCR70 and MCR71 devices were developed specifically to handle the very high peak currents experienced in crowbar service. Check that any alternative device used has equivalent trigger-voltage and current requirements. The SCR does not require a heat sink, since it should conduct for only milliseconds before the fuse opens, but a small heat-sink bracket may provide a convenient mounting arrangement.

Construction and Setup

The circuit is built easily on perf board or a pc board.[1] Before installation, the overvoltage trip point must be set at 14.75 V. A test setup is shown in Fig. 6. A digital multimeter will provide optimum accuracy; if you don't have one, use a good analog instrument. Set the variable power supply for its lowest voltage level and switch it on. Slowly increase the voltage, while carefully watching the meter. If the dial lamp lights below 14.75 V, readjust the trimming potentiometer (R5) so that the lamp lights as the voltage reaches 14.75. If the power-supply voltage reaches 14.75 and the lamp is still out, adjust R5 until the lamp lights with the power supply held at 14.75 V. Check the operation several times to ensure the circuit operates as increasing voltage reaches the 14.75-V level.

[1]A professionally made glass-epoxy pc board and one each 10.5-kΩ, 1% and 2-kΩ, 1% metal-film resistors are available from the author for $5 U.S. currency, including return Air Mail postage. Personal checks are not accepted. Please allow 2 to 4 weeks for delivery. The ARRL and *QST* in no way warrant this offer.

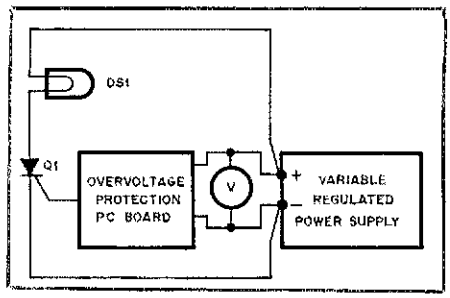


Fig. 6 — Test setup for adjusting the overvoltage-protection-circuit operating point. DS1 is a 12-V dial lamp. Q1 is identified in the parts list of Fig. 5. The voltmeter is discussed in the text.

If the circuit operates at less than 14.75 V, regardless of adjustment of R5, it is possible that the actual voltage of D2 is on the low side. Lift one end of D2 and repeat the adjustment procedure. The circuit should now act normally. Replace D2 with another 15-V device.

How Do We Use the Protection Circuit?

Since the power for our equipment comes from the power-supply output terminals, that's the correct place to connect the IC and related components. However, positioning the crowbar SCR requires more care. Putting the SCR across the output terminals will stop damage to equipment connected to the supply, but what happens after the SCR fires? Over-voltage on the output is most likely to be a result of failure of the series pass transistor or the voltage-regulator IC. In either case, it is unlikely that the normal power-supply current-limiting function will still operate. So, we would have a power supply with inoperative overload protection looking into the near short circuit of the conducting SCR. Under these circumstances we would have to rely on blowing the transformer primary mains fuse. Unfortunately, this fuse has to be selected to withstand repeated turn-on inrush current of the power supply. It is thus unlikely to blow instantly, given the wiring resistance and current-limiting resistance in the power supply. My experience is that a rectifier shorts first and that may, or may not, blow the fuse before the transformer burns out!

The circuit of Fig. 7 overcomes these problems. The power-supply voltage is sensed at the output terminals. A fuse is placed between the main filter capacitor and the voltage regulator. The crowbar SCR is placed on the output terminal side of the fuse. If the SCR fires, a large amount of energy is available from the transformer

to blow the fuse immediately and so open the positive line to the regulator. In this position, the fuse does not have to withstand significant inrush current because most regulator circuits turn on slowly and the fuse can be chosen to handle the normal full-load current of the supply, plus a small safety margin.

D1 discharges any capacitance on the output of the regulator. If your power supply uses a three-terminal regulator with the adjustment pin bypassed, D2 will also be necessary to discharge the bypass capacitor.

If you "float" a battery across the output of your power supply, a diode will be needed between the output of the power supply and the battery, so the battery is not shorted via D1 and Q1. A Schottky diode will have the lowest voltage drop.

Installation

Install the new components in the circuit position shown in Fig. 7. Put the crowbar SCR near the main filter capacitor and the series fuse. Ensure that the positive supply for all regulator devices is taken from the output side of the fuse, including collector voltage for any Darlington-connected driver transistors and the supply voltage to the regulator IC. The overvoltage-protection IC and its associated components can be tucked away with sensing leads running to the output terminals. Keep the circuit away from hot areas.

Make sure the fuse holder is able to carry the required current. Most small plastic units can handle little more than 5A. Do not use a fuse with too large a current rating. When the SCR fires and short circuits the transformer secondary, the fastest possible clearing of the fault current is desired to minimize any possible damage to the transformer and rectifiers. Above approximately 7.5 A, a fast-acting circuit breaker is an attractive alternative to the fuse.

Troubles

If the protection circuit operates when your power supply is switched on or off, you most likely have transient-overshoot problems in the supply. The time-delay bypass Zener diode, D2, is very quick to actuate the circuit under transient overvoltage conditions, but it is better to improve the power supply than to reduce the level of protection.

Here's an effective fix for transient overshoot, especially in switching supplies. Series-connect a 1N5342B 6.8-V, 5-W Zener diode and a 1N4343B 7.5-V, 5-W Zener diode. Check that the reference voltage of the combination is above about 14.1 V and below the 14.75-V operating point of the overvoltage-protection circuit. Connected across the output of a power supply — observing the correct polarity — this combination limits transient overshoot to a safe level.

In repeater installations, where lightning strikes are common, transient sensitivity can be reduced by omitting D2 and increasing C2 to 0.1 μF, but *only* if a storage battery is floated across the power-supply output to dampen momentary transients. Refer to the comments made earlier regarding diode isolation of a floating battery.

I have used this overvoltage-protection circuit since late 1977 in applications ranging from the State Police base stations that fueled my original interest, to dc-to-dc converters in mining equipment. I'm sure you'll find it to be a valuable addition to your power supply.

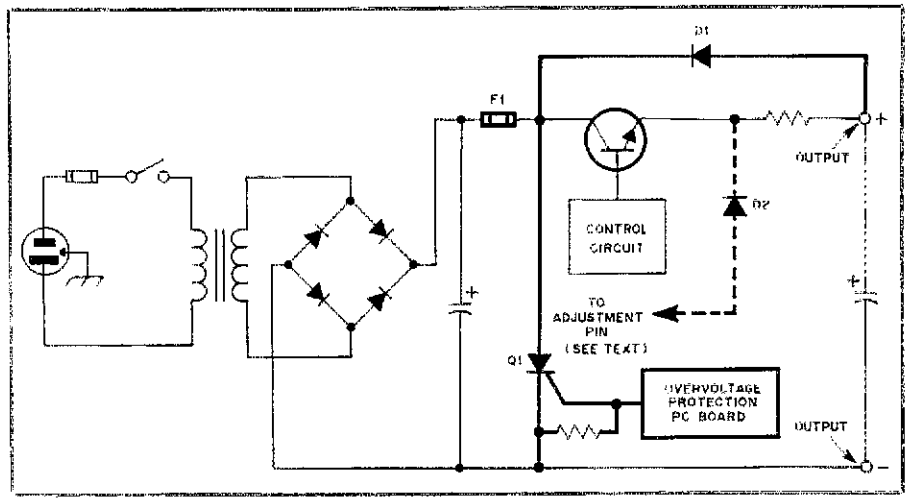


Fig. 7 — Overvoltage-protection circuit component position within a power supply. Added components are shown boldface. D1 serves to discharge the power-supply output capacitor. D2 discharges the adjustment pin capacitor if a three-terminal voltage regulator IC is used with the adjustment (or ground) pin bypassed. F1 is a standard 3AG fast-blow fuse with a current rating equal to the steady state rating of the power supply, plus a small margin; e.g., a 5-A fuse for a 4-A power supply, and a 10-A fuse for a 7.5-A supply. For power supplies with higher current ratings, a small circuit breaker can be substituted for F1.

D1 — MR751 (Motorola, 100-V, 400-A surge), 1N5401 (various manufacturers, 100-V, 200-A surge).
D2 — 1N4002 or equiv.
F1 — See text and caption. Circuit breakers such as the Airpax Electronics T11-1-XXXA-02-11AL or Heinemann Electric JA1-B3-XX-3 series may be used. The required current rating is inserted in place of the Xs; e.g., a T11-1-12.5A-02-11AL is a 12.5-A unit, and a JA1-B3-15-3 is a 15-A circuit breaker.
Q1 — Refer to Fig. 5.

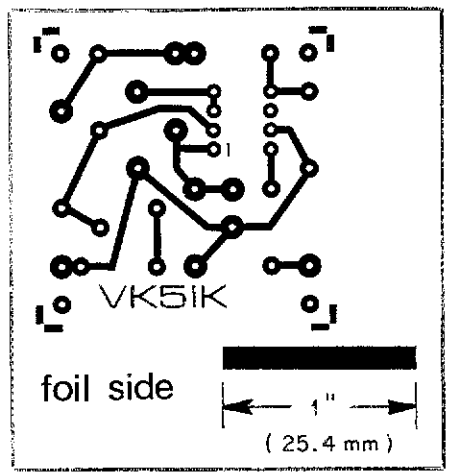


Fig. 8 — Pc-board etching pattern for the overvoltage-protection circuit. Black represents copper foil. The pattern is shown full-size from the foil side of the board. The parts-placement guide appears in Fig. 9.

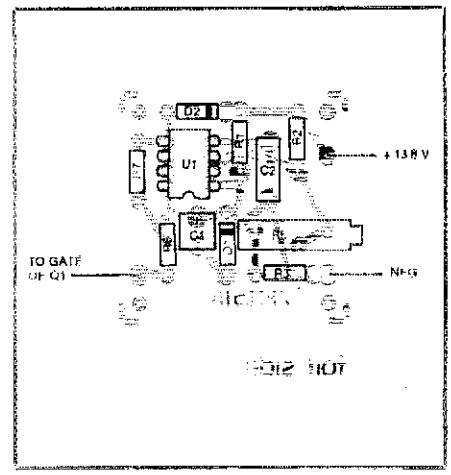


Fig. 9 — Parts-placement guide for the overvoltage-protection circuit. Components are mounted on the nonfoil side of the board. Shaded areas represent copper on the foil side of the board.

Ian Cousins was first licensed in 1960. He attended Adelaide University, leaving to work in electronic equipment and component sales for four years. Ian then started his own business, designing and building audio amplifiers and radio tuners for long-distance passenger locomotives. Since 1971, he has been involved in the design and manufacture of power-supply systems for radio equipment, primarily dc-to-dc converters that convert the high battery voltage of heavy traction vehicles to 13.8-V dc.

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

A NEW MIXER FOR THE ASTRO 103 RECEIVER

☐ When I purchased a Cubic Astro 103, I compared its performance with that reported in the *QST* Product Review column for the Astro 102BXA.[1] My results were much the same (−13 dBm third-order intercept and the blocking DR not measurable because of noise limiting), and indicated to me that some improvement to the receiver front end should be possible.

When I studied the circuit diagrams, I found that the rf amplifier, the first mixer and the post-mixer amplifier were also part of the transmitter. Everything seemed okay on transmit, so I decided to switch in a new circuit for receive only. My plan was to add a new mixer and a post-mixer amplifier, along with the required power supply and switching scheme.

After reading everything I could find about mixers, and making some performance checks, I decided that the Plessey SL6440C device would suit my application quite nicely. It boasts a third-order intercept of +30 dBm and requires an LO signal level of about 300 mV. I used a balanced circuit to reduce the LO leakage to a minimum, and used 1:4 input/4:1 output transformers to

[1]D. DeMaw, "Cubic Astro 102BXA," Product Review, *QST*, Dec. 1981, pp. 48-49.

*Assistant Technical Editor

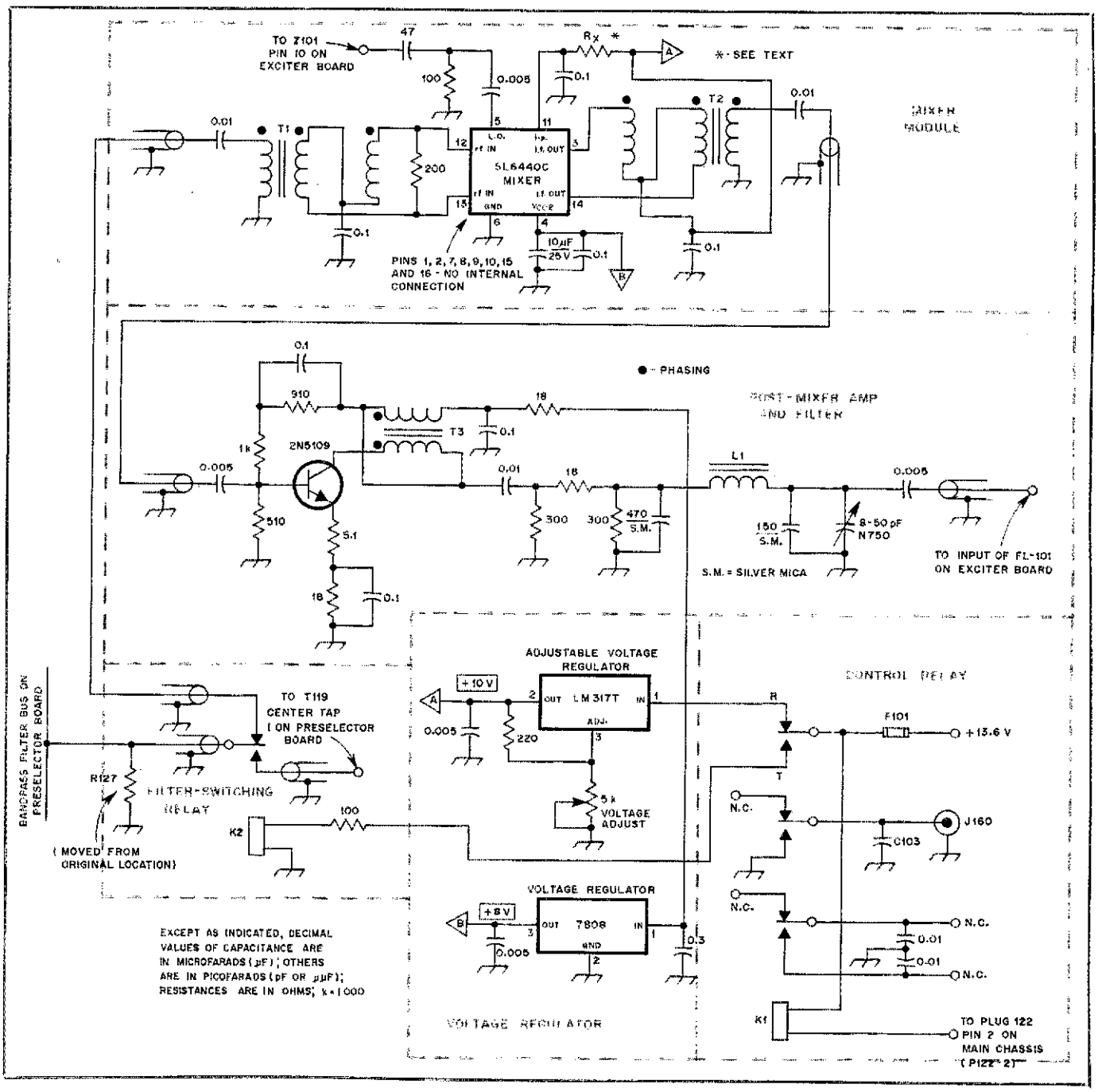


Fig. 1 — Schematic diagram of the receiver-circuit modifications that AG4R made to his Astro 103. The circuit is built as four separate modules, as indicated.

K1 — 3pdt relay, 12-V, 300-Ω coil.
K2 — spdt relay, 5-V, 50-Ω coil (Radio Shack part no. 275-215).
L1 — 22 turns of no. 28 wire on a T50-6 toroid core.
T1, T2 — Nine trifilar turns of no. 32 wire on an FB-801-43 ferrite bead.
T3 — Ten bifilar turns of no. 32 wire on an FB-801-43 bead.

provide the necessary gain and impedance matching. Fig. 1 is a schematic diagram of the circuit that I added to my receiver. R_x should be adjusted for the best IMD level using a two-tone, 0-dBm input signal to the mixer. After this adjustment is completed, you can substitute a fixed resistor of the proper value. I used a 200-Ω resistor here. I found that about 23 mA at pin 11 of the SL6440C gave the lowest IMD level for the voltages in my circuit and the mixer samples I checked. I found it necessary to test several mixer chips to select one with the best characteristics. I also found it important to hand select the 2N5109 transistor in the post-mixer amplifier. The tested IMD had wide variations from chip to chip and from one transistor to another!

The post-mixer amplifier and 50-Ω input to 500-Ω output low-pass filter designs were borrowed from previous designs, and so took no special engineering skills.[2,3,4] A 3-dB attenuator pad was included to provide a gain of 1, as compared to the original circuit. This attenuation can be varied to adjust the overall gain of the modified circuit. A step attenuator is a handy test item for this experimentation. The pad and low-pass filter are designed to present a 50-Ω impedance to match the amplifier output impedance. This is important for best overall operation of the amplifier.

My voltage regulator and control-relay circuit are straightforward and easy to build. My radio came with an spst relay in the line to control an external relay, even though the schematic diagram gives no indication of this. It was a simple matter to replace this relay with a 3pdt unit (K1) that I had on hand, to provide the desired internal and external switching and relay control features. The extra set of contacts can be brought out to another jack and used for antenna or amplifier switching.

K2 is used to switch between the new mixer circuitry on receive and the original circuit on transmit. This is accomplished easily by breaking the lead to T119 on the preselector board and inserting the relay contacts. One other change is required. I found it necessary to move the location of R127 as shown in Fig. 1, because this resistor is part of the PIN diode switching arrangement to select the proper band-pass filter.

I built the circuit on four pieces of circuit-board material. The mixer, the post-mixer amplifier and filter, the voltage regulator and the control-relay/filter-switching unit were each constructed and tested as separate modules. I used double-sided pc-board material for the mixer module and single-sided material for the others. I drew the layouts on the boards freehand, with consideration for the parts that I had available. The mixer IC needs a heat sink for this application. Mine is made from flashing copper and is attached to the IC by means of Super Glue®. The construction details are given in Fig. 2.

Each module is mounted by means of a single angle bracket and an existing mounting bolt. This provides a good ground connection between each module and the main circuit. The modules are mounted as close to the boards they connect to as is practical. You can see the mixer and amplifier/filter modules in Fig. 3A. The voltage regulator and control-relay modules are shown in Fig. 3B. All rf interconnections are made with RG-174/U miniature coaxial cable.

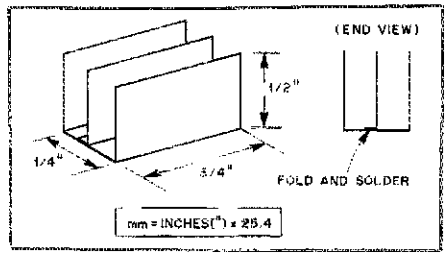
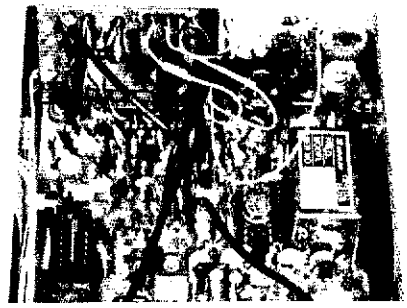
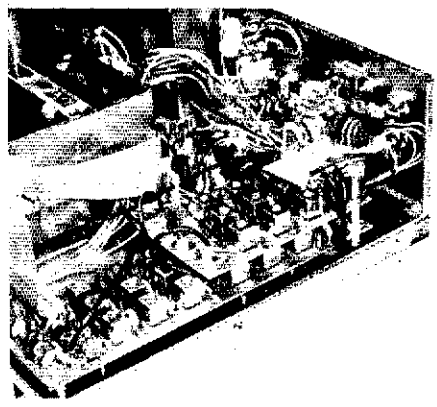


Fig. 2 — Construction details of a heat sink suitable for attaching to the mixer IC with Super Glue®.



(A)



(B)

Fig. 3 — The mixer and post-mixer amplifier modules can be seen at the top of A. Notice the homemade heat sink on the mixer IC and the conventional heatsink on the post-mixer-amplifier transistor. The voltage regulator and control-relay circuitry can be seen as mounted in the transceiver at B.

These simple modifications seem to have made quite an improvement to the receiver. I measured a third-order intercept point of +17 dBm and a blocking DR of 116 dB. My test measurements were made following the method described in *The Radio Amateur's Handbook* so that a comparison could be made with results published in the *QST* Product Review column over the last few years.[5] This method uses two signals 20 kHz apart at the receiver input. My measurements were made on the 20-meter band.

I don't claim to have the "Ultimate Receiver," but I am pleased with the results of my modification. For my application, I have not found an rf-gain control or input attenuator to be necessary with this receiver. These options may suggest further experimentation for another amateur. — *Wayne Cooper, AG4R, Miami Shores, Florida*

[2]D. DeMaw and G. Collins, "Modern Receiver Mixers for High Dynamic Range," *QST*, Jan. 1981, pp. 19-23.
[3]P. Chadwick and D. DeMaw, "Receiving With Plessey ICs," *QST*, April 1981, pp. 13-15.
[4]W. Hayward and J. Lawson, "A Progressive Communications Receiver," *QST*, Nov. 1981, pp. 11-21.
[5]G. Woodward, ed., *The Radio Amateur's Handbook* (Newington: ARRL, 1982), Chs. 8 and 16.

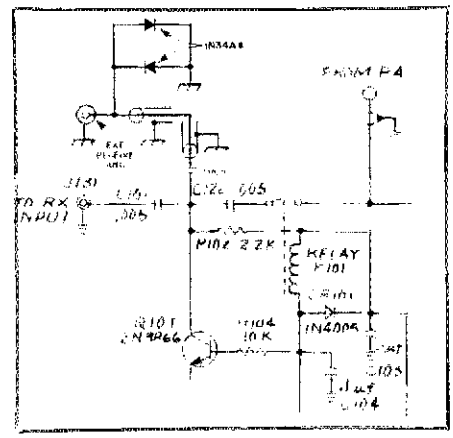


Fig. 4 — Part of the Astro 102BX Low-Pass Filter/Bandswitch Board is shown. The additional components required to add external receive antenna capability are shown darker than the main diagram.

SEPARATE RECEIVE ANTENNA FOR THE CUBIC ASTRO 102BX

☐ One feature that my Astro 102BX did not have, but which the newer Astro 103 did, was a jack for an external receive antenna. I checked with Cubic about adding this feature, and was told that it was not possible because the preselector board had been redesigned for the 103. I decided to study the schematic diagrams myself to see how I might modify my 102BX.

My investigation led to the discovery that I should be able to add an external receive antenna quite easily. All that is necessary is to tack solder a 0.005-µF capacitor to the top of R102 on the Bandswitch/Low-Pass Filter Board. Use a short length of RG-174/U miniature coaxial cable to connect to the new jack that is installed on the back panel, and solder two diodes from the center conductor to ground for protection against overload. See Fig. 4 for a section of the transceiver diagram. The new components appear a bit darker than the rest of the circuit.

This modification bypasses the low-pass filter section, but these filters are not required on receive anyway. I have found no ill effects on the normal operation of the radio, and I am pleased to be able to use the rig with vhf receiving converters. — *Robert Whitford, WA7STA, Ellensburg, Washington*

PROTECTIVE COATING FOR DTMF KEYPADS

☐ Several of the hams in my area who purchased ICOM hand-held transceivers began to have a similar problem. The DTMF keypad identification markings were wearing off. Worn keypads can be replaced, but this requires sending the unit back to the manufacturer or taking it apart yourself.

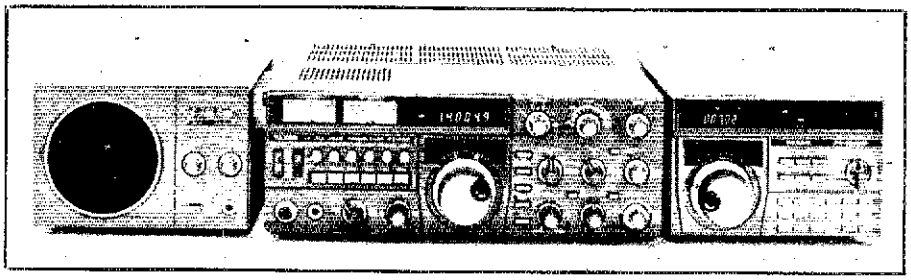
We tried various methods to protect the markings, but the best one seems to be simply coating the keypad with a clear lacquer spray. Mask off the area around the pad with tape to protect the rest of the rig. Two light coats of spray provide adequate protection. I have experienced no ill effects to the operation of the keypad, and the finish is like new after months of use. — *W. E. Wiehe, WD9BBI, Plainfield, Illinois*

Product Review

Conducted By Paul K. Pagel,* N1FB

Yaesu Electronics Corp. FT-102 HF Transceiver

I have observed a steady and impressive improvement in the performance of each new model of Yaesu transceiver. The receiver dynamic range has increased markedly, and the transmitter spectral purity has improved similarly. The FT-102 compares favorably in this respect to some other present-day, high-performance commercial transceivers. But most importantly, there is no performance similarity between the FT-102 and the earlier FT-101B and E models. The '102 provides fully competitive performance!



Some of the Features

There seems to be no important feature missing. A notable feature is the fm-mode capability. An accessory a-m/fm module can be installed to permit operation in these two modes. The fm function allows the operator to employ fm on 10 meters. It also provides for vhf and uhf fm operation by means of a suitable transverter. A squelch control is included as a standard feature of the FT-102.

Not two, but *three* 6146B tubes are used in the transmitter PA! This permits driving external power amplifiers at the prescribed excitation level without operating the FT-102 PA at or beyond the nonlinear range. This is a shortcoming with many commercial exciters, causing wide signals of poor quality on our amateur bands. The dc input power to the 6146Bs is rated at 240 W (ssb or cw) from 1.8 to 25 MHz. The limit is 160 W from 28 to 29.9 MHz. During SSTV and fm operation, the dc input power is restricted to 120 W on all frequencies. It is reduced to 80 W for a-m transmissions.

The stock i-f filter has a 2.7-kHz bandwidth at the −6 dB points on the response curve. This can be reduced to as low as 500 Hz by means of the SHIFT/WIDTH control. An ssb "narrow" filter is available as an accessory. It yields a 1.8-kHz bandwidth. Additional filters are offered for cw reception in a variety of bandwidths: 600, 500, 300 or 270 Hz. The accessory a-m filter bandwidth is 6 kHz.

An i-f NOTCH control is included. It provides a notch depth greater than 40 dB for reducing the effects of QRM. This, when used separately or in combination with the built-in R-C active audio filter (frequency-variable), has proven to be a tremendous asset when dealing with interference on the cw bands.

Two panel meters are employed in the FT-102. One of them indicates the relative signal strength (S meter) and has a scale for use when setting the alc level correctly. The remaining meter, by virtue of a front-panel switch, can be used to read the high voltage, PA current, relative output power and speech-compression level. If the a-m/fm accessory adapter is installed in the transceiver, this meter serves as a discriminator-tuning indicator.

Some of the controls that are used infrequently are accessible from the front panel, but once adjusted, they are recessed into the panel, where they are safe from accidental "readjustment."

Yaesu Electronics Corp. FT-102 Transceiver, Serial No. 2J-050152

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 160 through 10 meters, plus WARC bands.	As specified, plus additional coverage above and below each band: 1453-2032, 3453-4032, 6953-7532, 9953-10,532, 13,953-14,532, 17,953-18,532, 20,953-21,532, 24,453-25,032 and 27,953-30,032 kHz.
Operating modes: Cw and ssb (a-m and fm optional).	As specified.
Readout: Blue 5/16-inch digital-display numerals.	As specified.
Resolution: 100 Hz.	As specified, 18 kHz per 360° dial rotation.
Power requirements: 100, 117, 200 or 234-V ac, 50/60 Hz.	As specified.
Power consumption: 95 VA receive and 440 VA transmit.	As specified.
Transmitter rf power output (cw with 50-ohm load): 100 W or greater.	150 W on 160-15 meters; 100 W on 10 meters
Transmitter third-order IMD: Better than −40 dB at 14 MHz.	−40 dB
Spurious suppression: Better than −40 dB.	Approximately −44 dB worst case (10.1 MHz).
Frequency stability: Less than 300 Hz during first 30 minutes and less than 100 Hz each 10 minutes thereafter.	Less than 200 Hz during first hour of operation.
Audio output (receiver): 1.5-W minimum at 8 ohms, 10% THD.	As specified.
RIT range: Not specified.	± 3 kHz.
Receiver notch depth: Better than −40 dB.	As specified.
S meter (μV for S9): Not specified.	160 m — 50; 80 m — 43; 40 m — 43; 30 m — 42.5; 20 m — 42.5; 15 m — 39.5; 10 m — 30.
Receiver dynamic range (preamp off): 95 to 102 dB, depending on filter used.	Receiver dynamics measured with optional narrow cw filter installed.

	80 m	*20 m*
Noise floor (MDS) dBm:	−127	−127
Blocking DR (dB)†:		
Two-tone, third-order IMD DR (dB):	96.5	97.5
Third-order input intercept (dBm):	18	19.5

Size (HWD): 5 × 14.5 × 12 inches (129 × 368 × 309 mm).	As specified.
Weight: 33 pounds (15 kg).	As specified.
Color: Not specified.	Dark gray.

†unmeasured — noise limited

A slight inward pressure pops the control knobs out so that adjustment can be accomplished. Pushing gently upon the tips of the knobs will cause the controls to recess and lock in that position. The functions controlled by these knobs are VOX/GAIN, VOX DELAY, MIC GAIN, NB LEVEL and SQUELCH. A row of push-button switches below them permits operator selection of MOX, RF AMP, NARROW filter, PROCESSOR, NB and CW MONITOR.

A vertical row of push buttons at the right of the main-tuning knob provides control of the AGC ON/OFF, AGC FAST/SLOW, ALC metering, RX RIT and TX RIT. Another push-button switch can be used to provide a 500-kHz "upshift" for use

*Assistant Technical Editor

during 10-meter operation. The audio filter and notching features are actuated by means of two additional push-button switches.

Transmitter Tuning

Four tuning controls are involved when adjusting the transmitter to the operating frequency. They are labeled PLATE, LOADING, DRIVE and PRESELECT. The latter is used also for receiver front-end peaking when the 10-dB switchable preamplifier is activated. A definite tuning procedure for ssb operation is spelled out in the operating manual. If the method is followed as prescribed, signal purity will be assured. Generally, it calls for keeping the PA plate current below 300 mA at resonance. This will yield up to 100 W of rf output. During cw operation, the plate current may be increased to 350 mA, which results in substantially greater output power. The maximum output obtained in the ARRL lab was 175 W on the bands below 10 meters.

Receiver-Performance Observations

Real-life testing of the FT-102 was done at the usual severe (former) W1FB proving grounds — two blocks from the simultaneous multiband high-power onslaught of W1AW, which has its 20- and 40-meter Yagis bore-sighted over my house. If ever a receiver will collapse from strong signals, it's at that location! My worst band for survival is 80 meters: I have measured a W1AW signal level of 5-V peak to peak across a 50-ohm termination at the transmitter end of my 80-meter antenna! Only a few commercial receivers could handle this without 10 or 20 dB of front-end attenuation switched in. The FT-102 fared well under these conditions. No problems were noted when the preamplifier was not in use. In fact, I was able to copy weak signals within 5 kHz of the W1AW frequency. When the preamplifier was actuated, there was some evidence of cross-modulation on signals lower than S9, but they were still readable. For the most part, the preamplifier is not needed on the bands below 15 meters, since the atmospheric noise usually exceeds that of the receiver anyway.

I detected no dynamic-range problems on the bands above 80 meters, even with the preamplifier operating. The notable exception was when I pointed my 20-meter beam antenna directly at the stacked 20-meter Yagis of W1AW. The problem was resolved when the preamp was turned off.

The audio quality of the receiver is good, even at relatively high output levels into a speaker. There is no evidence (by ear) of reciprocal mixing (buzz between signals when a strong signal is within the receiver passband) when using the FT-102 local oscillator or the outboard FV-102DM memory/synthesizer LO unit. This is important when strong signals are being handled by a receiver, irrespective of how high the receiver dynamic range might be.

Performance of the built-in audio filter is similarly good. There is no ringing evident, and the frequency peaking is sharp, although easy to adjust. Use of this filter greatly reduces the wide-band noise from the overall system, which provides a useful noise-reduction benefit. The audio filter can be switched in during all cw operation. It can't be used for phone operation, and is automatically disabled when changing from the cw to the voice mode.

Noise Blanker

As is the case with most blankers, this one works well on sharp impulse noise, but is ineffective in reducing ordinary QRN. It is not useful when the blanking level is advanced full on, at which time all signals become limited and distorted. The best level setting seems to be about "12 o'clock."

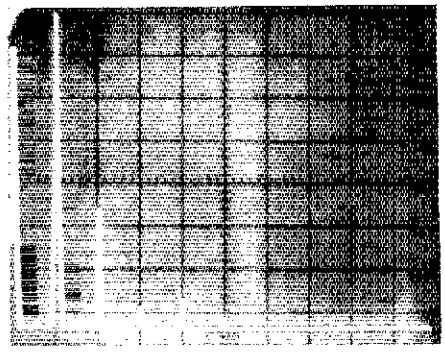


Fig. 1 — Worst-case spectral display of the Yaesu FT-102. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 150 W at a frequency of 10.105 MHz. All spurious output is at least 45 dB below peak fundamental output. The FT-102 complies with current FCC specifications for spectral purity.

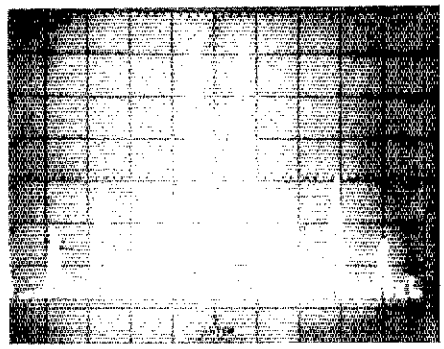


Fig. 2 — Spectral display of the FT-102 output during transmitter two-tone IMD testing. Third-order and fifth-order products are about 40 dB below PEP output. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated input power on the 20-meter band.

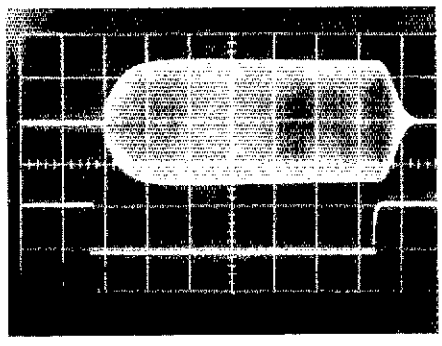


Fig. 3 — Cw keying waveform of the FT-102. Upper trace is the rf envelope; lower trace is the actual key closure. Each horizontal division is 5 ms.

Rear-Panel Ports and Switches

A SEP/NORM antenna switch is located on the rear wall of the transceiver. When in the SEP mode, an outboard receiver may be bridged to the FT-102, permitting the main station antenna to be used with the transmitter and outboard receiver. The FT-102 receiver has no antenna connected under this condition. But, a separate antenna can be attached to the FT-102 receiver if it is connected to the phono jack labeled ANT, near the switch. In the NORM mode, there is no internal connection to the EXT RCVR jack, and the main antenna is used both for transmit and receive with the FT-102.

An RF OUT jack provides low-level transmitter output for use with a transverter. The output level of the energy is 0.1-V rms (-7 dBm) at 50 ohms. There is also a jack for connecting the FV-102DM outboard VFO (synthesizer) to the transceiver.

A seven-pin DIN jack permits muting an external receiver and supplying sidetone to it. The FT-102 scanning signals can be picked off at this jack for external use. Another jack, the ACC-1, is a six-pin DIN type that permits the operator to utilize the FT-102 control circuits to be used with a transverter.

The ACC-2 socket is a five-pin DIN unit that allows T-R switching and alc input-control connections for use with a linear amplifier. In addition to this socket are a number of phono jacks that provide phone-patch input, wide-band i-f output, constant-level af output (for a recorder), foot-switch control and narrow-band i-f output for use with a monitor scope. There is a 12-V, low-current dc output jack for interface with auxiliary equipment that requires that operating voltage.

Inside a removable bottom cover on the '102 are controls for adjusting the side-tone level and pitch. There is another control that can be adjusted to boost the high-frequency response from the microphone before it is routed to the transmitter modulator. A low-frequency boost control is also available for shaping the audio response.

Comments on Performance

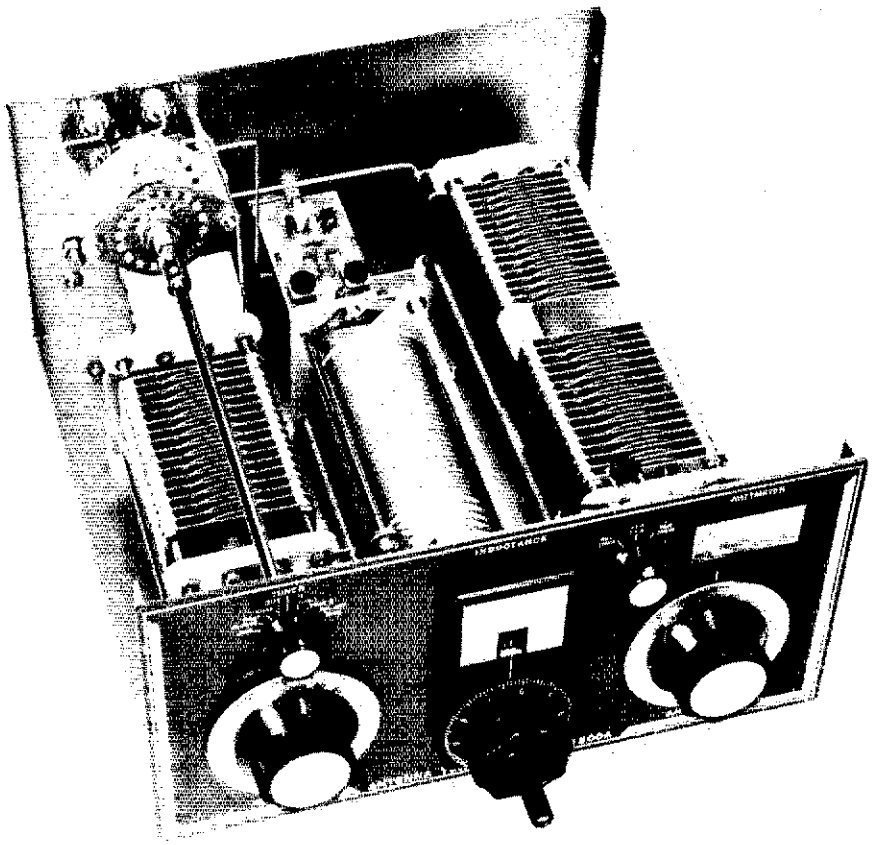
A frequency-jumping problem was observed (30 to 50 Hz) at random intervals when the unit was new. This affected the transmit frequency as well as that of the receive mode. It did not occur when using the outboard VFO. The malady ceased with time (about a week), and it appears that it was caused by a tight tuning mechanism (backlash) on the FT-102, which loosened up after being used for awhile.

Some of the earlier releases of the FT-102 had severe key clicks on cw. Apparently, this has been resolved. Yaesu states that owners with this problem should contact the company for instructions concerning a cure. Not all FT-102s had the problem. It was a sporadic type of anomaly that was cured easily. The review unit has a good cw wave form.

One might be baffled by the excellent receiver dynamic range after examining the receiver front-end circuit. There is nothing unusual about the mixer, for it contains only a pair of source-driven FETs in a singly balanced mixer arrangement. The rf amplifier is similarly mundane upon cursory examination: it employs two more JFETs, this time in series. The reason for the strong front-end performance comes clear when you trace the dc supply line to the pc-board terminal strip: Yaesu uses + 24 V for the rf amplifier and mixer rather than the usual 12-V dc! The higher operating voltage greatly enhances dynamic range.

FV-102DM Outboard LO

This unit is a remarkable accessory. It contains



a synthesizer and CPU designed especially for use with the FT-102. This product allows tuning by the dial, scanner, keyboard or memory 100 kHz beyond the band edges during transmit, receive, transceiver or RIT operation.

A dual-function, 17-button keyboard on the panel permits push-button frequency entry along with 5- or 20-kHz stepping, four-speed scanning, frequency lock, last-digit blanking and RIT operation. There are six extra keys to allow convenient receive and transmit frequency-source selection of the FT-102 internal VFO, the FV-102DM dial or one of the 12 memory channels of the FV-102DM. LEDs indicate the operating status.

The FV-102DM includes an internal-battery holder to provide dc backup for retaining the data stored in the memories when the transceiver is turned off, or if a power failure occurs. The five-digit frequency display indicates kilohertz with resolution to 10 Hz, or 100 Hz if the last digit is blanked. Scanning can be controlled from the front panel of the FV-102DM or by means of the FT-102 scanning microphone, if the latter is used. No outward indications of reciprocal mixing caused by synthesizer noise in the FV-102DM were observed. Similarly, nearby stations were unable to detect wide-band noise on the transmitter signal.

This transceiver is fully modern, and the performance is outstanding. Price class: $1150 (stock FT-102). Manufacturer: Yaesu Electronics Corp., 6851 Walthall Way, Paramount, CA 90723. — *Doug DeMaw, W1FB/8*

VIEWSTAR VS 1500A TRANSMATCH

☐ The VS 1500A Transmatch looks functional from the front, even at a quick glance. However, it isn't until one gets the cover off that the cleanliness of design and layout strikes the eye.

Truly a first-class job of design and construction, the matching network employs some of the highest-quality components available. This is also the first commercially made Transmatch I have seen that makes use of the SPC configuration. The SPC arrangement, developed by Doug DeMaw, W1FB, is the result of an effort to design a circuit that would maintain a band-pass response under all load conditions. Some readers may be interested in reviewing W1FB's explanation of the SPC circuit, which appeared in Technical Correspondence, *QST*, July 1980.

Features and Flexibility

The VS 1500A will handle the "legal limit" and a bit more. It is generously rated to handle 1500 W continuously. A 1:4 balun is incorporated to handle balanced feed lines. The range of antennas that may be connected to the VS 1500A includes dipoles, inverted Vs, Yagis, whips and random-length wires.

The built-in wattmeter will read 300 W or 3 kW in the FORward position, and 300 W in the REVerse position; it is always in the circuit. A front panel switch selects one of two coaxial-cable-fed antennas (direct or through the tuner), a balanced line or a random-wire antenna. The LOAD and BYPASS positions provide for connection to an external dummy load, and to a coaxial-cable-fed antenna that is connected to, but not *through*, the Transmatch. In the LOAD, BYPASS, COAX 1/OUT and COAX 2/OUT positions, the tuner is bypassed.

Instructions

The manual that accompanies the VS 1500A is detailed and complete, and includes a large schematic diagram of the unit. There are a few minor errors in the manual, and some terminology doesn't quite agree with the labels on the equipment. These have been called to the attention of the manufacturer, who has assured me that they will be corrected. However, none of them is sufficient to cause any problem with understanding the operation of the VS 1500A, or in preventing one from placing the unit in use.

Lab Tests

As measured in the ARRL Lab, the insertion loss of the Transmatch was only 0.5 dB. It handled the rated input power into a 50-ohm dummy load with no difficulty.

The VS 1500A Transmatch has been in use in my station for several months, and has done a thorough job of helping to match to a variety of antennas from 160 to 10 meters. Operation is simple, straightforward and effective in that it combines all antenna switching and feed-line matching into one compact unit. As with any device of this type, it is desirable to obtain a matched condition at low power, prior to the application of high power.

The VS 1500A measures 5-3/4 × 11-1/4 × 13-1/2 inches (HWD) and weighs 6-1/4 lb.[1] It is distributed by Unadilla/Reyco Division, Microwave Filter Co., 6743 Kinne St., East Syracuse, NY 13057. Price class: $490. — *Lee Aurick, W1SE*

MORSE CODE TRAINER II

☐ Written by Joe Morris, N4EU, this product is a versatile Morse training program for users of the Radio Shack TRS-80® Models I or III microcomputer. This software package, available for 16K cassette or 32K disk systems, tutors and drills you in the 26 letters, 10 numerals and five common punctuation marks (. , ? / —), and helps you increase your code speed, at your own pace, to 31 words per minute (wpm). The 16K cassette version was reviewed on a TRS-80 Model III.

The manufacturer has intentionally omitted a detailed instruction manual to keep the cost down, knowing that even novice TRS-80 users will use the CLOAD command in the absence of other directions. The instructions can be called easily, and the program will automatically lead you in the right direction with clear-cut menus, self prompting and effective error trapping.

Not until you've unwrapped the package, loaded the program and begun running the Morse Code Trainer II will you realize that additional equipment is needed. Early in your first encounter with the program, you'll read on the video screen: "Requirements: In addition to the computer and software you will need a code oscillator or an audio amplifier similar to those available at your local Radio Shack." You'll also need wire, clip leads and possibly a speaker or batteries, depending on whether the oscillator or amplifier comes equipped with them.

The code-practice oscillator and speaker are attached to the computer by running a clip lead between the oscillator and the smallest cassette cable plug. This cable is normally used to turn the cassette player on and off remotely; here it is used by the computer to key the oscillator. Alternatively, you can take advantage of the keying tone generated by the computer at the large auxiliary (AUX) plug by using an audio

[1]mm = in. × 25.4; kg = lb × 0.454.

amplifier. Suitable oscillators and amplifiers are available from Radio Shack under part numbers listed in the program.

Program operation is straightforward, self-explanatory and effective. On starting up, you're presented with a choice of creating or loading from a cassette (previously created and saved) word/phrase data file that will be used under later menu options. The beginner can bypass this simply by pressing C, * and ENTER. Once this has been completed, you are given the main menu options: (W) random words, (M) mixed groups, (L) letter groups, (N) number groups, (B) Beginner's Club and (E) end cw practice. You simply respond with the letter of your choice.

If you're a newcomer, you'll select (B) to enter the Beginner's Club, and will be asked to respond to several questions. First, you'll be asked to list those characters (if any) already known and then to list a few characters you'd like to learn during the session. The program initializes at 5 wpm (characters are formed at 13 wpm, spaced to yield 5 wpm overall) and begins the instruction sequence.

The first of the new characters to be learned is sent 10 times at 5 wpm in perfectly formed code, and the character is displayed on the screen. The beginner is then asked if "You got it . . . (Y/N)?" Responding with a "no" causes the sequence to be repeated; responding with a "yes" causes the computer to offer congratulations and gives the option of reviewing the characters one more time. Then, the sequence recycles for the next new character to be learned. When all new characters are learned to the *user's* satisfaction, you'll move from the instruction sequence to the drill sequence.

Under program control, you're drilled on both the characters just learned and the ones listed earlier as already known; a character is sent and you're asked to type the appropriate response. If the response is correct, another character is sent. If the response is incorrect, the phrase "No, I sent . . ." (followed by the character) is displayed as the character is sent three more times; then, the incorrect response is displayed and sent three times. If you don't respond at all, the character being sent is eventually displayed on the screen.

When you have had enough drill, or if you already know the code at 5 wpm, you can get to the other options through the main menu. Typing W, M, L or N will bring up the speed-setting routine for subsequent practice. Code speed is adjusted from 5 to 31 wpm by holding down the F key to increase, or the S key to decrease the speed; the speed, which changes in 2-wpm increments, is displayed on the screen. At code speeds of less than 13 wpm, each character is sent at 13 wpm with between-character spacing adjusted for the proper overall speed; at 13 wpm and above, the code is formed and spaced in "real time." You also have the option of changing the within-character dot/dash/space ratios, that is, the character weighting. Ratios are initialized at the proper relative values.

The remaining options provide a variety of specialized practice routines to get you up to your desired code speed quickly. Selecting L results in five-character groups of random numerals; M mixes letters and numerals in five-character random groups; W yields randomly selected words and phrases from the user-generated text files; and E ends the code practice session. Under all of these options (except E), the characters being sent are displayed on the screen so you can check your accuracy.

How effective is the Morse Code Trainer II? Its approach, from aural-only drill, immediate feedback and user-specified drill sequences to the slow-code-speed 13-wpm character generation, is an adaptation of many successful techniques. These, with the operating flexibility, make the Morse Code Trainer II attractive. Micro 80, Inc., claims that a newcomer who spends 1/2 hour daily using the program will reach the 13-wpm level in 120 days, and within 60 more days, 20 wpm. For most people, this estimate is likely conservative, especially if they also *use* their newly learned skill *on the air*. Though many other techniques that don't require a computer are also effective in teaching the code and increasing one's speed, if you have a TRS-80 Model I or III microcomputer, Morse Code Trainer II is certainly an effective and enjoyable way to go. Morse Code Trainer II is available from Micro 80, Inc., 2665 North Busby Rd., Oak Harbor, WA 98277. Price class: $17 (plus $2 shipping). — *Steve Place, WB1EYI*

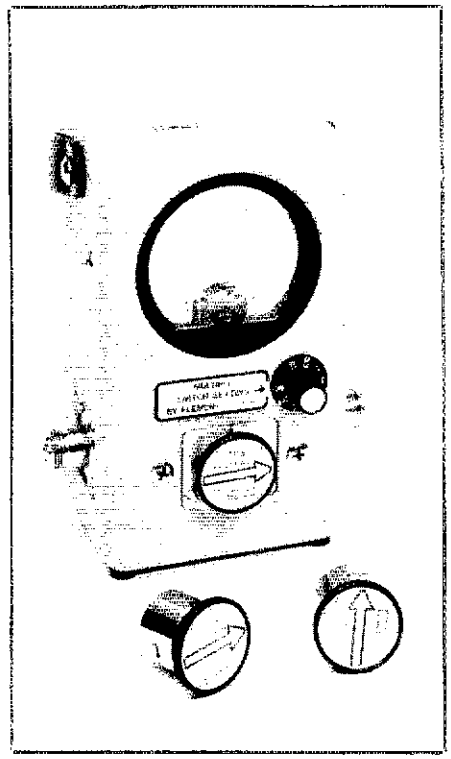
BIRD MODEL 4410 THRULINE® WATTMETER

☐ Bird wattmeters have long enjoyed a reputation for accuracy and reliability. The model 4410, designed for use in 50-ohm transmission lines, upholds the tradition.

The 4410 is housed in a sturdy grey 6-7/8 × 4 × 3-3/8 inch (HWD) aluminum enclosure, complete with leather carrying strap and rubber feet on both the bottom and rear panels.[2] It weighs three pounds. In size and appearance, the 4410 is very similar to the venerable Bird 43. The unit is normally supplied with female type N connectors, but a wide variety of male and female Bird quick-change fittings is available.

Depending on the plug-in element selected, this instrument will measure 0 to 10 kW from 200 kHz to 30 MHz, and 0 to 1 kW from 30 to 1000 MHz. Like the Bird 43, the 4410 samples rf flowing in the precisely machined Thruline, a short section of air-type line with a characteristic impedance of 50 ohms. The coupling circuit, which samples the traveling waves, is in the plug-in element. The element may be rotated to measure either forward or reflected power.

[2] m = ft × 0.3048.



Unlike the Bird 43, the 4410 incorporates circuitry to allow each plug-in element to measure a wide range of full-scale power values. The 4410 meter face has two scales: zero to one, and zero to three. A switch above the slug socket allows the user to select the full-scale power range needed for the job at hand. The switch has the following settings: 100, 30, 10, 3, 1, 0.3 and 0.1. Each element has a "factor" (100 for the 10-kW slugs, and 10 for the 1-kW slugs). The power-range-switch setting multiplied by the element-factor number gives the full-scale-power value. For example, with the 1-kW, 144-520 MHz slug installed (factor = 10) and the switch set on 1, the full-scale power reading is 10 W. Move the switch to 30, and the full-scale value becomes 300 W. Depending on the switch setting, each 1-kW slug will measure 0 to 1000, 300, 100, 30, 10, 3 or 1 W. For the 10-kW slugs, the full-scale values are 10,000, 3000, 1000, 300, 100, 30 and 10 W.

A 9-V alkaline battery powers the 4410. With the range selector in any position but OFF, there is a slight battery drain. Battery life is rated at 24 hours of continuous use. Among the settings on the range switch is a battery test position, which should be used before making any measurements. A weak battery will affect accuracy.

To find out if the same slug could really measure 0 to 1 and 0 to 1000 W with accuracy, we compared readings made with the 4410 to some made with the ARRL laboratory unit, a recently factory-calibrated Bird 43. We tried various powers at different frequencies, from 1 kW on 3.5 MHz, to 120 W on 14 MHz, to 10 W on 144 MHz, to 500 W on 432 MHz. Although the 4410 and the 43 did not always exactly agree, the readings were always within Bird's claimed specifications of ± 5% of reading above 20% of full scale. Readings on the 4410 were consistent from setting to setting (i.e. 100 W on the 100 W setting was also 100 W on the 300- and 1000-W settings).

The only complaint I have with the 4410 is that the meter movement is slower in responding to power changes than most other wattmeters I've used. It's so slow that I sometimes found it difficult to tune up a transmitter with "touchy" controls when using the 4410 to monitor output power. I would tune through the output power peak before the meter responded. Other than that, the 4410 is a dandy little unit, able to measure QRP or QRO accurately at the flick of a switch.

The instruction manual is exceptionally comprehensive for a device as simple as a wattmeter. Included are such goodies as nomographs for determining VSWR based on forward vs. reflected power readings, and complete calibration information. Slugs of interest available to amateurs include 1 or 10 kW 2-30 MHz, and 1 kW 25-80, 50-200, 144-520 and 200-1000 MHz units.

Price class of the Bird 4410: $495; plug-in elements: $150 each for the 2-30 MHz units, $125 for the 144-520 MHz unit. The manufacturer is Bird Electronics Corp., 30303 Aurora Rd., Solon, OH 44139. — *Mark Wilson, AA2Z*

Technical Correspondence

Conducted By
Dennis J. Lusis,* W1LJ

NOTES ON NOISE FIGURE

☐ Recently, I was reading about diode mixers and noise figure in Microwave Associates' *Receiving Diode Handbook.*[1] Thinking over what I had read, I realized there are a number of ways to confuse people when discussing noise figure and noise factor. I am going to try to clarify these terms.

The *Receiving Diode Handbook* gives the following definition of overall receiver *noise figure* (p. 8): "The noise at the output of a receiver is the sum of the noise arising from the input termination (source) and noise contributed by the receiver itself (i.e., the i-f amplifier and mixer diode). The *noise factor* is the ratio of the actual output noise power of the device to the noise power which would be available if the device were perfect and merely amplified the thermal noise of the input termination without contributing any noise of its own."

The ARRL *Handbook* also gives the following equation for noise factor:

$$NF = \frac{S_i/N_i}{S_o/N_o} \qquad \text{(Eq. 1)}$$

Look at Fig. 1, which illustrates the noise factor relationship. We can see that

$$S_o = G \cdot S_i, \text{ and } N_o = G(N_{amp} + N_i) \qquad \text{(Eq. 2)}$$

The noise factor is derived as follows:

$$NF = \frac{S_i/N_i}{G \cdot S_i/G(N_{amp} + N_i)}$$

$$= \frac{S_i \cdot G(N_{amp} + N_i)}{G \cdot S_i \cdot N_i} = \frac{N_{amp} + N_i}{N_i}$$

$$= \frac{N_{amp}}{N_i} + 1 \qquad \text{(Eq. 3)}$$

This equation agrees with the definition. However, it is distinctly different from the popular noise-factor and noise-figure equations, which represent the equivalent noise power looking into the system (N_{amp}) compared to the noise power of a 293 K source.

The two concepts are separable. The first case (Eq. 1) doesn't seem particularly useful, because the noise factor changes with generator temperature. The second case (Eq. 2) represents the effective input temperature of the system referenced to a known temperature (290 K, 293 K and 298 K are used). This "standardization" allows meaningful comparisons among different equipment.

I've shifted from the term "noise power" to "temperature" because it is more useful and easier to use. Noise power is the product of bandwidth, Boltzmann's constant (1.38×10^{-23} J/K) and the temperature in Kelvins. The bandwidth and the constant cancel themselves in the ratios used to derive noise factor, while only the temperature ratio remains.

[1]Microwave Associates, South Avenue, Burlington, MA 01803.

*Assistant Technical Editor

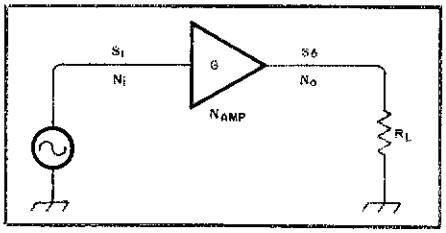


Fig. 1 — Model used to illustrate noise figure and noise factor.

The third source of confusion about noise factor is that it may refer to either

$$\text{(A)}\ \frac{T_{amp}}{293} + 1 \quad \text{or} \quad \text{(B)}\ \frac{T_{amp}}{293}$$

The A form is the more common of the two; however, the B form is needed for calculations. In the *Receiving Diode Handbook* both forms are mixed in one equation (Eq. 13, p. 187): $NF = L(t_m + F_{IF} - 1)$.

In that equation, F_{IF} is apparently the noise-factor form A, since 1 is subtracted from it in the equation. Inconsistently, NF is the noise-factor form B, since 1 is not added back to it.

Another source of confusion comes from mixing the logarithmic form with an arithmetic form in one equation. Noise figure is the logarithmic "dB" form, and noise factor is the arithmetic form. It is the noise-factor (B) form that is divided by the gain of preceding stages — *not* the noise figure when calculating the combined noise factor of several amplifier stages.

We could benefit by standardizing the terms in several ways. Noise figure could always be in the decibel form, and noise factor the arithmetic form, $\frac{T_{in}}{298} + 1$.

Temperature ratio (Tr) would generally be $\frac{T_{in}}{298}$, or $\frac{T_{out}}{298}$ for diode specs.

I've chosen 298 K because it equals 25 °C, which is the commonly used reference for semiconductor ratings. I think *one* arbitrary reference temperature is enough! Actually, we could do away with NF entirely. I don't know of any use for the logarithmic form that can't be better served by the temperature ratio, or simply the temperature. — *Martin Sample, WA6JTD, Tuolumne, California*

MY DIPOLE DOESN'T WORK RIGHT

☐ Have you ever cut a dipole to the dimensions in the ARRL *Handbook* and ended up with a horrible mismatch to the feed line? Take heart. It happens for a reason that is fairly simple but rarely mentioned in the literature. I've had it happen a number of times to me.

An item that is discussed very briefly at best is *ground effect* on antenna impedance. When an antenna is strung over the ground, regardless of height, ground reflections cause changes in the feedpoint impedance. Table 1 gives the minimum height for a dipole where ground effects cause less than a 20% change in impedance. It's pretty terrifying for the 160-meter buff! Regardless, let's look at the overall picture and see what we can learn.

Table 1

Minimum Antenna Height for Less Than 20% Impedance Shift from Ground Effects

Band	Height
160 m	260 ft†
80 m	130 ft
40 m	66 ft
30 m	47 ft
20 m	34 ft

†m = ft × 0.3048.

The model I used for comparison is an antenna mounted over a *perfectly conducting* ground plane. When a dipole is strung horizontally above this perfect ground, the entire system appears as if there were no ground, but instead an active antenna located below the real one, spaced twice the distance to ground level (Fig. 2).

The subject of mutual impedance for parallel antennas is covered in the literature, but usually in an unintelligible manner. Kraus contains a fairly good section and Terman has several useful charts on different configurations.[2,3] Fig. 3 is a graph of the mutual impedance between two antennas at spacings of up to 1.8 λ (0.9 λ above ground for the "real" antenna). Note that the mutual reactance and resistance varies in a damped sine wave fashion. This function is described by Kraus. By studying Fig. 3 one can observe several interesting facts. If the antenna is mounted close to the ground, there is severe mutual coupling between it and the ground image "antenna." The resultant resistance and reactance of the antenna pair is given by

$$R = R_{11} - R_{21} \quad X = X_{11} - X_{21} \qquad \text{(Eq. 4)}$$

where

R_{11} and X_{11} represent the antenna self impedance

R_{21} and X_{21} represent the mutual impedance between the antenna and its image.

The importance of this relationship is that the mutual resistance and reactance subtract from the free-space antenna characteristics. Thus, at resonance (where the antenna is about 68 ohms in free space) and at 0.1 λ high, the center im-

[2]J. Kraus, *Antennas* (New York: McGraw-Hill Book Co., 1950), pp. 262-268.
[3]F. Terman, *Radio Engineer's Handbook* (New York: McGraw-Hill Book Co., 1943), pp. 774-780.

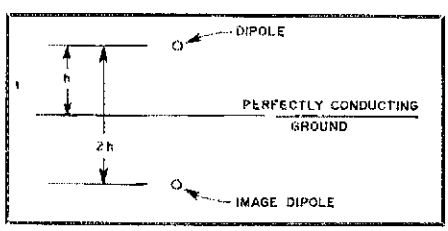


Fig. 2 — Illustration of the relationship between a dipole and the image dipole "formed" within the ground.

Table 2

40-Meter Dipole Characteristics at Different Heights

Height	Free Space			0.2 λ Above Ground			0.48 λ Above Ground		
(MHz)	R	X	SWR	R	X	SWR	R	X	SWR
6.9	63.6	− 16.9	1.34	63.6	− 16.9	1.34	63.6	− 71.2	2.72
7.0	65.8	− 29.2	1.54	65.8	6.7	1.18	65.8	− 47.6	1.97
7.1	68.0	− 5.7	1.14	68.0	30.2	1.54	68.0	− 24.1	1.42
7.2	70.2	17.8	1.29	70.2	53.7	2.07	70.2	0.6	1.07
7.3	72.4	41.2	1.74	72.4	77.1	2.73	72.4	22.8	1.36
7.4	74.5	64.6	2.32	74.5	100.5	3.52	74.5	46.2	1.84

Note: Antenna is 67.45 feet long and fed with 75-Ω feed line.

pedance is actually R = 68 − 50, or 18 ohms with X = 0 − (−24) = +24 ohms reactance. Where we had an SWR of 1.1:1 with 75-ohm feed line in free space, we now have an SWR of 4.62 with 75-ohm feed line, which will drop to 3.49:1 when using 50-ohm feedline. This is for a 160-meter dipole at 50 feet, or an 80-meter dipole at 25 feet.[4] A Transmatch will make these impedances acceptable to the transmitter, but I do not like them!

To illustrate this more graphically, some calculations were made for a 40-meter antenna. The results are shown in Table 2 and plotted in Fig. 4. You can see the shift in apparent resonant frequency as the height above ground is changed. For this example, I have chosen heights at which the mutual resistance is zero. Choosing other heights gives much poorer SWR curves, and muddies the water in seeing what happens as a function of height. You can estimate the effects of height on your antenna by assuming a free-space center impedance of 68 ohms, and subtracting the mutual R and X as read on the curve in Fig. 3. To illustrate this, assume we have an 80-meter dipole cut to 3750 kHz, which is hung at 62 feet above the ground. In free space the impedance would be about 68 ohms. Sixty-two feet is 0.236 λ at this frequency (0.472 λ between antennas), so the mutual impedance from the curves is −9.8 − j30.2 ohms. Subtracting the mutual terms from the self impedance, the antenna now appears as 77.8 + j30.2 ohms. Fed with 75-ohm line, the SWR would be 1.48:1, while the lowest SWR point has dropped down about 100 kHz to 3650 kHz. This example illustrates why antennas in general must be shortened when they are installed nearer the ground. Granted, the shift is only 100 kHz, but haven't you ever wondered why this is so?

What about the "real" world where there are

[4]m = ft × 0.3048.

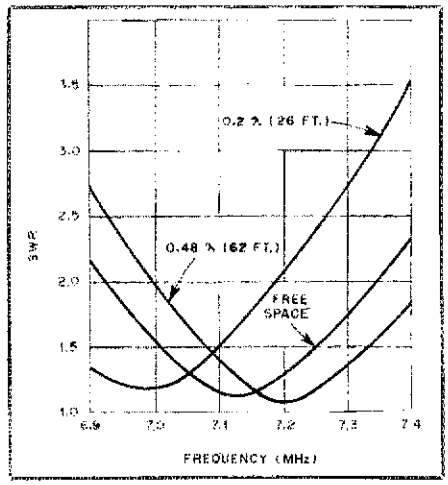


Fig. 4 — Graph showing the effects of antenna height on resonant frequency.

no perfectly conducting ground planes? I don't live on a field that used to be a broadcast station antenna farm! Less than perfect ground causes two effects. The first effect is that the image dipole spacing is greater than twice the physical height above ground. I've found the impedance of an 80-meter dipole mounted over 60 feet of coral rock (in the Caicos Is.) to be that of a dipole 80 feet above perfect ground. The coral rock is a very poor ground plane! The second effect is that there is less mutual coupling because of lower illumination of the image antenna through ground losses. This reduces the change in antenna impedance. (It is difficult to find information on these effects!)

What does all this add up to and what can be done about the situation? From Fig. 3, calculate the mutual coupling with the antenna ground image. Subtract these values from the free-space antenna impedance. This impedance may be calculated with the formulas developed by Hall or myself.[5,6] The SWR for a given feed line is determined by the formula in the ARRL *Handbook*.[7] If the SWR is acceptable, then all is fine. However, even if it is as bad as the example shown earlier, all is not lost. A matching system at the feed point can be used to make this low dipole appear as though it were in free space. This all sums up to the fact that one should string his or her antenna as high as possible, unless you desire some particular angle of radiation for point-to-point communications.[8] — *Alan B. Harbach, WA4DRU, Melbourne, Florida*

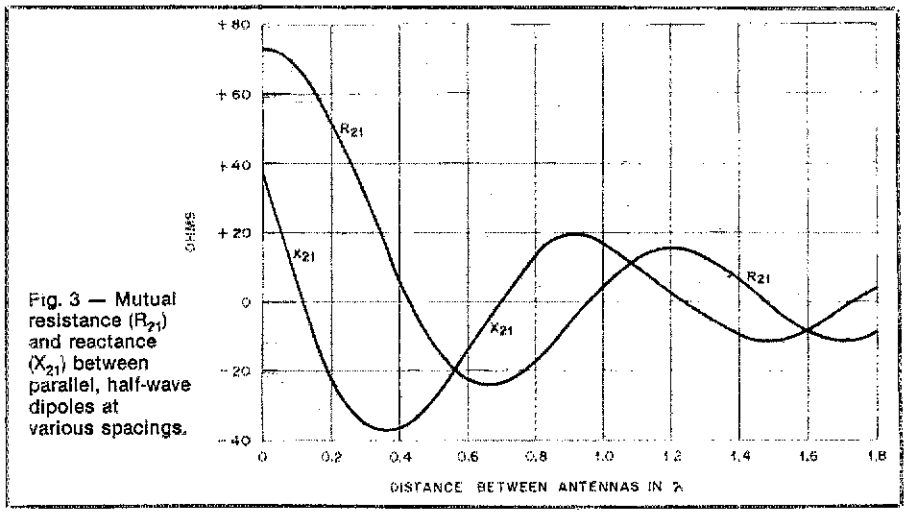


Fig. 3 — Mutual resistance (R_{21}) and reactance (X_{21}) between parallel, half-wave dipoles at various spacings.

MINIMUF FOR POLAR PATHS

☐ Users of MINIMUF (Dec. 1982 *QST*) should be suspicious of muf predictions on any path through a polar region that is in the summer season. MINIMUF uses the control-point method of muf prediction. For paths longer than 4000 km, the control points are located along the path at points 2000 km from each of the two terminals.[9] The path muf is the lesser of the two found at the control points.

MINIMUF computes the muf at each control point as a function of several parameters, including the number of hours of sunlight at the control point on the specified date and the elapsed time since sunrise or sunset at each UTC hour. If a control point is located in a polar region and a winter season polar night condition exists, there is no sunrise or sunset; MINIMUF detects this condition and uses an appropriate algorithm to compute the control point muf. It does *not* contain a separate algorithm for the summer season, midnight-sun condition in which there are 24 hours of sunlight at a control point. MINIMUF will instead compute an erroneous muf. I have observed this failing on two paths from Los Angeles to Europe in June and July.

There is no simple way to correct this problem. However, MINIMUF can be modified so that it will generate an error message instead of incorrect mufs if the midnight sun condition exists at a control point. It is only necessary to change line 1530 to

K9 = 12-ATN(K9/SQR(1-K9*K9))*7.639437

The argument of the SQR function is negative under the midnight-sun condition. The wording of the resulting error message will depend upon the computer system. — *Sheldon C. Shallon, W6EL, Los Angeles, California*

[5]J. Hall, "The Search for a Simple, Broadband 80-Meter Dipole," *QST*, April, 1983
[6]A. Harbach, "Broadband 80-Meter Antenna," *QST*, Dec. 1980.
[7]G. Woodward, ed., *The Radio Amateur's Handbook*, 60th ed. (Newington: ARRL, 1983), p. 19-2.
[8]G. Hall, ed., *The ARRL Antenna Book*, 14th ed. (Newington: ARRL, 1982), Chapter 2.

[9]mi = km x 0.6215.

Feedback

☐ In "A Top-Fed Vertical Antenna for 1.8 MHz — Plus 3" (Sept. 1983 *QST*), there are two errors pointed out by author Eichenauer. On page 27, the first paragraph should read: "...resistor of value R4 + RG."

Also on the same page, computer program line 490 should read:

490 LET R4 = .01215*(ABS((SIN ATN (B))*180/PI))[2]

The 8th Triennial Conference of IARU Region 2

The IARU member-societies of the Americas spent a week making decisions that strengthen international Amateur Radio.

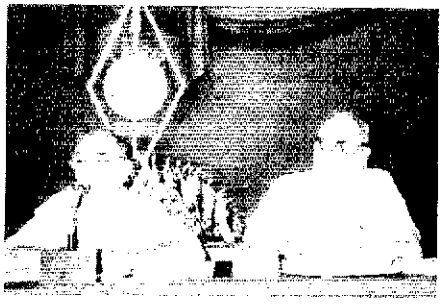
By Richard L. Baldwin,* W1RU

Perhaps one of the least-well-known organizations in Amateur Radio is the International Amateur Radio Union (IARU). And yet, in recent years, its work has had a profound influence on the future of Amateur Radio. IARU was founded at a meeting in Paris in 1925. Its goals included the encouragement of friendship and cooperation among amateurs of all countries. And while international friendship and cooperation did come to pass, there were loftier goals that needed to be addressed.

In 1950, the amateurs in Region 1 (Europe and Africa), recognizing that a more organized and forceful approach was needed, particularly with respect to conference preparation, formed the IARU Region 1 Division. In the '60s, similar organizations were formed in Region 2 (the Americas) and Region 3 (Oceania and the Far East). Through a process of evolution, the regional organizations have become more autonomous and more active in the decision-making process of IARU, a fact that is being formally recognized in the constitutional restructuring of IARU now taking place.

The "business" of the regions, and therefore of IARU, is transacted in a continuing series of regional triennial conferences. They are scheduled so that each year, in one of the three regions, there is a week-long conference, with delegates or proxies from each of the region's member-societies and the officers of the Union present. If possible, representatives of the other two regions attend as observers. It is at these conferences that regional problems and activities are discussed, and that coordination takes place with what is happening in the other regions. It often happens that a new idea or a new approach adopted by one region at its triennial conference soon becomes discussed and adopted or modified by succeeding conferences in the other regions. Such is the deliberate and certain progress of the work of IARU.

The most recent IARU regional conference was that of Region 2, held in Cali, Colombia, during the week of June 5-11. It coincided with the 50th anniversary of the Liga Colombiana de Radioaficionados, and was an action-packed week of work and celebration. Although we shall return to this subject later in this report, we must emphasize the high quality of the preparation and support provided by our HK friends — it was superb!



Gustavo Reusens, OA4AV, President of Region 2 IARU for the past three years, addresses the conference in Spanish while Victor C. Clark, W4KFC, IARU Region 2 Vice President (and ARRL President) listens to the simultaneous translation. (*N1CIX photos*)

Honorary chairman of the conference and president of the Liga Colombiana de Radioaficionados, Enrique Valencia, HK5ASF, is at the left. In the center is Victor C. Clark, W4KFC, while Alberto Shalo, HK3DEU, member of the Region 2 Executive Committee, is at the right.

Who Was There?

Following is a list of the countries represented at this 8th Region 2 conference, together with the names and call signs of the individuals who attended. (Where more than one person is shown for a country, the first one listed was the official delegate, with the others present as observers.)

Argentina — Jose Manuel Ahumada, LU2DX; Lucio Mansini, LU3EM; Jose D. Wainsztok, LU2BAT; Reinaldo Szama, LU2AH. *Barbados* — (Proxy held by Trinidad and Tobago). *Bermuda* — Steve Dunkerley, VP9IM. *Bolivia* — (Proxy held by Colombia). *Brazil* — Hugo A. Silva, PY2DSQ. *Canada* — Tom Atkins, VE3CDM. *Chile* — Rogelio Gomez, CE3GF; Daniel Zavala G, CE3DZ. *Colombia* — Enrique Valencia, HK5ASF; Juan Kattan, HK5CBR; Azael Gonzalez, HK5AHW; Eduardo Milhem, HK5BWX; Eduardo Londono, HK4BHC; Fred Laun, K3ZO/HK3NBB; Richard Bard, HKØFBF; Juan F. Rojas B., HK3ZZA; Luis Bernal, HK3BAV; Alberto Llana, HK3XB; Efrain Chaparro, HK5BTN; Javier Calcedo, HK5EEK; Alvaro Martinez, HK3AVA; Ferando Benedetti, HK5CSV. *Cuba* — (Proxy held by Nicaragua). *Ecuador* — Gustavo Crespo, HC2NW. *El Salvador* — (Proxy held by Panama). *Guatemala* — (Proxy held by Honduras). *Honduras* — Juan de Dios Herrera, HR2JDH. *Mexico* — (Proxy held by Dominican Republic). *Netherlands Antilles* — Willy Gravenhorst, PJ2WG; Ismael Lopez R., PJ2ILR; Mathias Vrolijk, PJ3MV; Irwin Damasco Provence, PJ3IDP. *Nicaragua* — Lucy Alvarez, YN1CSD. *Panama* — Rodolfo Delgado, HP1RD; Edmundo Burgos, HP1AVD. *Peru* — Alfonso Alvarez, OA4PQ. *Dominican Republic* — Virgilio M. Malagon, HI8VMA. *Trinidad & Tobago* — Nick Percival, 9Y4NP. *USA* — Carl Smith, WØBWJ; Dave Sumner, K1ZZ; John Lindholm, W1XX; Naoki Akiyama, N1CIX. *Venezuela* — Pedro J. Fajardo, YV5EC; Juan J. Bartolomeo, YV5HYX.

Also present in their roles as members of the Region 2 Executive Committee were President Gustavo Reusens, OA4AV; Vice President Victor C. Clark, W4KFC; Secretary Pedro Seidemann, YV5BPG; Treasurer Peter Parker, VP9GO; and

*President, IARU

The ARRL delegation (l-r): John Lindholm, W1XX, Communications Manager; Carl Smith, WØBWJ, ARRL/IARU Vice President; David Sumner, K1ZZ, General Manager.

members-at-large Alberto Shaio, HK3DEU, Luis P. Caamano, HI8LC, Fabian Zarrabe, YN1FI, Hugo Coscio, CP5EC, and Carlos G. Kaufman, LU9CN.

Carl L. Smith, WØBWJ, played a dual role. Carl is Vice President of the IARU and, as ARRL First Vice President, served as head of the U.S. delegation. Dave Sumner, K1ZZ, also played a dual role, as IARU Secretary and member of the U.S. delegation. Also present were IARU President Richard L. Baldwin, W1RU; Philipp Lessig, DK3LP, President of the Deutscher Amateur Radio Club and representing Region 1; Masayoshi Fujioka, JM1UXU, IARU Region 3 Secretary; and M. L. Gibson, W7JIE, Region 2 Intruder Watch Director.

Conference Procedure

All IARU regional conferences follow pretty much the same general operating pattern. Several months prior to a conference, the secretary of the region will call for reports of activity and papers. Member-societies, along with the headquarters and various working groups, will submit papers dealing with particular topics of interest and concern. (For example, for this conference there were several papers submitted dealing with various aspects of the Intruder Watch.) These papers are, in the case of Region 2, translated into both English and Spanish (the other two regions use only English), and are then indexed and assembled into a loose-leaf binder for the use of the delegates. Further, the regional secretary assigns responsibility for action on each paper to one of the standard conference committees — Committee A is administration, Committee B is technical and operating, Committee C is for credentials, and Committee D is for vhf and uhf matters. At Cali, a special Committee E was established to develop a budget for the next three years; more about that committee later.

Each committee, formed on the first day from the delegates present, chooses a chairman and a secretary. It then actively discusses each of its assigned papers and comes to a consensus on what the conference position should be with respect to the topic of concern of the paper. On the final day of the conference, the committee reports are reviewed by the entire conference, and each item in each committee report is generally accepted, sometimes modified, and rarely rejected. The policies and procedures thus adopted become a part of the legislative doctrine that will help govern the activities in the region for the next three years. These decisions are shared with other regions after the conference, so there is a continuing exchange of opinion and a commonality of approach between and among the three regions.

What Was Done at Cali

By the close of the conference, the regional secretary (YV5BPG) had circulated 91 papers. About a quarter of these dealt with the administration of the conference. The rest covered a wide range of concerns, such as band plans, the use of various modes of emission, the sizes of QSL cards, the Intruder Watch, implementation of WARC-79 actions, the second-society problem, changes in the bylaws and reciprocal operating. When it was all over, the following actions had been taken:

- Criteria were established by which a member-society of Region 2 may be declared inactive.
- The appointment of YV5BPG and HK3DEU as the Region 2 representatives to the IARU Administrative Council was affirmed.
- A resolution of support for World Communications Year was adopted.
- Efforts to promote reciprocal operating were encouraged.
- Member-societies were reminded of the strictures in the IARU Constitution against maintaining relations with "second societies" in those countries where they exist as divisive forces.
- A memorial award was created in honor of George Dawson, HP1GD, longtime supporter of IARU Region 2 and manager of the Region 2 Net.
- The Bylaws were modified so as to permit more than one officer to be from the same Area, with other provisions to ensure that each Area is represented on the Executive Committee.
- The Executive Committee is to prepare a draft of a new Constitution for Region 2 to conform to the new IARU Constitution, once the latter has been adopted.
- Member-societies were encouraged to seek early implementation of WARC-79 decisions in their countries.
- A resolution condemning the attack on the West German DXpedition to Spratly was adopted.
- Congratulations were extended to Owen Garriott, AMSAT and ARRL for obtaining permission for W5LFL to operate during the upcoming STS-9 mission.
- Member-societies were urged to make known the frequencies used by their national emergency nets, and to guard against excessive use of the amateur bands by nonamateur, quasi-emergency nets.
- Band plans for the 18- and 24-MHz bands were adopted that conform to plans adopted earlier in Regions 1 and 3, and are as follows:

18.068-18.100 MHz	Cw
18.100-18.110 MHz	RTTY and Cw
18.110-18.168 MHz	Telephony and Cw
24.89-24.92 MHz	Cw
24.92-24.93 MHz	RTTY and Cw
24.93-24.99 MHz	Telephony and Cw

- The appointment of Jorge Koch, OA4CK, as coordinator of 28-MHz beacons in Region 2 was affirmed.
- Regions 1 and 3 were urged to consider expanding the RTTY segments of their high-frequency band plans at their upcoming triennial Conferences.
- Member-societies were urged to pursue domestic regulations that give visiting reciprocal operators the same subband privileges as other licensees (subject to restrictions that may arise from the class of license held).
- The Administrative Council was asked to consider a QRP endorsement for the Worked All Continents award.
- Sponsors of contests and DXpeditions were encouraged to specify frequency limits so as to minimize the adverse impact on other activities.
- Member-societies were urged to appoint an Intruder Watch Coordinator, and publication of a handbook for their use was authorized.
- A Working Group was established to encourage greater use of RTTY and AMTOR within the Region.
- DXers were urged *not* to submit money with QSL card requests, because of currency restrictions in many countries and the growing tendency toward QSLs becoming a commercial enterprise.
- Member-societies were requested to not forward QSLs of nonstandard size through their outgoing QSL bureaus after January 31, 1984.
- A band plan for 144-148 MHz was adopted that is identical with the one in the current ARRL *Repeater Directory*, p. 18, with the additional designation of the

Representing Region 3 was Masayoshi Fujioka, JM1UXU (left), Secretary of the Region 3 Association. Representing Region 1 was Philipp Lessig, DK3LP, President of the Deutscher Amateur Radio Club.

144.3-144.5 MHz OSCAR subband as "tentative." Simplex operation on repeater frequencies is recognized in those areas having no repeaters, but repeaters have priority.

- The parallel use of latitude/longitude and the "Maidenhead" locator system (see Jan. 1983 *QST*, p. 49) was approved.
- Member-societies were urged to pursue exclusive amateur allocations at 902-928 MHz.
- The band plan for 50-54 MHz that was adopted by ARRL at the 1983 Annual Meeting of the Board was appproved (see Aug. 1983 *QST*, p. 72).
- Similarly, the band plan for 1215-1300 MHz that was adopted by the ARRL Board at its 1982 Annual Meeting was approved (see May 1982 *QST*, p. 48).
- Concern was expressed about interference to amateur operations by cordless telephones.

Priorities Established

IARU has come a long way since 1925. What was, in retrospect, a rather parochial organization has shown its increasing maturity by its development of the regional organizations, by its success at WARC-79, by its dynamic restructuring program, and now by the work of Committee E at Cali. The assignment for Committee E was to establish a budget for the next three years. It took the logical first step of establishing the objectives of Region 2 and their priorities, as follows:

1) To represent amateur interests at international telecommunications conferences

2A) To strengthen the national member-societies

2B) To represent Region 2 in IARU

3) To help member-societies in technical matters and to act as an information center.

In one giant step, Region 2 has clearly recognized that the most important task that IARU Region 2 (at least) faces is the proper and adequate representation of the Amateur Radio Service at ITU conferences. Without adequate international radio regulations, and without adequate frequency allocations, the Amateur Radio Service would have a difficult time of it. Through a gradually improving process, amateur representation at international telecommunications conferences has become more and more sophisticated, and what Region 2 has done is to emphasize the importance of that representation and label it the number one priority.

With some sort of an ITU conference scheduled every year for at least the next decade, and with the emphasis on a higher degree of activity within the region, an increase in operating costs of the region was inevitable. The conference found it necessary to approximately double the amount of dues paid by each member-society during the next three years, even with the adoption of a number of cost-cutting measures. This was the first dues increase since 1976.

The Canadian delegate and new treasurer of Region 2 — Tom Atkins, VE3CDM.

The Administrative Council

In another recognition of the changes that have been taking place in IARU, the conference, during its final session, passed the following Resolution:

This conference

Recognizing the great progress that has been made in the study of the restructuring of IARU, and

Recognizing the extent of the constitutional changes that have been proposed by the Administrative Council at its Toyko meeting, and

Recognizing that henceforth the policy-making organization of IARU will be on an entirely different basis,

Does therefore *congratulate* the members of the Administrative Council on their forward thinking and accomplishment in achieving true internationalism of the IARU, and

Urges all member-societies, regional organizations, and the headquarters to support the work of the Administrative Council in order to reach even greater heights of achievement in the years ahead.

[Editor's Note: The Administrative Council has drafted a new constitution for IARU, and in November will meet to develop a set of Bylaws. These documents then will be presented to the member-societies of IARU for their decision.]

New Officers

At the conclusion of the conference, a new slate of officers and other members of the Executive Committee was elected. Stepping down were President Gustavo Reusens, OA4AV; Vice President Victor C. Clark, W4KFC; and Treasurer Peter Parker, VP9GO. Each has served IARU Region 2 well for a number of years, and each now has other responsibilities. The new Region 2 Executive Committee consists of

Pedro Seidemann, YV5BPG, President
Fabian Zarrabe, YN1FI, Vice President
Alberto Shaio, HK3DEU, Secretary
Thomas B. J. Atkins, VE3CDM, Treasurer

Members-at-Large

Steve Dunkerley, VP9IM
Carl L. Smith, WØBWJ
Luis Caamano, HI8LC
Hugo Coscio, CP5EC
Carlos Kaufman, LU9CN

These nine will serve at least until the next triennial conference of Region 2, which will take place in Argentina in 1986. (In the meantime, there will be a Region 1 conference in Italy in 1984 and an Region 3 conference in New Zealand in 1985.)

Conference Support

We cannot praise too highly the preparation for this conference and the support provided while it was in session. Regional Secretary Pedro Seidemann, YV5BPG, did an outstanding job in his organization and preparation of papers for the delegates prior to and during the conference. Although his was largely a one-man operation prior to the conference, once in Cali he was ably assisted by a team provided by the local HK5 amateurs. Typists, translators, photocopy operators, runners and all of the necessary equipment were available in efficient supply. Simultaneous translation was provided during the plenary sessions because in Region 2 the official languages of the conference are both Spanish and English.

In addition, there was a corps of energetic young women, all either wives or daughters of local Cali amateurs, who supervised transportation, escorted wives of delegates and otherwise made themselves most useful. They dressed alike, most becomingly, wearing a different wardrobe each day, and we fell in love with them all.

Alberto Shaio, HK3DEU, a human dynamo if ever there was one, was the straw boss who took responsibility for making sure that we met all our scheduled commitments. He was there in the morning to shepherd us all onto the bus for the 30-minute ride from the hotel to the meeting site at CIAT, an agricultural institute on the outskirts of Cali. He made sure that we got to dinner on time, and made sure we were all present and accounted for when we were supposed to be present at some official luncheon or ceremony. He was also the unofficial master of ceremonies all of the time, and the official master of ceremonies at the banquet and dinner-dance on the final evening in Cali.

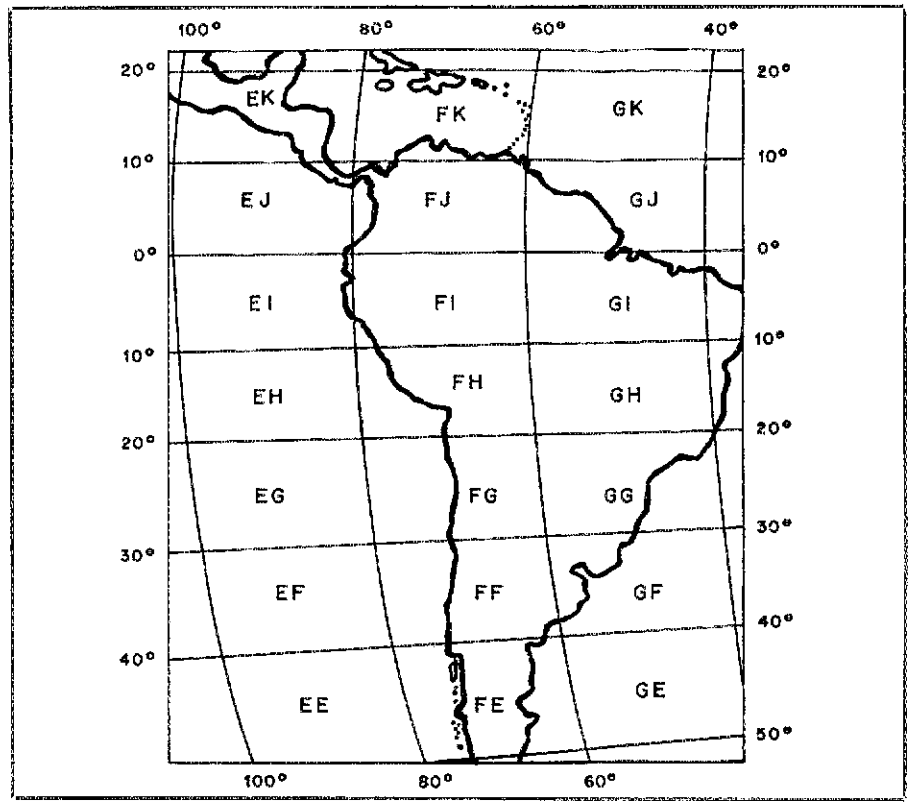
Fiftieth Anniversary of LCRA

Coincident with the holding of this IARU conference, the Liga Colombiana de Radioaficionados celebrated its 50th

(continued on page 53)

Grid Locators for South America

By John F. Lindholm,* W1XX



New enthusiasm in vhf operating has been sparked by the January 1983 *QST* announcement of the VHF/UHF Century Club Awards program.[1] Not only have grid-square exchanges like DMØ2 and FM26 become commonplace, they are even understandable! Collecting grid squares has already become quite a sport.

Interest in locators runs high within the hemisphere and worldwide. The Maidenhead Locator System (used for VUCC) was officially adopted within Region 2 (North and South America) at the Triennial Conference held in Cali, Colombia, in June (see article elsewhere in this issue). There was great interest shown in locators at that conference with many "how to" inquiries. Also, with many TE, E_s and EME contacts bridging the equator, some have wondered how to determine locators for places *south* of the equator. Since latitude is measured north and south *from* the equator, the 4th character of the locator (and the 6th for more precise work) is *not* determined in the southern latitudes in the same way as are locations north of the equator.

The January article focused on locators in the U.S., Canada and some of the Caribbean. To assist in locator determinations for the rest of the hemisphere (and particularly *south* of the equator), the following tables are presented.

Good grid hunting!

[1] J. Lindholm, "VHF/UHF Century Club Awards," *QST*, Jan. 1983, pp. 49-51.

*Communications Manager, ARRL

Table 1
How to Determine Grid Locators for South and Central America

1st and 2nd characters: Read directly from the map.

3rd character: Take the number of whole degrees west longitude, and consult the following chart.

Degrees West Longitude	*Third Character*	*Degrees West Longitude*	*Third Character*	*Degrees West Longitude*	*Third Character*
30-31	4	54-55	2	76-77	1
32-33	3	56-57	1	78-79	0
34-35	2	58-59	0	80-81	9
36-37	1	60-61	9	82-83	8
38-39	0	62-63	8	84-85	7
40-41	9	64-65	7	86-87	6
42-43	8	66-67	6	88-89	5
44-45	7	68-69	5	90-91	4
46-47	6	70-71	4	92-93	3
48-49	5	72-73	3	94-95	2
50-51	4	74-75	2	96-97	1
52-53	3			98-99	0

4th character: For **north** latitudes, this number is the same as the *2nd single digit* of latitude. For example, for a latitude of 21° N, the 4th character is 1. For single-digit north latitudes, use that number. For example, for a latitude of 8° N, the 4th character is 8.

For **south** latitudes, consult the following chart:

2nd single digit of latitude	*4th Character*
0	9
1	8
2	7
3	6
4	5
5	4
6	3
7	2
8	1
9	0

For single-digit south latitudes, use that number to consult chart. Examples: For a latitude of 14° S, the 4th character is 5; for a latitude of 6° S, the 4th character is 3.

This four-character (2-letter, 2-number) locator indicates the 2° × 1° grid square for VUCC award purposes.

Table 2

More Precise Locator

To indicate location more precisely, the addition of 5th and 6th characters will define the *subsquare*, measuring about 6.5 × 5 km. A more detailed map from which longitude and latitude can be extrapolated to the nearest tenth of a minute is necessary for this level of locator precision. *This is not necessary in the VUCC awards program.*

5th Character: If the number of degrees longitude is an *odd* number, see Fig. A. If the number of degrees longitude is an *even* number, see Fig. B.

Odd Longitude (Fig. A)*		*Even Longitude* (Fig. B)*	
Minutes W. Longitude	*5th Character*	*Minutes W. Longitude*	*5th Character*
0- 5	L	0- 5	X
5-10	K	5-10	W
10-15	J	10-15	V
15-20	I	15-20	U
20-25	H	20-25	T
25-30	G	25-30	S
30-35	F	30-35	R
35-40	E	35-40	Q
40-45	D	40-45	P
45-50	C	45-50	O
50-55	B	50-55	N
55-60	A	55-60	M

6th character: Take the number of *minutes of latitude* (following the number of degrees) and consult the following chart.

Minutes N. Latitude	*6th Character*	*Minutes S. Latitude*
0- 2.5	A	57.5-60.0
2.5- 5.0	B	55.0-57.5
5.0- 7.5	C	52.5-55.0
7.5-10.0	D	50.0-52.5
10.0-12.5	E	47.5-50.0
12.5-15.0	F	45.0-47.5
15.0-17.5	G	42.5-45.0
17.5-20.0	H	40.0-42.5
20.0-22.5	I	37.5-40.0
22.5-25.0	J	35.0-37.5
25.0-27.5	K	32.5-35.0
27.5-30.0	L	30.0-32.5
30.0-32.5	M	27.5-30.0
32.5-35.0	N	25.0-27.5
35.0-37.5	O	22.5-25.0
37.5-40.0	P	20.0-22.5
40.0-42.5	Q	17.5-20.0
42.5-45.0	R	15.0-17.5
45.0-47.5	S	12.5-15.0
47.5-50.0	T	10.0-12.5
50.0-52.5	U	7.5-10.0
52.5-55.0	V	5.0- 7.5
55.0-57.5	W	2.5- 5.0
57.5-60.0	X	0- 2.5

The 8th Triennial Conference ...

(continued from page 51)

anniversary, with a grand ceremony being held on Saturday night, June 11, at the country club in Cali. It was a celebration both national and international in scope. LCRA presented awards to a number of its outstanding members, while its president, Enrique Valencia, HK5ASF, received a medal for outstanding service from the Ministry of Telecommunications of Colombia. The head of each Region 2 society's delegation received a plaque commemorating attendance at this 8th triennial IARU conference. W1RU, as president of IARU, also received a medal for outstanding service from the Colombian Ministry of Telecommunications, which he accepted on the basis that it was a recognition of the value of Amateur Radio internationally.

Also announced and presented at this evening celebration was a colorful postage stamp honoring the 50th anniversary of the LCRA. First-day covers bearing the new stamp were autographed by the Colombian vice minister for communications and a number of other dignitaries. And then there was wining, dining and dancing until the wee hours of the morning. (Let me tell you, Colombians place great emphasis on some of the finer things of life, such as friendship and good food and hospitality, but one thing that seems to be missing from their plan for life is *sleep*!)

Other Social Notes

In Colombia, there is obviously a very close and healthy association between the radio amateurs and a multitude of civil and military individuals and organizations. We were privileged to mingle with many of these individuals at an IARU reception held on Monday evening, June 6, and again during the final celebration of the LCRA 50th anniversary on Saturday evening, June 11. In addition, the entire conference was the guest of the Commanding General of the Codazzi Engineering Battalion in Palmera on Thursday noon, June 9.

A number of delegates' wives were present in Cali, and their stay was made ever so much more enjoyable by the hospitality and guided tours that were provided by the wives and daughters of local Cali amateurs. Cali is a lovely city in a beautiful part of Colombia, and it offered more than enough to keep our sightseers and shoppers well occupied.

One of the fascinating and rewarding aspects of this great fraternity of Amateur Radio is the friendship and hospitality that is extended wherever you travel. Nowhere was that hospitality and friendship greater than in Cali, Colombia, during the 8th Triennial conference of Region 2.

In Conclusion

As you read through this account of the work and play at the IARU conference in Cali, we hope that you will be left with the impression that a good time was had by all and that a multitude of actions were taken — all of which have some bearing on the future of the administrative, technical and operating sides of Amateur Radio.

Obviously, depending on your own personal interests, some of these actions will seem of more importance than others. But above all, we would like you to recognize how far IARU has come toward identifying and articulating those goals that were only a vision 60 years ago. There has been an increasing awareness that paramount among the responsibilities of IARU is the adequate representation of the Amateur Radio Service at international telecommunications conferences. This awareness has been spelled out clearly, not only by the IARU Administrative Council in its proposed draft of a new IARU constitution but also by the delegates of the Americas at the Cali conference. To those of us most closely involved in the work of IARU, it is a tremendously encouraging indication of the even greater successes that can be achieved in the future.

The ARRL Interference Reporting System

The stalwart Intruder Watch is being revitalized. The result: ARRL Interference Reporting System (AIRS). Here's what it's all about.

By Harold M. Steinman,* K1ET and Larry E. Price,** W4RA

It is a fact of life, too often learned the hard way, that we must not take our privileges and rights for granted. They must always be vigilantly protected and guarded, lest they be usurped by others. So it is in Amateur Radio. Amateurs have access to choice portions of the radio spectrum, from 1.8 MHz to infinity, all obtained quite legitimately through the regulatory process in both international and national forums. In the United States, before frequencies can be reallocated from one service to another, adequate notice must be given and ample time allowed for comments and reply comments before the FCC renders a decision. This procedure prevents surprises, and has served Amateur Radio well in recent years. It was not that long ago when we fought a years-long battle against the encroachment of Class E CB on the 220-MHz band, and won. No doubt there will be other similar battles in the future. But the Administrative Procedure Act, which governs FCC rule-making procedures, helps preclude the possibility of a "sneak attack." This is not always the case on the international scene.

Member-governments of the International Telecommunication Union (ITU) meet every several years to divide up the radio spectrum amongst themselves and to sign a treaty to abide by the agreed-to allocations table. Curiously, though, there are a couple of "loopholes" in these allocations. First, any government may assign *any* frequency to *any* radio service so long as such stations operating "out of band" do not cause harmful interference to stations of other countries operating within the agreed-to regulations. (There is also an official ITU definition of "harmful interference," which appears elsewhere in this article). This means that before any action can be taken against these "intruders," two conditions must be met: (1) Harmful interference must exist, and (2) someone must complain. And it must be the users of the spectrum that complain,

> "Harmful Interference: Interference which endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations." — *International Radio Regulations (ITU Convention, Nairobi, 1982)*

not simply a monitoring service. If there are no complaints from the legitimate users of the spectrum, the intruder may be considered to be operating quite legally!

The second "loophole" is that, other regulations notwithstanding, member-countries of the ITU "retain their entire freedom with regard to military radio installations of their army, navy and air forces." This provision probably explains the existence of a number of "intruders" that have been so troublesome.

In 1963, then-Assistant General Manager Richard L. Baldwin, W1IKE, with the cooperation of FCC staff, established the ARRL Intruder Watch.[1] Its purpose was to allow amateurs to register complaints against intruders in an organized manner, and to channel those complaints through ARRL Hq. and to the FCC so that the FCC could officially register a formal complaint against the intruder through international channels. (Usually the FCC sends an official governmental telegram to its counterpart agency in the offending country. In difficult cases, the aid of the U.S. Department of State is sought, or an appeal is made to the International Frequency Registration Board of the ITU.) Of course, it was understood then (and still is) that there are many hard-core intruders who do not respond to diplomatic pressure to move their out-of-band operations, and since the ITU has no formal enforcement capability, these intruders would probably continue their intrusions. But this did not mean that the efforts of the Intruder Watch would be in vain, for an additional purpose of the IW was simply to build a *record* of incursions of nonamateur stations in the amateur bands. This would help preclude the possibility that at some future allocations conference an intruding service might ask for a permanent allocation in an amateur band on the pretense that it had been operating there for several years and no complaints had been received!

Why AIRS?

With the WARC-79 Conference behind us, the time seems appropriate for a reordering of priorities and a fresh start for the Intruder Watch. WARC-79 created a new allocations table for amateurs to defend for the rest of this century. Moreover, the Intruder Watch may have been too ambitious in the goals it set to remove intruders from the amateur bands. While it is true that many intruders have been eliminated from the ham bands, one needs only to tune across 7000 to 7100 kHz (where the Broadcasting Service is prohibited by international regulations) to understand what amateurs are up against in a seemingly never-ending uphill battle. Yet no one questions the necessity that amateurs maintain a sharp vigilance against nonamateurs encroaching on the amateur bands. The present situation, far from perfect, would get *worse* if we rolled over and played dead! The question to be answered is, "How do we revitalize the Intruder Watch and channel our resources into the most productive channels to maintain a viable protective force against those who would use our bands for their own purposes, without unrealistically raising anyone's hopes?"

To answer this question, the ARRL Board of Directors, in July 1982, created an ad hoc committee to study and determine methods to revitalize the Intruder Watch. The members of this committee are

*Manager, Membership Services, ARRL
**Chairman, Ad Hoc Committee on the ARRL Interference Reporting System

[1]Although the ARRL Intruder Watch was established in 1963, the original concept of the Intruder Watch was born during the '50s under the auspices of the Radio Society of Great Britain (RSGB).

Charles Dorian, W3JPT; M. L. Gibson, W7JIE; Merle Glunt, W3OKN; John Kanode, N4MM; Gay Milius, W4UG; Larry E. Price, W4RA, Chairman; and Hal Steinman, K1ET, staff liaison.

An early decision of the committee was to change the name of the Intruder Watch to the ARRL Interference Reporting System (AIRS). More than being merely cosmetic, this name change recognizes the fact that it is the duty of radio amateurs to maintain a vigilance against all forms of harmful interference in the amateur bands, and not solely to "watch for intruders." Indeed, the international radio regulations make no reference to "intruders," but simply to "harmful interference," which can have many causes. The committee then outlined a plan for the AIRS program, which was adopted by the Board at its April 1983 meeting.

Objectives of AIRS

The objectives of AIRS are threefold:

1) to report nonamateur stations causing harmful interference in the amateur bands so that our government may take steps to have the interfering stations removed;

2) to establish a record of vigilant protection of the amateur bands (especially the frequencies allocated exclusively to the amateur service) so that administrations at international conferences may be apprised of their out-of-band operations;

3) to develop band occupancy data and such other special studies as shall be required from time to time.

Membership in AIRS

The present Intruder Watch has approximately 200 members, a dozen or fewer of whom submit the vast majority of reports of harmful interference. It was decided that membership in AIRS should be limited to a small number of dedicated amateurs who have both the technical knowledge and receiving equipment necessary to provide quality data. It is anticipated that there will ultimately be 25 to 35 AIRS stations with an even geographical distribution around the U.S. If you would like to be considered for appointment as a member of AIRS, write to ARRL Hq. for an application form. Eligibility for AIRS will be based on the following factors:

1) maturity and experience in Amateur Radio;

2) technical knowledge of monitoring and related matters;

3) availability of necessary equipment;

4) achievement of geographical dispersion of active stations.

Role of ARRL Hq.

The principal function of AIRS stations is to document interference and report cases thereof to ARRL Hq., which will maintain an up-to-date, readily retrievable data base of reports of interference to amateur communications by nonamateur stations. This data base will be maintained on electronic data processing equipment. ARRL Hq. will perform four primary tasks:

1) It will perform a screening function so that interference reports passed on to the FCC for further action will only be serious cases and those that have some possibility of resolution.

2) ARRL Hq. will maintain records of interference on the amateur bands. These records may be called upon from time to time as may be required to defend the rights of amateurs to operate freely in their allocated bands.

3) Hq. will share interference reports with the three regional IARU interference-reporting organizations.

4) Hq. staff will assure that proper information, guidance and feedback are given to AIRS members on a regular basis. Where appropriate, suitable publicity through *QST* and other sources will be given from time to time to AIRS and its accomplishments.

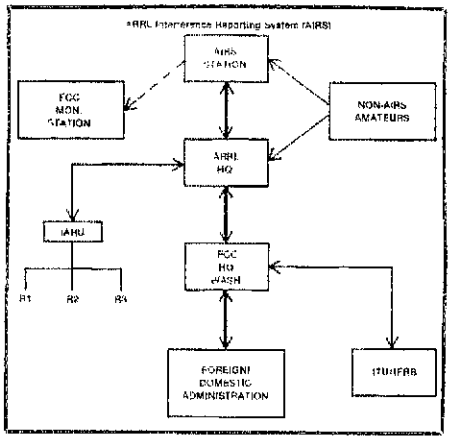


Fig. 1 — A diagram depicting the operation of the ARRL Interference Reporting System. Thicker lines indicate the primary avenues of information flow. The dotted line indicates that that channel of communication would be used infrequently.

FCC

As with the present Intruder Watch, the support of the FCC will be vital in order for the AIRS program to be successful. Although amateurs may on their own build a record of cases of harmful interference to Amateur Radio operations, only the FCC (or, in extreme cases, the U.S. Department of State) can officially notify offending administrations that their stations are treading on frequencies officially allocated to the Amateur Radio Service. FCC staff has reviewed the AIRS program, and has expressed approval of its objectives and procedures.

Odds and Ends

There are many types of nonamateur stations causing harmful interference in the amateur bands. To utilize the time and resources of AIRS member stations most effectively, the following AIRS priorities have been developed:

1) Those nonamateur stations causing harmful interference according to the definition that appears in the International Radio Regulations, who are intentionally operating out of band and against whom complaints have been lodged.

2) Unintentional harmful interference due to harmonics and other spurious emissions. These are often short-lived situations once the station is properly notified. The station is usually as eager as those reporting the interference to see it halted.

3) Nonamateur stations occupying the band in derogation of The Table of Frequency Allocations, but against which no interference complaints have heretofore been lodged.

Since the number of AIRS stations will be limited to 25 to 35, a natural question is, "How do I participate in the AIRS program if I'm not an AIRS member? In other words, how can I report harmful interference without joining AIRS?" It is not the intent of the AIRS program to exclude the bulk of U.S. amateurs from participating in protecting the amateur bands from nonamateur incursions. In fact, the opposite is true. Reports from *all* amateurs will be welcome, and will indeed be vital to the success of the program. If you experience an instance of harmful interference from a nonamateur station, you should report it to an AIRS member station (AIRS station lists will be published in *QST*) or to ARRL Hq. The latter may be the more practical approach.

It will then be the role of AIRS member stations to verify the harmful interference and to provide monitoring data to assist in judging the severity of the case. But AIRS stations can't be listening everywhere all the time! Your input will be crucial! Please notify us anytime your communications are disrupted by nonamateur stations causing harmful interference.

A Final Word

We extend our grateful thanks to the participants in the Intruder Watch program, many of whom we hope will apply for membership and take part in the ARRL Interference Reporting System. We could not possibly name all who have contributed to the program for the past 20 years, but we would like to specifically mention Art Ericson, W1NF, who has been a member of the IW since its inception and who is now 89 years of age; Bill Conklin, K6KA, who is a winner several times over in terms of number of reports submitted and a former IARU Region 2 Intruder Watch Coordinator; and M. L. Gibson, W7JIE, who took over the Region 2 Coordinator post from K6KA. They, and all IW participants, are a testament to the soundness and inherent strength of the League's volunteer field organization, which has brought success to many League programs — success that could not have been achieved otherwise. QST

Ham Radio on the Road

It's time to pack up our stations and hit the road — and pick up new hams along the way.

By Richard S. Moseson,* N2BFG

And finally in tonight's news, a report from Fresno, California, that the last Amateur Radio operator has died. John Smith, better known to his old-time radio friends as NGFB6R, was at his transmitter, trying desperately to find someone to talk with, when he died of exhaustion. He was 105."

Fiction? Of course — today. Sixty years from now, maybe not. Look at the graph (Fig. 1). A high percentage of hams today are between the ages of 30 and 40. Of the approximately 400,000 amateurs in the U.S., fewer than 16% are under age 30. Only 5% are in their teens. Fewer young people are becoming hams today, often because they simply never hear about our hobby.

It's time for us to take a lesson from Lee Iacocca, whose salesmanship helped take the Chrysler Corporation from the brink of bankruptcy back to financial health, from being behind the times to a position of industry leadership. Iacocca did this by coming out from behind his desk and taking his message straight to the public. Now it's time for us to come out from behind our rigs and go straight to the public — young people in particular — with our message: Being a ham is fun. To get things started, we are introducing Ham Radio On the Road (HROTR), a nationwide recruitment program that will reach out and *grab* those would-be hams.

Strategy for Success

Ham Radio on the Road has been developed to recruit new amateurs, primarily by going to places where young people already gather — Scout troops, 4-H Clubs, schools, even computer clubs — setting up an amateur station at their meeting place and showing them what the hobby is all about.

What sets HROTR apart from typical past recruitment programs? It's aggressive. It's going out and actively recruiting new hams, instead of waiting for them to come to us. In the age of the $100 computer, the old, passive approaches will no longer work. It's not enough anymore to simply post a licensing class notice and wait for prospective hams to knock down the door.

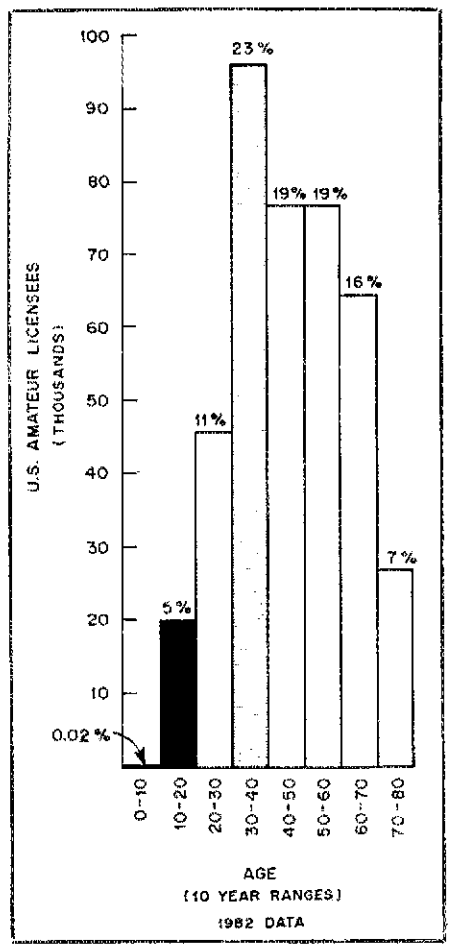


Fig. 1 — A breakdown of radio amateurs by age group. Notice the marked difference between the percentage of hams less than 20 years old and those in other age brackets, particularly the 30-40 age group. Data courtesy Jack Speer, N1BIC, Buckmaster Publishing Co.

Today, we need to be more aggressive. For example, a club that in the past might have mailed Novice class notices to Scout troops now has to do more to succeed. Call each Scoutmaster. Tell him, "Our club would like to show your Scouts what ham radio's all about. Can we set up a station and get on the air *at your meeting?* You're interested? Great. Let's set up a couple of possible dates. I'll put a team together and let you know who will be there and which date is best."

Salesmen are taught to close a sale by limiting the customer's opportunities to say no. We have to do the same. "What date is best?" is far more effective than, "Would you like us to come down sometime?" The first question makes it more difficult for the group leader to hedge, "Oh, yeah, good idea. I'll call you". . . and then forget to call. Make *sure* you get a firm commitment.

But before you start making phone calls, make sure your club is ready to "hit the road."After all, the youth leader might say, "How about next Monday?" You'd better be prepared.

Clubs are the key. Most, we hope, have a ready pool of members willing to take their equipment "on the road" to youth groups in their area. (While the emphasis of HROTR is on recruiting young people, there's no reason it can't also be used with adult groups.) League Hq. will help coordinate activity at the national level and provide program materials, but it's local clubs — yours and your neighbors' — that will make this program work.

Getting Our Act Together . . .

HROTR is intended to meet the nationwide need for an influx of bright young people into the Amateur Radio Service. On a local club level, bringing new young people into Amateur Radio will also give your club an infusion of energetic, excited people who will get things done and bring your club to life with renewed enthusiasm.

The program calls for the formation of

*H-1-17 Wyndover Woods, White Plains, NY 10603

Jim Jipping, W8MRR, of Holland, Michigan, gives a live ham demonstration to school kids. A self-contained rig and an antenna are all that's needed for an effective Ham Radio on the Road demonstration.

a new club officer — a *Club Recruitment Coordinator*. He or she should be an enthusiastic member of your club who is elected or appointed to be the contact person for the groups you want to reach, and for groups that want to reach you.

The Coordinator is the most important link in the nationwide chain we're building. He or she is the organization person — the person who will contact different youth groups in town, set up dates for demonstrations and match teams of club members to each demonstration. Another duty will be to coordinate HROTR activity with the club's instructors. Why get a young person interested if a Novice class isn't being held in the next six months? Organization and timing are critical. Have your instructors contact the ARRL Hq Training Branch for the latest information on the new Novice examination procedure and instructor aids.

So if all the work is done by local clubs, why and how is the ARRL involved? *You* are the ARRL. The League is no more and no less than its members and affiliated clubs. Coordinating this program nationally, League Hq. and the field organization will:

a) provide effective program materials (audiovisual aids and handouts)

b) help coordinate the work of different clubs in the same area, to prevent mix-ups and redundant efforts.

c) work with major youth groups at the national level to promote Amateur Radio as part of their programs.

The last point is possibly the most important. If we can get national groups to feature Ham Radio on the Road in their publications, the result can mean a lot less footwork for the Club Recruitment Coordinator.

"Why participate in this program?" you may ask. The survival of our hobby is at stake. It's that important. Unless we reverse the trend shown in Fig. 1, most U.S. hams will be 55 or older by the year 2000. Amateur Radio needs the influx of young people that HROTR will provide. Your participation will help ensure a healthy future for the Service. In addition, you will help those youngsters who become involved. The future is high tech, and Amateur Radio is one of the best paths to lead young people to it.

Since we all like to be recognized for helping out, any licensed ham who participates in a demonstration or in follow-up classes will receive an attractive certificate. Plus, endorsements will be awarded, depending on the cumulative number of people licensed as a result of your ongoing recruitment program. Top point earners in the U.S. and Canada each year will be awarded plaques and be featured in *QST*. In addition, an embroidered HROTR patch will be available for dyed-in-the-wool HROTR "roadies" who participate in at least five demonstrations or license classes.

Some Tips on Finding Your Target

Some of the major organizations that provide service to youth in the United States are

- Boy Scouts of America
- Girl Scouts of the USA
- Boys' Clubs/Girls' Clubs of America
- Campfire International
- 4-H Clubs
- YMCAs/YWCAs

You can help by adding your suggestions to the list. In addition, schools and religious organizations sponsor clubs and youth groups. Some towns and cities also provide youth programs. Look in your phone book. Larger organizations, such as the Boy Scouts and the Girl Scouts, are organized into local councils that coordinate individual units. One phone call might put you in touch with dozens of potential audiences.

Some sources may be able to put you in touch with several organizations. A call to a local government youth council, or to the local United Way, for example, could net you a complete list of youth organizations in your area. Your section Affiliated Club Coordinator may also be able to help.

If you are interested in participating in this program, contact Leo Kluger, WB2TRN, Recruitment Program Manager, at ARRL Hq.

. . . And Taking It on the Road

Each demonstration team should include two to four people. If possible, set up the station *before* the presentation begins. At the beginning of the demonstration, one person should assume the role of "talker" and explain in a few minutes what makes ham radio such an exciting hobby. When the introductory talk is over, the station should be put on the air by another member of the team while the talker provides a running commentary on terms such as CQ, QTH, rig.

What equipment should you bring? There's no hard-and-fast list, but the best arrangement should include an *hf* and a *vhf* station. That way, if one doesn't work, you have a backup. Plan to work phone. Cw will work only if you can translate the code as it's received. People love to hear the dits and dahs of cw — *if* they can understand what's being sent. Otherwise, it's a quick turn-off. Don't overwhelm the audience with fancy equipment. That might scare off some potential hams who decide it would be too expensive to get started. Further guidelines for giving effective demonstrations are included in your Ham Radio on the Road kit, available on request from ARRL Hq.

Getting Results

The most important part of your demonstration is effectively closing the sale. Take down the names and addresses of all who are interested in pursuing ham radio further. Then, be sure to let them know when the next Novice class will begin. It is *essential* to follow these demonstrations with a Novice class. If a youngster gets interested and then finds there's no help available to get him licensed, he or she will be frustrated and discouraged. It's up to you to capitalize on the interest you've generated.

And remember: Success builds on itself. If one group member gets interested and becomes licensed this year, his or her enthusiasm is bound to lead to more interest in that group later on. And you can snag 'em with another demonstration later.

A Proven Approach

A small-scale HROTR has been underway since early 1983 in Westchester County, New York. At each demonstration, the young people have been fascinated. It doesn't matter how many stations you contact or how far away they are. By taking Amateur Radio on the road, the youngsters *see* you on the air — and that's what makes an impression.

Rich Moseson, N2BFG, is Affiliated Club Coordinator for the ENY section and is the Hudson Division's representative to the League's Public Relations Advisory Committee. He is also active in Boy Scouting at the district and council levels. Professionally, he is associate producer of "In The News," the award-winning CBS News broadcasts for young people.

Happenings

Conducted By Carol L. Smith,* AJ2I

RM-4040 — ARRL Moves to Get Action

- *ARRL Asks for Action in Cable RM-4040*
- *No-Code Reply Comments Reflect Overwhelming Opposition*
- *Scholarship Info*

RM-4040, the ARRL's proposal to get cable television (CATV) operation off Amateur Radio frequencies, was initiated on January 12, 1982. (See March 1982 *QST*, p. 58, and March 1983 *QST*, pp. 57-58, for details.) Now, more than a year and a half later, the League has moved for expedited consideration of the matters raised in RM-4040. "...The problem is as acute as, or worse than, it was then," the League asserted. "It is time that the Commission took some action to eliminate this incompatibility by restricting use of amateur frequencies by those 'closed' system users who have demonstrated a marked inability to maintain system integrity."

The National Cable Television Association (NCTA) had previously indicated a willingness to work with the League to seek solutions *other* than keeping CATV operations off amateur frequencies. Several meetings and discussions between the League and NCTA provided no solution to the serious interference problems suffered by amateurs.

The magnitude of the CATVI problem was emphasized in the League's motion for expedited action. "...They [the problems] have not abated in the slightest...In several areas," the ARRL noted, "the vhf repeaters serving a community are rendered utterly useless by strong carriers from leaking CATV cable systems." The ARRL attached a list of CATVI cases, apparently still unresolved, representing interference problems in over 30 states.

The ARRL and the NCTA had been working on a joint policy statement, which (it was hoped) would have (1) made neighbors aware that an amateur station was not the "cause" of interference from signal ingress to cable TV and (2) persuaded cable companies of their obligation to resolve signal egress interference problems. However, the League now feels that "NCTA never intended to agree to any such statement, nor seriously intended to participate in resolving interference problems, but merely sought to achieve 'detente.' Amateurs are now no further along toward resolving these problems than when the League first filed its petition. The problem has, in that year and a half, increased considerably."

"It is time that the Commission took some action to eliminate this incompatibility by restricting use of amateur frequencies by those 'closed' system users who have demonstrated a marked inability to maintain system integrity."

The League's motion for expedited action brought a quick reply from American Video Corporation and Landmark Cablevision (both companies that were cited by the ARRL as examples of problems encountered by amateurs). They claim that, "An investigation of the complaints against respondents shows, at bottom, an obsessive desire on the part of a few individual amateur radio operators for a 'pristine' environment. For the most part, the 'signal leakages' complained of are at very low levels, often less than other ambient background emanations. The instances of actual harmful interference by CATV systems that 'seriously degrades, obstructs or repeatedly interrupts' (Rule §76.613) amateur radio communications are very few and far between."

American Video Corporation and Landmark Cablevision called the stance of the ARRL "absolutist — total nationwide prohibition of CATV use of Channel E — is a classic case of unjustified overkill." The cable companies went on to "not necessarily oppose expedited action on the ARRL's motion, but [to] maintain that that motion should be dismissed as an unreasonable response to an isolated and manageable problem."

Storer Communications, Inc., also opposed the ARRL's motion for expedited action. Its thrust was that "[the] ARRL destroys its own case with outdated information...Storer's cable specialist in such matters, who is also a ham operator and ARRL member of long standing, has supplied the attached affidavit showing that:

"(a) although ARRL refers to four supposedly unresolved complaints against Storer systems, one of them arose and was satisfied in 1981, before ARRL's original petition; and the other three arose and were satisfied in 1982, at least nine months before ARRL's instant motion; and

"(b) there are no pending complaints at any of the four Storer systems listed by ARRL."

The League will refute and respond further to these cable company comments. See League Lines or November Happenings for details.

NO-CODE REPLY COMMENTS, ARRL

The League's Reply Comments to PR Docket 83-28, the Commission-initiated no-code proposal, made clear that this Docket is not controversial. In fact, the ARRL declared, "it is absolutely clear that *no significant controversy exists.*" Most amateurs don't want a no-code license.

More than 1500 comments to the proceeding were filed, and the ratio of comments that were opposed to the proposal to those in favor of (or resigned to the perceived inevitability of) such a license class was at least 25 to 1. Thus, it is apparent that the public opinion of the Commission's proposal to establish a no-code amateur license is overwhelmingly negative.

Furthermore, the League said that "also readily apparent was that the extremely small minority of commenters in favor of the proposal, or who were resigned to a perceived inevitability, suggested that the restrictions to be placed on any no-code license class be greatly in excess of those suggested in the Notice." The ARRL went on to note that "not more than 10 individuals who are not presently licensed amateurs submitted supportive comments. Indeed, several non-amateurs specifically opposed the proposal, stating that the establishment of a no-code amateur license would diminish the value of an amateur license, once obtained."

The League's Reply Comments went over arguments for and against the no-code proposal in great detail (see September *QST*, page 61, for more information). Its conclusion was certain: There should not be a no-code license in the Amateur Radio Service. Indeed, the ARRL said, "Those to whom this matter was important have submitted their comments, which have been filed in almost unprecedented numbers and which indicate overwhelming opposition to the proposal." The League therefore again requested that the Commission terminate this proceeding without action, and not establish any form of Amateur Radio license that does not require a knowledge of the Morse code.

NOVICE EXAMS — ARRL ASKS FOR PARTIAL RE-THINK

The ARRL asked that the Commission recon-

*Membership Services Assistant

sider and delete from the Report and Order issued in PR Docket 82-727 (Novice exams) the prohibition of employee- employee relationships among those persons ineligible to act as Novice examiners. (See September *QST* for background information on the Report and Order.) The League also requested that the FCC clarify the "extent to which an in-law relationship acts as a bar to eligibility to act as a Novice examiner."

These Report and Order provisions, which were suggested by the Capitol Hill Amateur Radio Society in its comments to PR Docket 82-727, have the potential to cause further problems to amateurs, instead of facilitating the Novice program. The League stated that "[T]here are many corporations around the country, which have radio clubs and, in many communities around the country, the vast majority of the amateur population works for the same corporation. In Cedar Rapids, Iowa, for example, most amateurs work at Collins Radio. Should this new restriction be enacted, a potential amateur who works at Collins Radio would have an extremely difficult time obtaining an amateur examination. For no good reason at all, the clubs' members would be prohibited from administering a Novice examination to other employees of Collins Radio."

The ARRL pointed out that a certain amount of integrity must be presumed in the context of Novice examinations. "Try as one might," it said, "it is difficult to conceive of a routine conflict of interest in the case of an amateur employee of any firm or business. With all due respect to CHARS and the Commission, there is *not* normally an 'appearance of compromise' in any given employee-employee relationship which would necessitate a prohibition on *all* such relationships for Novice examination administration purposes."

Appendix B to the Report and Order and the present 610 form require that an applicant certify that he or she is unrelated to the applicant, and not, among other things, an in-law of the applicant. The ARRL said that "while it is unaware of any practical problems this prohibition may have caused, it would be useful to clarify that this would prohibit only immediate family in-law relationships, such as mother-, father-, son-, daughter-, brother- and sister-in-law. If the Commission intended for the in-law prohibition to be broader than that, the Commission should so specify. The matter is not one that, in every case, common sense would resolve."

TRANSMITTING POWER ERRATUM

In the Report and Order in PR Docket 82-624, issued July 22 and reported in September Happenings, page 64, the Commission inadvertently omitted rules changes for beacon operation. Accordingly, it amended Part 97 as follows:

§97.67
(e) Within the limitations of paragraphs (a) of this section, the peak envelope power output of an amateur radio station in beacon operation shall not exceed 100 watts.

FOUNDATION FOR AMATEUR RADIO — SCHOLARSHIP WINNERS

The Foundation for Amateur Radio is pleased to announce the 1983 winners of the 14 scholarships that it administers. They are: The John W. Gore Memorial Scholarship ($900): Richard E. Church, Jr., WA2YMS, Central Square, New York. The Richard G. Chichester Memorial Scholarship ($900): David J. Schmocker, KJ9I, Oconomwoc, Wisconsin. The Edwin S. Van Deusen Scholarship ($350): Jeffrey D. Girton, WB3GCH, Selinsgrove, Pennsylvania. QCWA Silent Key Memorial Scholarship ($500 each): Bruce A. Wade, N9UR, Milwaukee, Wisconsin; Marc Vernon, KI9V, Hinsdale, Illinois; Paul D. Sargis, KI6U, Modesto, California. Radio Club of America Scholarship ($500): Theodore S. Rappaport, N9NB, West Lafayette, Indiana. The Edmund Redington Memorial Scholarship ($500): Steven J. Gies, KA9EHI, Stevens Point, Wisconsin. Young Ladies Radio League Scholarhsip ($300): Pamela Sue Hayward, WBØMUS, Kansas City, Missouri. Amateur Radio News Service Scholarship ($500): William J. Bishop, NØEBA, Ottumwa, Iowa. Columbia (MD) Amateur Radio Association Scholarship ($500): Robert Peterson, KA3DJV, Potomac, Maryland. Baltimore (MD) Amateur Radio Club Scholarship ($500): Armen Caroglanian, AK3K, Silver Spring, Maryland. Dade Radio Club Tropical Hamboree Scholarships ($500 each): Wayne F. Poole, KC4XL, Surfside, Florida; Peter F. Sinkowski, KD4NM, Surfside, Florida.

These scholarships were open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. The Foundation is a nonprofit organization representing 50 clubs in Maryland, the District of Columbia and Northern Virginia. It is devoted exclusively to the scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service. Information regarding 1984 awards will appear in April or May *QST*.

MAX ARNOLD, W4WHN

Former League Vice President and Director Max Arnold, W4WHN, died July 31, 1983. Max was well known in ARRL and QCWA circles nationwide, and he was especially active in his home Delta Division. Though he had many interests, including flying, dogs and collecting guns, Max was most proud of his involvement with Amateur Radio and the League.

Nashville-area hams remember Max for his tireless work in conducting radio theory and Morse code classes. It has been estimated, in fact, that Max personally taught over 1500 prospective amateurs.

Max is survived by his wife, Rosemary, and two children. At their request, a scholarship fund, administered by the QCWA, has been established. Contributions should be sent to the Max Arnold Scholarship Fund, QCWA Headquarters, 1409 Cooper Dr., Irvine, TX 75061.

A "friend to all, and an enemy of none," Max Arnold was a devoted Amateur Radio enthusiast. He will be greatly missed. — *Leland Smith, W5KL, and John Sanders, WB4ANX*

ARRL ASKS FCC TO RECONSIDER 10-METER AMP BAN

The League, in its comments to General Docket 83-114 (a reexamination of technical regulations), asked the Commission to delete rules banning the commercial manufacture and sale of any external rf amplifier capable of operation between 24 and 35 MHz. Specifically, the League requested that Sections 97.77(c) and 2.815(b) of the Rules be eliminated.

League comments acknowledged the historical background of the 10-meter amplifier proscription. The ban came about because of the wildly expanded — and often illegal — use of CB radios in the '70s. Coincident with that growth was an equally precipitous increase in the number of TVI complaints, bringing initial efforts to curb the problem by prohibiting the marketing of any external power rf amplifier capable of use between 24 and 35 MHz *unless* the equipment could also be used on four other amateur bands: 7.0-7.3, 14.0-14.35, 21.0-21.45 and 28.0-29.7 MHz.

This action was ineffective, however. Manufacturers and suppliers got around the marketing rule by providing a "broad-band linear amplifier" capable of operating on the four amateur bands specified. Though marketed ostensibly for use in the Amateur Radio Service, the devices were devoted almost exclusively to the 27-MHz CB band. They were often poorly constructed, too.

The Commission closed the "loophole" in its regulations by adopting stricter rules. (1) Limited type acceptance of external radio frequency power amplifiers capable of operation below 144 MHz was required. (2) The marketing of any external amplifier that could be used between 24-35 MHz, regardless of whether it could also be used on other frequencies, was prohibited.

The League strongly opposed the effort to ban such amplifiers entirely since that would impose serious and detrimental effects on legitimate Amateur Radio equipment manufacturers and operators. The ARRL still remains "adamantly averse to such an unequivocal ban on external amplifiers and continues to request that, in the interest of eliminating unnecessarily burdensome and ineffectual regulations, the ban on such amplifiers, but not the type acceptance requirement, be deleted from the Commission's rules."

Now that the CB "boom" has waned, there should be no necessity in continuing to misdirectedly penalize the Amateur Service. Additionally, amateurs will shortly gain access to a new exclusive allocation at 24.89-24.99 MHz. Thus, the ban would have an additional adverse impact on amateurs and amateur manufacturers (mostly American) serving this market.

"It is long past time," the League said, "in which the Commission should have recognized that, while the courts cannot require (the FCC) to take the 'least restrictive alternative' course of action with respect to licensees, it nonetheless must impose such an obligation upon itself. Consistent with maintaining rule compliance and noninterference among stations, it should remove the excess layer of regulation where the underlying layer is sufficient to achieve the desired end. This is true especially where the excess layer of regulation directly impedes an admittedly rule-compliant, noncommercial radio service in the performance of its public service duties."

LEAGUE SUPPORTS ADDITIONAL RACES FREQUENCIES

More RACES frequencies, and the less restricted use of those frequencies during times of emergency — both these proposals of PR Docket 83-524 were heartily supported by the ARRL in its comments. (See August *QST*, p. 58, for details of this proposal.) The League favors "the additional frequencies available to RACES" because they "permit increased flexibility to radio amateurs to provide the highly organized, self-disciplined emergency communications that amateurs are uniquely capable of providing." Additionally, this proposal fulfills one of the primary bases and purposes for the existence of the Amateur Radio Service — the "...recogni-

tion and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications."

The ARRL suggested a change in the proposals of PR Docket 83-524 in order to accomplish one of the stated objectives of the proceeding: "...to be able to use existing amateur configurations without change when RACES is activated." The FCC proposed that 145.17-145.71 MHz and 146-148 MHz be made available for RACES. The League pointed out that "while this is a significant and desirable increase in repeater frequencies available for RACES, it omits most of the now-active repeater subband at 144.50-145.50 MHz. As there seems to be no reason why RACES should not be permitted on the full complement of repeater frequencies in the 144.50-145.50 MHz subband, it would be beneficial for the full lower repeater subband to be included, as well as all frequencies at 146-148 MHz. This would make it unnecessary for anyone to be required to alter existing equipment, especially repeaters, to operate on RACES frequencies during a declared emergency. ARES members could switch from ARES to RACES immediately without a shift in equipment."

The proposed deletion of the 30-day use limitation on certain frequency bands used by RACES during period of Civil Defense emergency imposed by present Section 97.185 (c)(2) received ARRL support. So did the proposed deletion of the geographic limitations on frequency use by RACES during national emergencies. On the whole, the League felt that PR Docket 83-524 will "...enhance and expand the potential for use of these services in the future." However, the ARRL also left the door open for improving other aspects of RACES rules at a future time — all with an eye toward improving further the ability of RACES to serve the public during emergencies.

MAXIM AWARD ENDOWMENT ESTABLISHED

Two additional contributions of $1000 have been received to close out the drive to establish an endowment for the Hiram Percy Maxim Memorial Award (see August 1983 *QST*, p. 54, for details). Stuart Meyer, W2GHK, and Edward E. Bissell, Jr., W3AU, joined the list of contributors in July.

Each year, the Maxim Memorial Award will recognize the radio amateur under the age of 21 whose accomplishments and contributions are of the most exemplary nature within the framework of Amateur Radio activities. The award will consist of a suitably engraved plaque or trophy, $1000 in cash, and travel and accommodations expenses to enable the winner to attend an ARRL convention for the presentation. Nominations based on 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.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, San Diego, South Dakota, Louisiana, North Carolina, Virginia and Pacific Sections: You are hereby solicited for nominating petitions persuant to an election for Section Manager. Incumbents are listed on page 8 of this issue. [Editor's Note: Solicitations for petitions in Canadian Sections henceforth will appear in Canadian NewsFronts.]

A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. 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 immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, December 9, 1983.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 2, 1984. Returns will be counted February 21, 1984. SMs elected as a result of the above procedure will take office April 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 April 1, 1984.

If no petitions are received for a section by the specified closing date such section will be resolicited in April *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

SECTION MANAGER ELECTION RESULTS

Balloting Results: In the Washington Section, Joseph N. Winter, Sr., WA7RWK, received 748 votes, and Gene E. Sprague, KD7G, received 649 votes. Mr. Winter is declared elected. His term begins October 1, 1983.

10-METER REPEATER FREQUENCIES — ARRL COMMENTS

The League called the proposals in PR Docket 83-485 (see July 1983 *QST*, p. 50) "premature." It also asked that the proceeding be dismissed, "perhaps to be revisited at a later time."

Justification for the request to dismiss this proposal rests on several important factors. First, the use of fm repeaters at 29.3-29.5 MHz will create instances of interference to the existing satellite downlink passband within those frequencies. Second, the possible pending telephony subband expansion of PR Docket 81-83 would change the requirements, and impact greatly on, this proposed 10-meter repeater subband expansion. Third, there would be an adverse impact on fm simplex activity in the 29.0-29.5 MHz segment by reducing available frequencies.

The League further noted that "there is no evidence presented in the Notice, nor is the League in possession of any evidence that illustrates any significant amount of overcrowding in the existing 10-meter repeater subband. [I]t may therefore be that greater need for repeater subband expansion may develop in the future. However, no present need for expansion is established, and it would appear prudent not to take such action at present."

MDS OPERATOR AGREES TO DROP LAWSUIT AGAINST HAMS

TVQ/Movie Systems, Inc., an MDS (multipoint distribution service) operator engaged in providing one-way television programming to subscribers, has agreed to drop lawsuits naming amateurs as defendants. TVQ subsidiaries in several cities have declared war against persons who view its transmissions without paying. TVQ's Indianapolis subsidiary alone claims it expects to file lawsuits against nearly 3000 homeowners suspected of unauthorized signal reception. At least 40 Amateur Radio operators have been sued because they possess antennas similar to those used for HBO signal reception.

ARRL Volunteer Counsel Jim O'Connell, W9WU, of Chicago, negotiated with TVQ-Milwaukee a way whereby Amateur Radio operators charged with unauthorized signal reception can be released from the lawsuit without having to appear in court. Several radio amateurs in the Milwaukee area have signed the affidavit that states: "I am an Amateur Radio Operator duly licensed by the FCC (attached is a copy of my current Amateur Radio license)...I do not now, nor have I ever, used the antenna in my possession for the interception, reception, use or viewing of Movie System, Inc.'s HBO programming." O'Connell, at press time, was negotiating a similar arrangement for radio amateurs being sued by TVQ in the Indianapolis, Indiana, area.

According to O'Connell, courts are not accepting the argument that anyone capable of intercepting an MDS signal has the right to receive that signal. On the contrary, courts are coming down on the side of the MDS operators. For example, the U.S. 8th Circuit Court of Appeals recently upheld a decision in which a man was found to have violated Section 605 of the Communications Act because he was watching a pay-TV service but was not a subscriber. (*Movie Systems, Inc. v. Edward P. Heller, III,* No. 82-2408, 8th Cir., 1983). The court in this case sided with the MDS operator even though the operator made no effort to scramble or in some other way protect its signals from interception. "Hams using antennas which look like MDS antennas should be aware of the fact that they could be sued by a suspicious MDS operator. Not only can Section 605 of the Communications Act be used as a basis to bring these lawsuits — several states have also enacted statutes which impose penalties for 'theft of services,'" O'Connell added.

MDS companies generally receive programming via satellite and then redistribute it to subscribers on the 2150-2160 MHz band. Amateur Radio operators have a frequency band at 2300-2450 MHz, so their antennas are similar in size and appearance to those used by persons receiving MDS signals. — *W. Dale Clift, WA3NLO*

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Ham Radio Power!

Think minimum, not maximum. If every ham were to "use the minimum amount of transmitter power necessary to carry out the desired communications," as mandated by the Rules, the bands would be a happier place for all (97.67[a]).

How many fellow amateurs do you know who violate this rule every day? Like the guy who checks into his local 75-meter traffic net running his new nuclear-powered amplifier to the meltdown point. Think before flipping on the Big Switch.

Think output, not input. In marginal communications conditions when more power is required to get information across to the other party, bear in mind the maximum power limits of the FCC Rules. Thanks to a recent Commission action, these limits are now expressed in terms of peak envelope power (PEP) *output*. The former terms were expressed as direct power input to the plate circuit of the transmitter final amplifier. The move brings the power terms into consonance with modern transmitter technology. For the modifications to Part 97, see Happenings, this issue.

General

In the general case, ham transmitters may never be operated with a peak envelope power (PEP) output of more than 1500 W (97.67[b]).

A-m double sideband (A3) users, however, may still use the old measure of 1000-W dc *input* to the transmitter's final amplifier until the year 1990. At that time, FCC may revisit the issue (97.67[f]). The reason for this "grandfathering" is that the new 1500-W PEP output limit would mean an approximate 3-dB reduction in maximum power permitted for A3 operations. FCC wanted to minimize the impact on these operations, but could not justify the additional expense of training personnel to measure power under the old system. Also, safety factors are involved with the old system of measurement. No longer will FCC inspectors have to stick their hands into a 5000-V power-supply cage for measurements!

Novice Bands

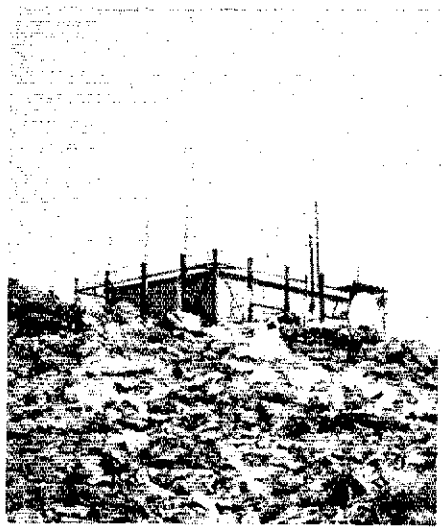
Novices and higher-class licensees inhabiting the Novice class subbands may never operate their transmitters with a peak envelope power (PEP) output in excess of 200W (97.67[d]).

Other

Repeaters, beacons, 160-meter stations and 450-MHz transmitters near certain military installations have special power limits that are now expressed in terms of PEP output.

Repeaters. Erp (effective radiated power) is the term used for defining the power limits for stations in repeater operation. Erp is defined as the product of the transmitter PEP output in watts, delivered to the antenna, and the gain of the antenna over that of a half-wave dipole antenna. See below for repeater erp limits and discussion.

*Deputy Manager, Membership Services, ARRL.



Repeaters combine power and height above average terrain to gain user coverage. This repeater site on Sugarloaf Mountain, home of the 146.97 machine, sits at the peak at 4000-plus feet, some 1500 feet above the average terrain in the mountainous region of northwestern Maine. *(K1CE photo)*

Authorized Effective Radiated Power for Repeater Stations

Antenna Height Above Average Terrain (HAAT)	*Maximum Effective Radiated Power for Frequency Bands Above:*		
	29.5 MHz	*420 MHz*	*1215 MHz*
Below 32 (105 ft)	800 W	Paragraphs (a) and (b)	Paragraphs (a) and (b)
32-160 (105-525 ft)	400 W	800 W	..do..
160-320 (525-1050 ft)	200 W	800 W	..do..
Above 320 (1050 ft)	100 W	400 W	..do..

Beacons. These special stations are limited to 100 W of peak envelope power output. See *The FCC Rule Book* for a discussion of stations in beacon operation.

160-meters. Stations operating in the segment 1900-2000 kHz must adhere to special power limits based on their geographic location. The purpose of these limits is to reduce the potential for amateur interference to the radio-location services (Loran) operating at this segment. See *The FCC Rule Book* (3rd printing) for maximum limits for 160-meter stations.

450 MHz. Special 50-W PEP output limits apply to stations operating at this region when they are located near certain military installations in the U.S. See *The FCC Rule Book* for discussion and a list of the applicable military bases, and areas of the limits. Telecommand and earth stations must also observe special power restrictions in these military areas: 611-W erp (1000-W equivalent isotropically radiated power) is the maximum. (97.421[c] & 97.422).

Q. What is peak envelope power?

A. Peak envelope power (PEP) is the average power during one radio frequency cycle at the crest of the modulation envelope, taken under normal operating conditions (97.3[t][1]).

Q. How do I measure PEP output to determine if my transmitter is operating within FCC rules?

A. The Commission has chosen and published the following standards of measurement: (1) Read a Thru-line peak-reading rf wattmeter that is properly matched (commercial units are available), and (2) calculate the power using the peak rf voltage as indicated by an oscilloscope or other peak-reading device. Multiply the peak rf voltage by 0.707, square the result and divide by the load resistance (SWR must be 1)

Q. Is it required that I have a means of measuring power output from my transmitter?

A. FCC does not require you to provide such measurement equipment and techniques. Hams are simply required to abide by the power limits, period. The standards listed in the answer above simply indicate how the Commission would measure your transmitter's output during a station inspection.

As a practical matter, most hams don't have to worry about special equipment to check their transmitter's output because they never approach the 1500-W PEP output limit. Many common amateur amplifiers aren't capable of generating this much power. However, if you *do* have a planet-destroyer amplifier and *do* operate close to the limit on those rare occasions when you need the extra power, then you'd better be prepared to measure your output along the lines of the standards reproduced above!

Q. What are the power limits for repeaters?

A. The repeater power limits are spelled out in the table. If your repeater operates at 420 MHz (with HAAT below 105 feet) or on the 1215-MHz band and above (with any HAAT), 1500-W PEP output may be used *except* that, in all cases, the minimum amount of power necessary to carry out the desired communications must be used.

An example: Your repeater is sitting atop a tall peak in the Berkshire Mountains. You've marked out the radials on your map and have determined that the height of average terrain is 1000 feet. From the contour lines, you've also determined that your antenna's height above mean sea level is 1600 feet. Thus, your antenna's height above average terrain (HAAT) is 600 feet.

Now, to erp: Your transmitter PEP output is 100 W, with losses in the feed line and duplexers totaling 3 dB. Antenna gain is 6 dB, giving an erp of 200 W (100 W at a net gain of 3 dB = 200 W). Your repeater operates at 220 MHz, and thus your transmitter operates at the maximum allowable erp of 200 W (refer to above table).

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL Hq., have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.]

Correspondence

Conducted By Peter R. O'Dell,* KB1N

WE BOMBED IN *QST?*

☐ Who will the two operators entombed in the shelter ("A-Bomb Proof Repeater," Aug. 1983 *QST*, p. 71) talk to after an atomic explosion? And after the two-week food supply runs out, what? The alternatives are frightening, and could be worse than being outside in the first place: starvation, cannibalism, radiation poisoning, insanity and/or suicide?

Seriously, by ignoring the fact that an atomic explosion leaves no capable survivors, editor and author — unwittingly, I'm afraid — propagate and promulgate the myth that atomic conflict is survivable. And as long as the world believes that, we'll continue on the road to self-destruction.

Without question, the Savannah shelter can serve well in a storm emergency. But to tout its A-proof virtues leads readers in the wrong direction. Rather, we all had better strive to make the world aware of the fearsome reality. — *Steve McCallum, K4URX, Key West, Florida*

RADIO JUNKIE?

☐ I thoroughly enjoyed Peter Costa's discussion of his malady, addiction to rf, in August 1983 *QST*. He pokes fun at a phenomenon of Amateur Radio that many of us hams know all too well.

We know the symptoms — lost sleep, negative bank balances and neglected families, among others — but to my knowledge no one has satisfactorily and scientifically explained why Amateur Radio really *is* addicting.

I believe that, in a sense, Amateur Radio can be likened to a cult. Many times along this road the would-be ham is faced with frustration, defeat and plain, old rejection, largely due to not meeting the standards for membership in the fraternity. Upon being inducted and making the first QSOs, acceptance is almost instantaneous, and all of a sudden the new ham is deluged with positive feedback. Everything — and I mean *everything* — in a stereotypical QSO has some positive aspect of it, and hams tend to emphasize that aspect. "Fine business," "great rig," "good signal," "nice fist" *ad infinitum*, are phrases which fill every ham-to-ham conversation, even those off the air.

Many will laugh at this thesis, but consider the type of intentional brainwashing tactics used by honest-to-goodness cults. Inductees are first torn down and softened up by psychological and/or physical abuse, and are then suddenly "smothered in love" to which they become addicted and are subsequently dependent on the cult to provide.

I would like to see a psychological study with results to support or to refute my thesis. — *Larry Ledlow, Jr., NA5E/3, Sykesville, Maryland.*

Q-WHAT?

☐ I would like to propose a new Q signal for contest use. It would save time if stations calling CQ also sent the new Q signal meaning "ignore this call. I'm not listening anyway." This pro-sign would be used by those contest operators who, after calling CQ, end their transmission and listen for less than a microsecond for a reply. Their age and antenna changeover system can't work that fast! Since no replying station can respond that fast, the calling station hears nothing and begins calling CQ again.

Please listen! Listen long enough for someone to transmit your call! You might find you are working people more and calling CQ less. — *Al Bates, W1XH, Chelmsford, Massachusetts*

QSLs — ANGER, GUILT, COURTESY?

☐ In response to KK9A ("He's Mad," Correspondence, Aug. 1983 *QST*), why do you insist on keeping score? If we had the courtesy to send you a QSL card in the first place, why can't you have the courtesy to spend the same amount we did to reply?

I first entered Amateur Radio because I felt it was a way to openly contact friendly, generous people. Why can't you be open and generous enough to "have the same courtesy" to return our QSL cards? — *Jim Seidman, KA6RNY, Los Altos, California*

☐ I cannot figure out why John Bayne, KK9A, is mad. He claims to get many stateside QSL requests, because of his rare prefix, without s.a.s.e.'s. Yet, he states they remain unanswered. So why the anger? I suggest John is suffering from a guilty conscience. I am an active radio operator with a so-called rare prefix who still enjoys receiving QSL cards. Because of this, I feel obligated to my fellow amateurs to answer all QSL requests. QSLing is part — a pleasant part — of Amateur Radio. — *Art Searle, KG2A, Smithtown, New York*

☐ Since when is a "9" in Illinois "rare"? If Mr. Bayne doesn't like the toll, perhaps he should stay off the bridge. — *Vern A. Weiss, WA9VLK, Kankakee, Illinois*

☐ Lest a letter like that of KK9A frighten newcomers away, I'd like them to know that many of us have a different attitude.

What I have to say reminds me of the early days when "No Hunting" signs first appeared in this area. One local farmer posted a huge sign saying "Hunt all you want, then come in for dinner."

My call is not too rare, but my cards are especially nice and I use a lot of them. However, your card is as valuable to me even if it is a card from the post office. After a QSO, send me a QSL and I will return the courtesy. If you send me a stamp or s.a.s.e., I'll return it unused. — *Charles J. Schwabauer, WB7OEM, Grandview, Washington*

☐ I *really* had to sympathize with John, KK9A. I have had my "rare" prefix call since 1978. It is a problem answering all QSLs, and *is* expensive! I figure I could have purchased a new rig with what I've spent on QSLs. I sent out about 5000 in 1979 and 4000 in 1980, and I've given up counting. Now I send them out by the pound! Just sent three more pounds to the ARRL QSL bureau (hi). My cards are expensive, and I am currently designing one which will have the Space Shuttle on it, as I work at the Kennedy Space Center. Guess I'll have to sell the car to pay for the next batch! This station QSLs 100 percent, and I know how John feels. I enjoy receiving QSLs as well as sending them. — *Carl S. Zelich, AA4MI, Merritt Island, Florida*

☐ I had to laugh at KK9A's lament in the August issue. Here we have the classic problem of wanting something and then complaining about it. I am not a prefix collector, nor do I intend to be in the immediate future. To me, a QSL card is a courtesy extended to someone because I enjoyed the QSO. Maybe if I was a rare country I might have a different frame of mind, but certainly not a "rare" prefix. Hey, KK9A, get off your pedestal. To me and thousands of other hams, your call is just another ham call. — *Dan Cron, W6SBE, Modesto, California*

HAMS ACROSS THE POND

☐ I'm writing this letter out of some frustration I have experienced while trying to QSO with some of my own countrymen. I moved here to England around the first of the year, just when the new reciprocal licenses were issued. As I understand it, they formerly issued a G5 call, but as of the first of this year they have changed it by simply placing a G4 prefix on the foreign call, so that now we should identify as "G4 stroke KAØNGP." On the air, I have had comments to the idea that I didn't know what I was doing: Some have told me that I should be identifying as "KAØNGP portable G4," and some have even implied that I just might be a pirate station operating illegally. It has gotten so bad that I wrote to the RSGB and had them confirm that I was in fact identifying correctly, which they have done. Since we Americans pride ourselves in being up to date on new developments, it seems that some need to be brought up to date on the reciprocal arrangements here in the UK — *David W. Restrick, G4/KAØNGP, Avon, England*

CODE BUTCHER

☐ I have just finished a QSO (if you could call it that) with a WA3 in Pennsylvania. He is the worst cw operator I have ever heard. He apparently was using a bug, and did not know how to use it. I have never been so frustrated as trying to copy this cw butcher. Upon answering my CQ, he sent three different calls, and chopped up his name, signal report and QTH (I think that's what he was sending). I then lost my patience, and my pencil broke in half.

Let's get it together; we should be setting an example for new operators. The FCC blew it when they threw out the cw sending test, and the bands are reflecting it now. If you can't operate a bug or keyer, don't. Practice off the air till you get the hang of it. Think about the operator on the other end, and send to him as you would like to be sent to. If we want to keep the code license, we should at least have enough esteem to operate like we have one. — *Tim Tomljanovich, K9SB, Uncasville, Connecticut*

*Public Information Coordinator, ARRL

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

World Scout Jamboree

What do you do when you get 14,000 young people in one place at a World Scout Jamboree? Tell them about the world of electronic communications — and Amateur Radio — of course!

The 15th World Scout Jamboree was held July 4-14 in Kananskis County, Alberta. Members of the Calgary Amateur Radio Association provided the electronic communications — an Amateur Radio program called Elektron — in an area of the Jamboree called Gateway to the World. Elektron had three parts: Amateur Radio station VE6WSJ, tours with a heavy emphasis on Amateur Radio and kit-building sessions.

VE6WSJ was located in a 16-metre trailer. There were three complete stations. One operated 24 hours a day throughout the Jamboree. The second was used by licensed Scouts and Scout leaders. The third was for demonstration of specialized modes RTTY and amateur television.

Typically, two stations operated at once — one on 40 metres, the other on 20 or 15 metres. Antennas included a 40-metre beam mounted on a 30-metre tower built from scaffolding borrowed from Calgary construction sites.

The one-hour tours were much more than a simple visit to VE6WSJ. Young people, 32 at a time, were taken into trailers and set down at tables. They were given microphones and headsets connected to a common amplifier and told to communicate. As individuals tried to contact each other, confusion reigned. A need for call signs and set operating procedures was soon discovered. These were taught, and when the young people moved on to the trailer where VE6WSJ was operating, they had a fairly complete idea of what was going on, and why.

The young people viewed VE6WSJ from behind a 6-metre glass partition. A public-address system allowed them to follow the action.

Each tour ended in a trailer that featured displays of Telidon, satellite television and video games. Video games are common in North America, but are still new to many from other parts of the world. This would include about half of those who attended the Jamboree.

The kit-building project was pure fun: a face with blinking LEDs for eyes and a pushbutton for a nose. The button operated a beeper that could be used to practice Morse code. For many young people, it was a first opportunity to wield a soldering gun and make something from electronic parts that actually worked; about 1500 took part in this activity.

Another 4000 took part in the tours. During 11 days of operation, VE6WSJ chalked up an impressive record: 1500 contacts with amateurs in every Canadian province and territory, every U.S. state and over 100 DXCC countries.

Was the Elektron program a success? You bet it was! Many amateurs contributed to that success, but none more than Elektron Chairman Earl Morris, VE6NE, and Co-chairman Al Davidson, VE6DE. They and the members of Calgary Amateur Radio Association did Amateur Radio proud.

SECTION MANAGER ELECTION NOTICE

(Note: In the future, all elections for Canadian Section Managers will be announced in this column and will be conducted wholly in Canada. This is part of a continuing program of having Canadian League members take responsibility for the management of their own affairs.)

To all CRRL members in the Maritime-Newfoundland Section: You are hereby solicited for nominating petitions persuant to an election for Section Manager. The name of the incumbent is listed on page 8 of this *QST*. A petition, to be valid, must contain the signatures of five or more full League members residing in the Maritime-Newfoundland Section. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on the petition*. It is advisable to have more than five signatures.

Petition forms (CD-129-C) are available from the CRRL Headquarters office, but are not required. The following form is suggested:

(place and date)

The Secretary, CRRL
Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned full members of the League residing in the Maritime-Newfoundland Section hereby nominate . . . as Section Manager for this section for the next two-year term of office. (Signatures . . . Calls . . . Addresses, including postal codes.)

The Section Manager candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur holding a Canadian Advanced Amateur certificate immediately prior to the receipt of petition at the CRRL Headquarters office.

Petitions must be received at the CRRL Headquarters office on or before 5:30 P.M., Eastern Local Time, December 9, 1983. If more than one valid petition is received, a balloted election will take place. Ballots will be mailed from the CRRL Headquarters office on or before January 2, 1984. Returns will be counted on February 21, 1984. A Section Manager elected as a result of this procedure will take office on April 1, 1984, and serve for two years.

If only one valid petition is received, the person nominated will be declared elected without opposition.

If no petitions are received by the specified closing date, the Maritime-Newfoundland Section will be resolicited in April 1984 *QST*. A Section Manager elected after resolicitation will serve for 18 months.

Vacancies in any Section Manager office between elections will be filled by the CRRL Secretary acting on the advice of the CRRL Board.

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

Harry MacLean, VE3GRO
CRRL Secretary

VE3CDM: NEW IARU REGION 2 TREASURER

CRRL President Tom Atkins, VE3CDM, represented Canadian amateurs at the Eighth Triennial Conference of IARU Region 2, held in Cali, Colombia, on June 6-11. There was an extremely full agenda: Over 80 documents having to do with band plans, radiolocator systems, reciprocal licensing and more vied for attention. CRRL President Atkins (who has been secretly slipping off to night school and studying Spanish) was elected to the IARU Region 2 Executive Committee, and will be IARU Region 2 Treasurer for the next three years. See elsewhere in this issue for a full report on the Cali Conference.

IARU is the organization that brought you the new bands at 10, 18 and 24.5 MHz. It's the only organization that keeps Amateur Radio strong at the international level. Many amateurs wonder who pays for this kind of work. CRRL is the Canadian member-society of IARU. In Canada, this work is funded by CRRL members — and only CRRL members — for the benefit of all Canadian amateurs.

CRRL NEWS

☐ At press time, DOC was revising its new TRC-24 based on joint proposals submitted by CRRL and CARF. TRC-24, in its final form, should be available later this month. It will take effect on February 1, 1984.

☐ That meeting with DOC to review examination questions in DOC's question bank has been postponed to October 29. DOC did release copies of all 400 questions to representatives of CRRL and CARF so those representatives might study the questions beforehand and speed up the process whereby questions will be approved, modified or even thrown out!

CRRL President Tom Atkins, VE3CDM (centre), represented Canadian amateurs at the IARU Region 2 Conference held in Cali, Colombia, June 6-11. Tom is the new treasurer for IARU Region 2. *(Liga Colombiana de Radioaficionados photo)*

*163 Meridene Cresent West, London, ON N5X 1G3, tel. 519-433-1198.

On Line

Conducted By Stan Horzepa,* WA1LOU

Special-Interest Publications

A list of ham publications that cater to computer-related interests follows. These are publications I receive through the mail or had picked up at Dayton. If you don't see yours here, send me a copy and I'll write it up.

Ad Astra — a bimonthly dedicated to ham applications for Atari computers. The last issue contains 50 pages full of tips and programs (write to Jack McKirgan, II, WD8BNG, 4749 S.R. 207 N.E., Washington C.H., OH 43160).

AMRAD Newsletter — a monthly from one of the most technically oriented ham clubs in the U.S. You can be assured that it contains state-of-the-art techniques, including packet radio and computers (write to Amateur Radio Research Development Corp., P.O. Drawer 6148, McLean, VA 22106).

Computers and Amateur Radio — a bimonthly newspaper published by Kantronics, the maker of ham/computer interfaces. Its scope goes beyond its publisher's product and contains information of general interest to the ham-computer hobbyist (write to Computers and Amateur Radio, 1202 East 23rd St., Lawrence, KS 66044).

QEX: The ARRL Experimenters' Exchange — a monthly edited by *QST* Senior Technical Editor Paul Rinaldo, W4RI. Each issue contains information on the state of the art in our hobby, much of it computer-related (write to QEX, ARRL, 225 Main St., Newington, CT 06111).

QZX — a monthly devoted to ham applications for the Sinclair/Timex computers. Each issue contains a lot of programs and tips for that mini-minicomputer (write to QZX, 2025 O'Donnell Dr., Las Cruces, NM 88001).

SLAPR Protocol — a bimonthly from the St. Louis Area Packet Radio Club that provides interesting reading about goings-on in packet radio. The most-recent issue contains 24 pages (write to SLAPR, 1309 Gloucester Dr., Edwardsville, IL 62025).

HAM RADIO SOFTWARE FOR IBM PC

PC RTTY

Bob Johnson, AA4L, has written a program for the IBM PC that provides Baudot RTTY at 60, 75 and 100 wpm and ASCII at 110 bauds. Received text is displayed on a CRT or printer, and transmit text is sent from a disk file or keyboard (with buffer). Keyboard control of transceiver send/receive is provided. Bob will send the program to anyone who sends him a blank diskette and a self-addressed, postage-paid diskette mailer. (Bob's address is 11305 Rums Hill, Raleigh, NC 27614.)

To use the program with your PC, you need an asynch communications adapter, an external terminal unit (for example, HAL ST-5000), one disk drive, DOS and BASICA 1.1. Full documentation is on the diskette.

SS Contester

Sweepstakes Log Processor is an IBM PC program intended to reduce the paperwork associated with preparing an entry for the ARRL November Sweepstakes. It processes contest log data entered into a disk file to produce an entry-ready summary sheet (including band-by-band statistics), a log and a dupe sheet.

The program, written by Jeff Maass, K8ND, is distributed under the user-supported software concept, popularized by Andrew Fluegelman and The Headlands Press, Inc., under the Freeware trademark. Anyone may request a copy of the SS Processor by sending two blank, formatted, single-sided, double-density diskettes or one double-sided, double-density diskette to K8ND (c/o Anguilla Contest Utilities, 4410 Norwell Dr., Columbus, OH 43220). A self-addressed, postage-paid diskette mailer must accompany the diskette. A copy of the program with documentation will be sent by return mail.

The program has a notice suggesting a contribution to the program's author. Contributions are entirely voluntary and, whether a contribution is made or not, the user is encouraged to copy and share the program.

The concept of user-supported software is an experiment in distributing computer programs, based on three principles:

First, the value of a utility is best assumed by the user. Only after using the program can one determine whether it is of adequate quality and serves personal applications, needs and tastes.

Second, creation of independent personal software can and should be supported by the computing community. It is in everyone's interest that individual programmers of varied backgrounds and interests be encouraged to write useful software and make it generally available. Rewarding a program's author (if the end result justifies) is the best way to encourage more effort.

Finally, copying and networking of programs should be encouraged. The ease with which software can be distributed outside of traditional commercial channels reflects the strength, rather than the weakness, of electronic information exchange.

*72 Stiles St., Waterbury, CT 06706

PX

Each month, I receive five to 10 new programs for distribution via PX. (I wish to thank all of you for your interest and desire to share your programming efforts with others.) In each bimonthly installment of PX, I offer three or four new programs for distribution. The problem is that, bimonthly, there may be as many as 20 new programs incoming, while only three or four are outgoing, which leaves me with a surplus. So, please be patient if the program you submitted does not appear in the next (or next) installment of PX. There is lots of catching-up to do!

Collecting grid squares is all the rage in vhf/uhf hamdom these days; the following programs may help you achieve the VUCC award (as described in January 1983 *QST*). Each program locates VUCC grids by inputting longitude and latitude.

- Program no. 23, a Fortran grid locator, was written by Ronald C. McConnell, W2IOL.
- A BASIC version, program no. 24, was submitted by Mark Whatley, WA5IED.
- Program no. 25, an Apple II version, was written by Jerry Jenkins, W4CAH.
- Sinclair and Timex are represented by program no. 26, submitted by Stephen T. Lund, WA8LLY.
- Program no. 27, an SWTPC disk BASIC adaptation, was written by Steve Stanley, W2FQG.
- Program no. 28 is a BASIC program that outputs a map of all U.S. VUCC grids (with corresponding latitudes and longitudes). Its author is Dave Meier, N4MW.

To obtain a listing of any program, 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. [Editor's Note: PX programs are also available via HamNet. See "PX Goes on Line," this page, for more information.]

PX GOES ON LINE

Members of HamNet, the Amateur Radio Special Interest Group on the CompuServe Information Service, now may download PX programs from the net's database. Courtesy of Scott Loftesness, W3VS, the HamNet system operator, programs distributed via On Line's PX are also available via HamNet. Instead of sending an s.a.s.e. to Dept. PX in Newington, all you need do is turn on your computer, dial-up CompuServe and check into HamNet.

HamNet, one of the original special-interest groups on CompuServe, has over 1000 members. Several hundred are regularly active, including many innovators in the areas of packet radio and other computer applications.

HamNet provides a nationwide bulletin board where members share information about current developments. In addition, there are monthly guest conferences that provide amateurs with the opportunity to pariticipate in on-line question-and-answer sessions. Also, there is a library of user-contributed ham-related programs.

Check into HamNet; it offers a lot, and newcomers are welcomed!

BITS

☐ New England Packet Radio Association (NEPRA) is the focal point of packet-radio activity in Red Sox Country, with 145.01 MHz as the primary packet frequency for Eastern Massachusetts and New Hampshire. NEPRA meets Thursday nights at 8 P.M. (EST/EDST) on the Billerica (MA) repeater (147.72/12). For more information, contact Dick Eastman, K1OJH, 45 Chelmsford Rd., North Billerica, MA 01862.

☐ Ted Cohen's "Report on Personal Computers" has expanded to the CBS Radio Stations News Service. CBS provides the feature to eight major markets: KCBS (San Francisco), WCBS (New York), KNX (Los Angeles), KMOX (St. Louis), WBBM (Chicago), WEEI (Boston), WCAU (Philadelphia) and WWJ (Detroit). In addition, the feature will be offered for syndication to stations across the country. Check local stations for the time.

☐ George Snow, VE1CAW, is looking for ham applications for a Xerox 820 computer. If you can help, write to George at RR 2, Site 12, Box 74, Windsor Junction, NS B0N 2V0.

☐ Jim Miller, N4BE, has a cw transceive program for the Interact Home Computer, and is working on an RTTY program. For more information, send Jim an s.a.s.e. at P.O. Box 455, Melbourne, FL 32901.

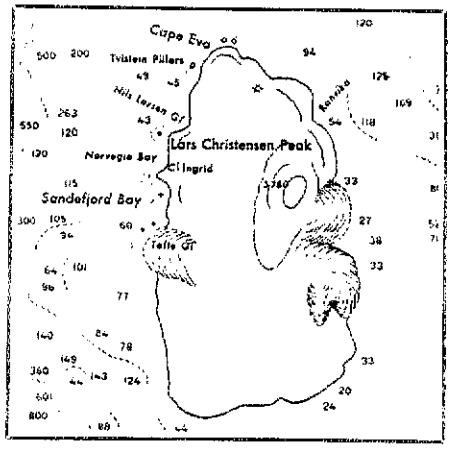
How's DX?

Conducted By Ellen White,* W1YL/4

Peter I Island

68° 50' South, 90° 35' West, in the Bellingshausen Sea, some 2200 km (about 1400 miles) from the Norwegian Sector of Antarctica, nearly rectangular, approximately 25 km long and 10 km wide (about 11½ × 5½ miles). . . volcanic, mostly covered with ice.

This summer, ARRL announced that Peter I Island in the Antarctic will be added to the DXCC List *when* an Amateur Radio operation authorized by the Norwegian government takes place from there. The ARRL DX Advisory Committee has studied the question of Peter I for about 5 years, and the entire subject is nothing short of fascinating. Peter I has been Norwegian Territory since 1931, and a Norwegian Dependency since 1933. Although Norway signed the Antarctic Treaty, it did not renounce its sovereignty over the island (claimed, it seems, to safeguard whaling rights in the surrounding waters). In a subtle fashion, Norway reaffirmed its sovereignty and demonstrated administrative jurisdiction over Peter I by issuing a license for such an operation in 1978 to Willy de Roos, VK9XR (but that's another story!).



Peter I Island, from U.S. Navy surveys, with additions from Norway.

Peter I Island was discovered by Bellingshausen in January of 1821, when it was viewed from a distance of about 15 miles. Captain Anderssen, in the Norwegian whaler *Odd I*, reached the island in January of 1927, having sailed direct from Deception Island (South Shetlands). This vessel was unable to land because of rough seas, but it did circumnavigate the island, taking soundings near the shores. In 1929, the vessel *Norvegia* reached the island, remaining a week for soundings, dredging, charting the island and establishing a depot for provisions. This same ship attempted to reach the island two years later, but could not approach closer than 36 miles because of the heavy-pack ice.

The hostile Antarctic environment is very evident on this bleak, dangerous and uninviting island covered mostly by ice. It is pretty safe to assume that conditions are so poor that landings may be possible for only a few days during a given year. The official 1984/85 Norwegian Antarctic Expedition (which has not yet announced its plans) may visit the island. The status of on-board hams is not as yet known. Should permission be obtained and valid operation take place, the likelihood is great that the prefix 3Y will be used.

KERMADEC/JIM SMITH

The ubiquitous Jim Smith, VK9NS, of recent Heard Island fame, is looking into the possibilities of a Kermadec operation and has received favorable governmental responses. Jim hopes to make the try in February. This will add one more exotic to a long string of enticing calls he has operated from these past years: VS1BQ, HZ1AB, MP4BER, 9V1PR, VR4BJ, C21AA, T3KJ, VK9YS, VK9XS, T30AJ, P29JS, ZM7JS, ZLØAAB, 5W1DG, VKØJS, etc.

Jim reminds the readership of the continuing availability of the $5 philatelic Heard Island "cover." It was designed by a direct descendant of the Bounty Mutineers, and depicts the Amateur Radio and scientific themes of the VKØJS expedition. The cover will be airmailed within a separate envelope to assure that it arrives in clean and unmarked condition. Requests via HIDXA, Box 90, Norfolk Island, South Pacific 2899.

After recently reviewing one of the Norfolk Island travel brochures Jim kindly forwarded, I'm not sure why anybody would want to leave there for *anyplace* else!

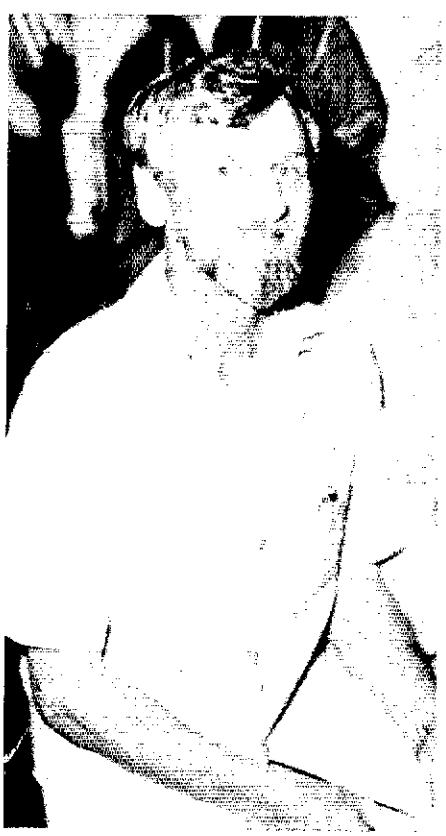
CLIPPERTON

The recent "How's" note of a pirate FOØX operation from Clipperton brought forth some very interesting background from WA4WME. Hugh notes: "Because of my current movie and slide show of the three Clipperton DXpeditions, I guess I am somewhat of the 'expert' on the subject. The first successful DXpedition to Clipperton was FO8AJ, by the famous Bob Denniston team in 1954. This was probably the most famous and difficult one of all time, as it had all the ingredients that constitute a 'true' DXpedition: first operation as a country, adventure, logistical achievement, danger, frequent setbacks, etc. The next successful one was in 1958 when Doug Magill, W9NAX, operated as FO8AT as part of the IGY scientific expedition by a French group.

"Twenty years then elapsed before the Radio Club 'd Normandie and the newly formed Clipperton DX Club were able to put together a 17-man team to accomplish a near-30,000-QSO assault using the calls FOØXA through FOØXH. The year was 1978, and the team consisted of eight Frenchmen, three Swiss and six Americans. The team leader was F9JS. No mention of Clipperton can be complete without mentioning that the famous *Yasme* pioneer, Danny Weil, visited Clipperton under the call FO8AN, circa 1957. However, a bout between the *Yasme* and a coral reef created havoc that resulted in a smashed bow and his subsequent return to Acapulco for repairs.

"One of the most-asked questions when I appear at conventions with the movie/slides is, 'Why are some of the Clipperton operations FO8 and then FOØ?' If the license was obtained by a non-Frenchman, the call was FO8; if obtained by a countryman, the call is FOØJS."

Hugh has researched Clipperton probably more than anyone else in the world and currently has all the slides of past Clipperton trips, including Danny Weil's collection. The six Americans that made the 1978 trip are members of the Clipperton DX Club, and should Clipperton reach the top five on the most-wanted list (probably 1988 or so), the five of them plan to repeat their *tour de force!*



The real Jim Smith, VK9NS/VKØJS, waiting to tell his Heard Island story at Dayton 1983. *(tnx DXers Magazine).*

KERGUELEN

This was the month for all kinds of "exotic" tidbits passing over the DX editor's desk — true DX in every sense of the word. AF2Y spotted an interesting article in Colombia's *Cromos* magazine. Some tidbits derived from the article, after a few facts gleaned from the trusty Webster's *New Geographical Dictionary:* Kerguelen, also called Desolation Islands, represents a French island group in the South Indian Ocean, with one major island, Kerguelen (2239 sq. miles), and about 300 other islets. The main island is mountainous, with the highest point being Mt. Ross, at 6430 feet. It has an irregular coastline and deep fjords, with snow fields in the central area. The area was discovered by the French navigator Kerguelen-Tremarec in February of 1772, and annexed by France in January 1893. In 1955, Kerguelen became part of the French Southern and Atlantic Lands. The magazine article breathes life into FB8X with the following information.

The Kerguelens lie in the Indian Ocean between Australia and South Africa, between Reunion and the South Pole. It forms part of French Antarctica, along

*19620 SW 234 St., Homestead, FL 33031

with the islands of St. Paul, Amsterdam (FB8Z), Crozet (FB8W) and the land of Adelie (FB8Y). Kerguelen discovered the islands in the search for the then-unknown land of Australia. The first French government mission was headed by P. Sicaud, who chose the site and named the base the Port of France, where there now stands a laboratory for meteorological studies. The actual mission is composed of a volunteer force of about 80 men. They work under 12-16 month contracts, and are well supplied with modern comforts: movies, a club, a library. The Antarctic flavor is well represented by the numerous seals and penguins.

The article's focus was far from ham radio, however. A group of inventors were looking for an ideal place to try out their wind-driven tri-wheeled "go carts" with sails!

THE CIRCUIT

☐ *Long Skip*, the Canadian DX Association's publication, has changed editors. A special thanks and 73 to Garth Hamilton, VE3EUP, and a big welcome to Garry Hammond, VE3GCO. Contributions go to Box 333, Listowel, Ontario N4W 3H4, Canada.

☐ YV Contest/Award: The Venezuela Radio Club will issue diplomas commemorating the 50th anniversary of its foundation as follows. The Gold Mention Diploma may be earned by foreign stations working 20 different YV contacts. A maximum of three YV stations per circuit will be accepted. One contact must be with the official station YV5AJ. Total contacts, 21. For the Silver Mention Diploma: Foreign stations work 10 different YVs, one with the official station YV5AJ; total contacts equal 11.

The contest began last May 1 and ends January 30, 1984, the anniversary of the Venezuelan Radio Club. Any band/mode. Logs go to the RCV, Box 2285, Caracas 1010-A, Venezuela, S.A., before and not later than March 1. Include usual sworn declaration and four IRCs for postage handling.

☐ Anguilla: K8CV will again be operating VP2ES from Nov. 21 through Dec. 14 with the VP2E contest group, organized by K8ND. Contests will be by individual operators on their own bands. Walt will go full-bore on 80 cw and will try to be on RTTY as much as possible in non-contest times. (He plans to try 110-baud ASCII, but will revert to 45 Baudot to make contacts.)

☐ Clipperton: The hint of things to come from FO8IW on a swing through ARRL Hq. is that they are planning a March 1984 expedition and have both landing permission and license authorization. Operators will be FO8s BI DO EM IW JD and a few Americans. Look for FOØXX.

☐ Bolivia: KAØMIW will be living at the home of CP6ES/CP6EG for a year as a foreign exchange student with the Rotary Program. He expects to have his reciprocal shortly and will probably QSL via CP6ES.

☐ Kure: KH6JEB notes that they have a new ham on Kure — N2EDQ/KH7. Rick notes that he will be the manager for this cw-oriented operator.

☐ 4NØATC: The 22nd annual conference of the International Federation of Air Traffic Controllers' Association took place in March 1983 at the Hotel Lav, Split, Yugoslavia. W1BFA notes that Amateur Radio and ATC have become closely associated in the last few years as a result of the International Air Traffic Control Net (14,277 kHz daily between 1000-1200Z). W1BFA and PAØGJA originated the net more than five years ago. Another international operation is planned for next year in Portugal, and another domestic operation is planned for the ATCA conference this month.

☐ Liechtenstein: HB9NL will be QRV through October 16, all bands/modes. Cards via Frank Acklin, HB9NL, CH 6233 Bueron, LU Switzerland.

☐ IARU: Receipt of a list of founding dates of IARU member-societies proves intriguing. The oldest society is the Australian WIA, founded in 1910. Three years later, the United Kingdom's RSGB was started, followed by ARRL on May 18, 1914. Rounding out the "top ten", in terms of longevity, are Canada, Finland, Argentina, Chile, Ecuador, Belgium and France. The recent *Calendar* of the International Amateur Radio Union notes that our statesman-like VE3CJ has been elected as IARU President Emeritus. Well earned, Noel.

☐ FPØHZC: Lee, W6OKX (ex-W6OBD), recently put in a delightful stint at FPØHZC for a few days (cards via Lee Sheridan, 3955 Winters Hill Dr., Atlanta, GA 30360. Enroute, Lee notes the outstanding hospitality of Newfoundland's VO1CA.

☐ Saudi Arabia: WA8WNK urges caution in operation. The subject is a sensitive one, and he asks visitors to contact him to keep Amateur Radio viable in HZ: Lee Cook, Major, USAF, Communications Liaison, AFLC/LSG-LCE, APO, New York 09038.

☐ Help! ZD8AD, November 1979, whereabouts are needed by Bruce Goff, 2413 NW 113th St., Oklahoma City, OK 73120. A December 1981 TZØPP confirmation is sought by Bob Brewer Jr., N4CRI, Rte. 3, Box 99A, Hamptonville, NC 27020.

☐ W1BWS/CS2 recently completed a two-week visit to Terceira Island in the Azores. In between teaching a graduate course in finance to the U.S. military and touring the islands, he managed to contact more than 3000 stations in all 50 states and 113 countries. QSL via WA3HUP. (That special prefix CS2 was authorized for all Azores amateurs for the period July 1-September 30, 1983.

☐ NJDXA Silver Jubilee Award winner announcement took note of scribe W6GO/FOØJO nailing down the award while on his French Polynesian DXpedition.

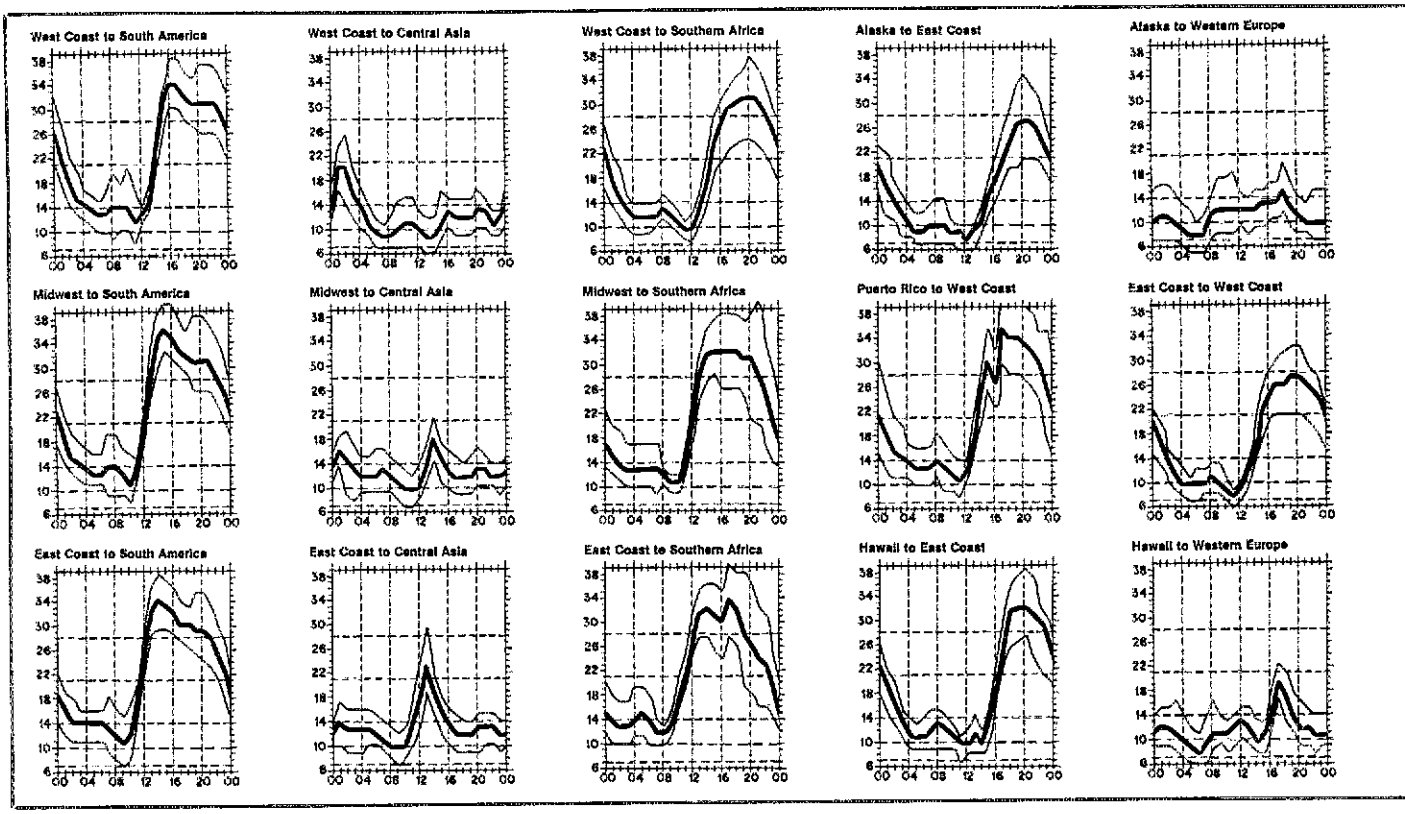
☐ Andorra: Last September C3ØOH made over 5000 contacts. DL8OH and company went back for a repeat performance — with more stations, more operators and more antennas — with stress on the low bands. The group participated in the popular WAE affair on September 10-11. Pasteboards via DL8OH, or direct to D. Schuster, Uhlandstr. 28, D-4902 Bad Salzuflen 1, Federal Rep. of Germany.

☐ Silent Key: Venerable DXer, Honor Roll member, and super cw operator YL K2UKQ became a Silent Key on July 6. Kay is deeply mourned by members of the South Florida DX Association and her many friends.

☐ Bolivia: From June 1970 to September 1978, KA1JOC operated CP1FW, including the first SSTV operation from that country. Anyone needing his card should send an s.a.e. to Meddy Landry, 10 Oak Ridge Dr., Somersworth, NH 03878. He is looking for help on a 9U5FR card for a 1972 contact. Any help?

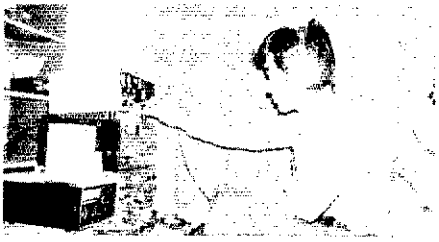
☐ Crete: Worked SVØAW/9? Leslie's present call is NI5S, but he isn't in the *Callbook* as yet. Cards for him as SVØWEE/SV9 and SVØAW/SV9 (also his daughter as SVØAX/SV9) go to Leslie Dale, 9526 Gold Dust, San Antonio, TX 78245.

☐ Malpelo: The LCRA, the Colombian Society, is



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpf). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or muf). On 90 percent of the days of the month, it will be at least as high as the

Padre Mike, ZD9BX. QSL via KA1DE.



JD1AEV, Ogasawara Island, has been active on 75 phone from about 0800Z using a TS-520 and several wire antennas. Cards via Shigeo Kikuchi, Box 2, Ogasawara Is., Tokyo 100-21, Japan. *(tnx JA1BRK)*

celebrating its 50th anniversary with a five-day Malpelo operation in October. Watch for HKØTU as follows: cw — 28.025 21.025 14.025 7.005 3.505 1.825, phone — 28.595 21.295 14.185 7.085 3.795 1.825. Experiments will be conducted on 146.460 MHz, and satellite operation will be attempted. Cards via HK3DDD.

☐ Belize: U.S. West Coast types are again planning a massive ham radio invasion of Belize, 6 through 160 for the CQWW phone. Low-band activities will be on 28,505 21,305 14,205 7205 and 3805 during the contest. Operators will include AK6A N6ADI WA6VNR W6SID K7CI W7MAP KA7EST WD5JEA and possibly K9ZO — all signing V3DX, V3CQ (and a few surprise calls/prefixes). Look for the crew from October 23 through November 2. The group will be on cw before/after the contest. All cards go to N6ADI, who also enjoys stamp collecting!

☐ EL2AE: W2AYJ is handling cards for K2LE's Liberian IARU Test foray.

☐ Help: ARRL Life Member KØHQW needs routings for 9J2KL, 3D2RJ, FRØFLO and FHØFLO.

☐ Spratly: Frank, KM2X, notes that Chinese history (before Marco Polo) describes the existence of the Spratlys. Frank's card carries an interesting tidbit of info: He held the calls XU8BC/C1BC in *his* 1946 China days.

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.

CE3DNP (WB6WOD) A.P.O., 09155, N.Y.
CN9CM (DLØOI) FGØHYJ/FS7 (VE2EWS)
CS2CR (CT2CR) FPØHRP (KC8A)
C6ANQ (K4IPO) FPØHSQ (KC8A)
EK10 (UK1OAZ) FPØHST (KC8A)
EL2FE American Embassy, FPØHSW (KC8A)
FPØHZC (W6OKX) TO5RV/FC (F5RV)
FPØHOQ (NS4M) TR8DR (W2PD)
FO8BW (W6JFM) TZ8DC (DL8DC)
G4JMB/CT3 (KB2XS) T3OCJ (VK3DAK)
HC1BP (W4PKM) VP2MIX (WØIJN)
HH2VP (W1FJ) YB5ASO (W4BBP)
HP1XUL P.O.B. 412, ZF2ØGP (N8AKF)
Miami, FL 34002 ZF2ØHC (K4BWV)
HP3JRP (K4WUX) ZL0AGS (K7RDG)
OD5IZ (KB8BS) 3X4EX (N4CID)
OHØAM (OH2BH) 5B4MN (VE7DLM)
PJ9EE (WA2SPL) 5H3DM (G3NXR)
PP8ZAT (KC8YW) 5K1LR (Box 584, Bogota)
PZ5JR (K3BYV) 5Z4MX (SM3CXS)
TG9XML (K5BDX) 7X2BX (F6EWK)
TL8DR (W2PD) 9X5WP (WB6VKD)

QSL Manager Volunteers

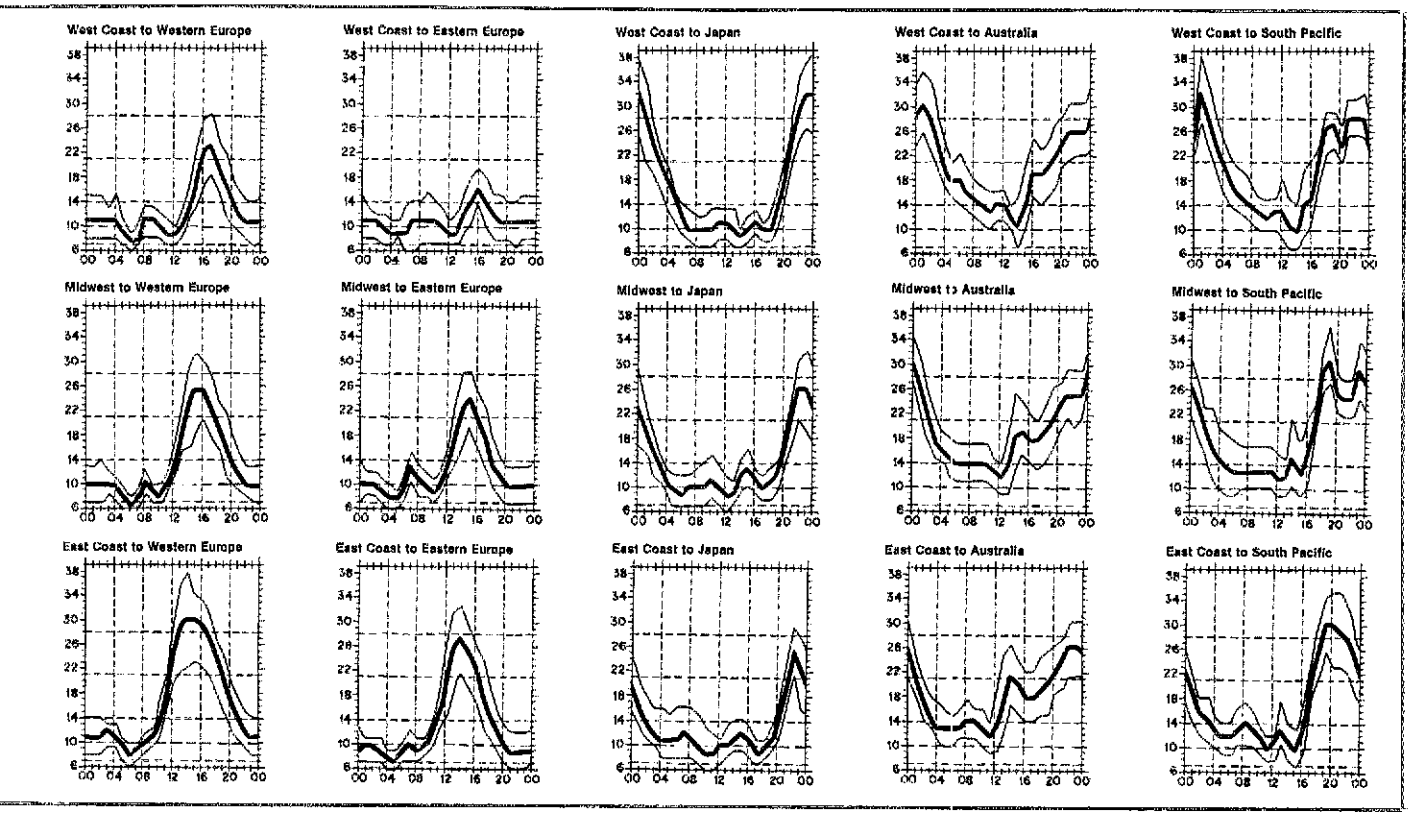
K1NCD
KC9VM
KB4JS

Special Notes

☐ WBØJFF is not the manager for XZ2AB
☐ N4XR is not the manager for HH2VP.
☐ June 1983 QSL Corner, page 69, contains information and addresses for the Incoming Bureaus. Sept. 1983 QSL Corner, page 65, contains information on the operation of the ARRL-Membership Overseas QSL. For the information on the bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.
☐ Liechtenstein: Worked OE1SBA/HBØ just recently? QSL Bruno via B. Settinger, P.O.B. 55, Vienna 1108, Austria, with your s.a.e. and IRCs.
☐ The Liberia Radio Amateur Association advises that the call sign EL7M has not been legally issued by the Ministry of Posts and Telecommunications. All QSL cards received by the EL Bureau for contacts with EL7M will be discarded.

New QSL Bureau Address

☐ VK1 QSL Bureau, P.O. Box E46, Queen Victoria Terrace, A.C.T. 2600, Australia.



least as high as the lowest curve (optimum traffic frequency, or fot). See April 1983 *QST*, page 63, January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11 for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for October 15 to November 15, 1983, assume a sunspot number of 73, which corresponds to a 2800-MHz solar flux of 123.

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 July 1 through July 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

DK6PZ/108 GM3YTS/255 I5NQZ/207 VE3MFO/100 K1HKI/105 KX2A/107 W4USW/103 W7HKI/223 KC8YG/100
DK9CR/106 HB9CBQ/104 J28DM/134 VE7BSM/285 N1CBM/103 WB2CZB/218 WM4W/102 KB7NJ/212 WA8RUJ/104
DL1MO/103 HB9CDX/103 JA3FYC/310 YS1GMV/100 WA1BWE/143 KB4LN/104 KX5U/100 W7KWI/135 K9HV/204
EI2DJ/103 HB9CND/141 JA6GWU/207 YU5TR/105 WB1DLH/179 KZ4T/108 W5AH/153 W7OIH/107 KA9FYF/105
F6DYY/257 HB9CSA/106 JAØCRG/100 ZS6PI/296 K2GHV/254 N4DPM/101 W5OSL/110 W7WCC/101 KØAOZ/107
G4IFB/102 HK3BFU/104 KG4TS/146 4Z4EC/141 KA2DYB/126 N4PN/318 N7AIK/103 WA7ZRB/102 NØDJJ/104
G4IJW/250 I5KXK/109 OH2BZ/342 4Z4KX/244 KA2EGF/131 W4LMW/102 N7EIJ/141 K8INU/110 WØYFJ/102

Phone

DJ1DX/111 JI1ACI/126 YS1GMV/100 4Z4EC/141 WA1BWE/138 W2PJH/100 KC5ZA/101 WA7TEG/130 WA8EUK/190
DJ3VM/123 OH2BZ/102 YS1UL/110 4Z4KX/189 K2GHV/147 WB2CZB/175 W5AH/128 AD8C/153 K9HV/140
DU1RFA/105 SP6DVP/122 ZL2BHS/102 8Q7AZ/113 K2LS/233 N3BNA/102 KB7NJ/210 N8BLD/131 WA9AZL/244
HB9BVB/112 VE7BSM/283 ZS6PI/294 9M2HB/145 KA2EGF/100 KB4LN/100 N7CYQ/165 W8VEN/100 WØYFJ/101
I2PEI/231 VP2MN/107 4X6BZ/104 N1CBM/102 KA2HMJ/110 K5PC/113

CW

CE6EAT/112 I3VJW/177 JA1EMQ/126 JA8KSD/161 K2AGJ/276 KY2W/101 KB6WI/101 W7GB/103 WB9CIF/103
DL1HBT/110 I5JRR/138 JE1JKL/290 4Z4KX/163 K2GHV/101 KC4HN/100 NG6W/134 WA8EUK/204 WBØSIM/105
HB9CND/141 I5NQK/112 JI1ACI/102 K1BJ/230 KB2CB/101 N5DOJ/111 KN7B/120 WA8YTM/100 WD9EIG/105
I2JIN/102 I8SCV/223

RTTY

YO3AC

160 Meters

AA1K

5BDXCC

W4OWJ W1XK JH7LVK NS6C UK2RDX W1WLW UR2RKS EA6ET YU3DQ
DL7SI WD9AHJ KJØU N7CW

Endorsements

Mixed

CT4YN/226 IV3BCB/226 OZ6EI/242 YU3TE/287 K2LS/291 NX4Y/176 K6DT/339 W7QZI/125 KU9C/151
DA2DC/290 I7TGT/320 PY1DH/345 YV5AE/330 K2VV/326 W4CZU/314 KA6BIM/160 W7UZA/318 N9OK/301
DJ4AX/334 IT9AF/308 PT2VE/249 ZL1PN/287 K2WT/256 W4FPW/330 KK6X/263 WB7NCD/304 W9GSB/251
DJ6TK/327 JA1FNA/316 PY2DFR/333 4Z4OZ/212 KB2CB/269 W4YKH/316 N6JM/273 WB7WIM/258 W9RXJ/317
DK1GF/127 JA1IFP/331 PY2ELV/330 AF1U/271 KF2G/271 WA4MSU/307 N6QR/321 AI8S/303 WA9AZL/306
DK3NU/224 JA1NTK/230 PY2JSF/225 K1MM/313 KS2G/171 K5AY/203 NG6W/173 K8ICE/202 KØCVD/269
DK5AD/305 JA1SJV/300 PY6TM/301 K1RM/334 W2AK/280 K5FNQ/290 NI6W/202 K8MC/271 KØJFN/249
DK5JI/250 JI1ACI/163 SM1CXE/340 K1VUT/191 W2BAI/324 KC5CR/229 NS6C/314 K8MNG/300 KØLD/301
DK5WS/302 JR1JFO/309 SM4CTT/309 N1AKX/290 W2GA/322 KV5B/165 W6MI/336 K8RA/324 KØVZR/201
DK6UR/202 JA2KVD/311 SM4EMO/301 N1YL/298 W2KE/310 N5AW/285 W6MND/292 KC8BK/282 KBØG/225
DL1PM/336 JH4UVU/250 SM5DBR/301 W1AX/355 W2NL/240 W5DOZ/317 W6OAT/311 KC8C/153 KCØXK/159
DL7JY/284 JA6PN/228 SM6DYK/309 W1EOA/325 W2VYX/315 W5IB/267 W6OL/310 KC8CN/227 KJØI/301
DL7UX/305 JA7GLB/317 SM7HCW/294 W1GG/332 WB2PMP/290 W5JK/271 W6OUL/254 KD8FX/205 NØAFW/227
DL7WL/290 JA8AYN/322 SP6DXG/235 W1PNR/267 KB3OM/253 W5OVU/324 W6PLK/336 N8AQV/296 NØOA/328
G2FYT/349 JA8JN/304 VE2DPJ/250 W1QV/311 N3CTB/125 W5VGX/226 WA6EZV/251 W8CWY/214 WØBF/280
G3KAA/315 JA8KSD/251 VE3CUI/175 W1RR/317 W3FM/300 W5YH/282 WB6WKM/260 W8LKG/292 WØBX/258
G3KDB/325 KH6HY/131 VE3DGX/301 W1WLW/325 WA3DMH/279 WB5FXX/127 K7ZBV/292 W8YLJ/218 WØCZE/266
G3YDX/300 LA8LF/341 VE3GJH/308 WB1AJG/124 K4FCT/317 WB5LBJ/DU6/294 KC7V/203 WA8EUK/289 WØHBH/305
HA9RT/123 LA9CE/335 VE3IR/310 AA2Z/259 K4LR/300 WB5ZKR/271 KN7K/200 WB8IGU/307 WØHZ/336
HB9BZA/280 OK2RZ/332 XF4MDX/151 AJ2E/321 K4OD/282 WD5ABG/250 N7BZ/269 WB8TXG/149 WA0JYJ/301
HB9T/269 ON4FQ/310 YU2AKL/305 K2AIO/298 N4CID/269 AJ6V/280 N7RO/329 K9AGB/308 WA0QID/181
HK3SO/158 OZ1CTK/303 YU3GI/300 K2IBW/217 N4GFI/148 K6ANP/300 W7FP/304 K9JF/329 WBØMWJ/125
I3VJW/200 OZ3PO/339 YU3QI/306 K2JLA/290 NE4F/251 K6CBL/315 W7HR/302 KR9S/154

Radiotelephone

CE3TZ/211 GM3BQA/326 PY2JSF/225 W1EQD/255 WA2BDB/267 NG5X/261 W6XH/296 W7YEM/299 WA8YTM/175
CT1FL/328 HB9NU/274 PY5OG/251 W1GG/265 WA2JQK/247 W5JK/270 WA6BIE/150 WB7BBO/288 WA8DZL/254
DA2DC/289 HK3SO/157 PY6TM/301 W1PNR/267 KB3GX/128 W5LVD/281 WA6EZV/251 WB7CJH/135 WD8JYR/285
DF7NM/280 HK5CKH/157 SM7HCW/283 W1RR/307 KM3Y/264 W5VGX/175 K7FE/300 WB7NCD/298 K9JF/280
DJ3QX/304 I7TGT/320 VE2DPJ/218 W1WLW/276 N3CQM/227 W5YH/263 K7LYT/125 WB7QEQ/187 KR9S/150
DK3NU/224 JA1FNA/310 VE3CWE/228 K2AIO/203 W3AX/199 WB5LBJ/DU/293 K7SPU/123 WB7WIM/258 W9CZI/283
DK5AD/295 JA1IFP/315 VE3DGX/301 K2IBW/202 W3IJT/175 K6JCK/132 K7ZBV/287 AI8S/302 W9ZTP/223
DK5WS/302 JA1NTK/209 VE3GJH/303 K2JLA/287 KC4ST/230 KA6BIM/156 KB7DT/261 K8LZ/318 KØLD/296
DK6UR/153 JA1SJV/252 VE7WJ/320 K2WT/229 KD4TS/213 KA6D/122 KB7MP/257 KA8DBM/179 KØVZR/200
DL4YAH/285 JA2KVD/297 XE1NI/309 KB2CB/262 N4CID/267 KK6X/202 KC7V/172 KC8BK/260 KA0DMB/207
DL9DY/329 JA7GLB/310 YV1TO/226 KG2U/291 N4KG/319 N6EBU/252 W7BKR/305 N8ANC/285 NØAFW/226
DL9GU/147 JA8JN/255 ZL1AAS/319 N2KW/302 WA4WTG/312 N6JM/252 W7FP/304 N8AQV/280 WØBX/150
EA3AOC/303 JA8KSD/160 K1AS/277 W2BHK/291 WF4V/308 N6QR/236 W7FXI/282 W8HFK/213 WØCZE/258
EA7CEO/203 KP4AE/229 K1MM/307 W2GT/304 K5BPY/130 NI6W/127 W7GBU/124 W8NDJ/263 WØDXY/212
EA7HN/230 LA4HH/251 KB1I/289 W2GZA/248 KB5KA/177 W6NTX/319 W7JXP/150 W8QHG/198 WØLXZ/214
F8RU/333 LA8LF/334 N1AKX/268 W2HXF/299 KC5CR/229 W6USG/327 W7KTL/193 W8SET/308 WB0CIW/300
G3YDX/236 OK2RZ/322 N1API/263 W2IJB/298 N5AW/163 W6VZZ/280 W7UPF/331 WA8VPN/233 WBØMWJ/125
G4IJW/250 OZ6EI/210 N1YL/265 W2LEC/300

CW

DK5AD/279 JA1FNA/271 OZ1CTK/293 YV1TO/133 W1WLW/281 W2XL/127 W5VGX/142 N6BC/277 AI8S/250
DK6UR/127 JA1IFP/286 PT2ACZ/129 ZL1AMO/146 K2AIO/171 KA4JMZ/164 W5YH/215 W6BJH/270 N8AQV/197
DL1PM/300 JA1SJV/158 PY2ELV/299 4Z4DX/253 K2LS/218 KN4B/217 K6DT/288 W6OUL/208 KB9RM/176
DL3RK/260 JA3FYC/299 SM6DYK/254 AF1U/157 KA2HMJ/125 NE4F/232 KK6X/231 K7ZBV/230 KM9L/199
DL7WL/226 JF3AUA/158 SM7HCW/234 K1MM/299 KQ2O/200 K5FNQ/224 N6JM/200 N7RO/226 W9KB/255
GM3YTS/250 JH4UVU/226 VE1BLX/251 W1GG/234 N2KW/299 KA5A/131 N6JV/291 W7BYK/128 KØCVD/254
IT9VDQ/178 JR6APX/125 VE3CWE/204 W1RR/267 W2TQC/261 N5AW/220 NI6W/141 W7TE/263 WØJIE/136

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

A Way to Make More Long-Haul QSOs

When setting up long-haul vhf schedules, each station involved knows the location of the other. Hence, determining the proper direction to point the antenna, assuming the direct path is involved, is no problem. In addition, the participants agree beforehand on time sequencing and a frequency, as well as the transmission mode. For random calling, however, things are not quite as well defined. Particularly on the higher bands, where antenna beamwidths may be quite narrow, the question of what direction to point for random CQs becomes critical. Many QSOs are undoubtedly missed because antennas are not aimed at each other. Wouldn't it be nice if a system could be devised for maximizing the probability that everyone is looking in the direction most likely to produce contacts?

The following proposed scheme for accomplishing this objective is based on a suggestion by K2RIW. I believe it shows promise of providing a systematic determination of what direction to aim at specified times for all of the bands above 50 MHz. It involves using the minute hand on the clock to establish beam heading. The idea is to aim parallel to the minute hand. Thus, at 15 minutes after the hour, one would point due east or due west, east being defined as the "primary" sense. On the half hour, it would be south or north. At 45 minutes past the hour, west would be the primary direction, with east as secondary. To determine whether to use the primary or secondary sense, one would use one of two procedures. Those living in areas where there is little likelihood of working anyone in particular directions, such as on the East or West Coasts, should avoid that direction. But what about those who are likely to be able to work stations in either direction? Don't we run the risk of a situation in which everyone's antenna is aimed in a common direction, so no one is pointed at one another? We certainly do. To minimize this probability, everyone not able to make a logical decision as to which way to point can merely flip a coin each hour to determine which sense to use. It seems reasonable to employ the same 15-second time sequence scheme commonly used on m.s. schedules, with the even or odd time slots being determined by the direction of pointing.

WA5VJB (left) shows off his winning entry in the 2304-MHz antenna category to WB5LUA at the Central States VHF Conference held in Overland Park, Kansas, last July. The homebrew loop Yagi displayed a gain of about 22 dB. *(W4HHK photo)*

This scheme should be applicable anytime that random contacts are being sought, but it will probably be especially useful during those lulls that always occur in contests, as well as on the designated Activity Nights. These are the same as the evenings the Sprints are run, e.g., Monday for 2 meters, Tuesday for 1¼ meters, Wednesday for 70 cm, Thursday for 23 cm and Saturday for 6 meters.

Before those with fancy digital clocks trade them in for Big Bens with easy-to-spot minute hands, let's reduce this proposal to an easy numerical representation we can all use. To accomplish this, the hour is divided into 12 segments of five minutes each. Antennas would be maintained in the specified direction for five minutes and then moved to the next position. The breakdown in terms of pointing direction in degrees and time slots is proposed to be as follows:

Time (in min. past hr.)	*Primary Direction (Heads)*	*Secondary Direction (Tails)*
58½-2½	0°	180°
2½-7½	30°	210°
7½-12½	60°	240°
12½-17½	90°	270°
17½-22½	120°	300°
22½-27½	150°	330°
27½-32½	180°	0°
32½-37½	210°	30°
37½-42½	240°	60°
42½-47½	270°	90°
47½-52½	300°	120°
52½-57½	330°	150°

Note: For the Primary Direction, use the 1st and 3rd 15-sec. time slots; for the Secondary use the 2nd and 4th 15-sec. time slots.

This degree of resolution should be adequate for most of us, but for those with the super-narrow antenna patterns, each of these headings and time slots may be divided into two, which infers moving the antenna every 2½ minutes.

So far this is merely a proposal. It surely has some flaws. I welcome readers' opinions on it. I will be particularly grateful for constructive suggestions on how to improve the system. The best way to detect flaws and work out fixes is to give the system a try. If enough amateurs begin to use it, it will become a defacto standard without much further effort. Once I receive a sufficient volume of comments, I will publish a synopsis of them along with any worthwhile updates. By then, if enough vhfers like the idea, it can be offered as an operating standard.

OSCAR 10 UP AND WORKING

The successful launch and placing into general operation of AMSAT's Phase IIIB OSCAR 10 satellite represents a major event in the history of the world above 50 MHz and, indeed, all of Amateur Radio. The roughly 26° inclination orbit, which remained following failure of the second motor burn, does not provide the hours-long coverage of the entire Northern Hemisphere that would have been available from the planned 57° orbit. It does, nevertheless, enable many hours of use throughout North America almost every day and hours of common visibility with Europe, Africa and the Far East at various times. This makes OSCAR 10 extremely valuable to vhfers wishing to set up EME, m.s. or tropo schedules, or just to discuss problems and ideas. As this is being written, this liaison has already begun. This conductor has heard a number of well-known vhfers, including K2UYH, VE7BBG and PA0SSB, conducting roundtables.

In agreement with the general suggestion made in this column for March, 1983, the downlink frequency being used is 145.950, which is just below the Special Service Channels and the AMSAT net frequency of 145.957. Notice that I specified the downlink frequency. From early operational experience, it appears that the most convenient way to define frequencies on the satellite is in terms of downlink. Any satellite operator should be able to hear his own downlink. Merely set your 435-MHz transmitter to produce the desired frequency in your receiver. Doppler will cause some error, except when the satellite is near apogee, but other stations can compensate by tuning their receivers. The transmitting station need only maintain the specified frequency in his receiver by tuning his transmitter. Unlike the low orbits used by earlier satellites, the amount of Doppler does not change rapidly with time, so frequent retuning is unnecessary. Note that a standard has been established calling for transmitting lower sideband to produce an upper-sideband downlink signal through the inverting action of the translator.

It appears that only about 500-W effective radiated power, referenced to an isotropic antenna, is needed rather than the 1 kW originally estimated. Moral: Listen to your downlink and run no more power than is needed to produce a signal about the same strength as that of the General Beacon at 145.810. Remember: You do not have to be the loudest one in the passband in order to communicate. When considering improvements to your satellite station, concentrate first on the receive side. Put up a bigger circularly polarized antenna, or mount the preamp at the antenna. These are but a few ideas.

CU on OSCAR 10.

ON THE BANDS

6 Meters — The 1983 E_s season was interesting for those who paid close attention and caught the openings. Those who did not probably thought it was just so-so. One who was obviously alert is K4CKS. Al says that the summer netted him seven new countries: FG7, FS, HR, HK, J73, TG9 and VP2K. He complains that

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

he was not so fortunate with TI9, HKØ and V3, which he never heard. I guess that even you can't be alert all of the time, Al!

The most notable day during this report period was undoubtedly Sunday, July 24. Following an aurora the evening before, the north-south path opened for the Caribbean and into South America. Extremely strong backscatter from all over the eastern part of the country was also apparent here in the Washington area. WA1OUB's list of contacts is somewhat typical of those in his area. Bob worked PJ9EE, VP2MO, HKØBKX, W2AAF/KP2 and LU6DLB. It was quite surprising to see an LU worked widely this time of year, but we should always remember to be on the lookout for north-south DX following auroras. After his July 1 contact with GJ3YHU, reported last month, WA1OUB had a partial two-way with G3LNF on July 6. Now that we know it can be done, let's hope that a lot more get in on the act next season. E_s openings continued quite late in the season. N5DDB Oklahoma City reports one of the more interesting ones. The evening of August 16, at 0455Z, Mike snagged KL7NO.

KC3EP points out, quite rightly, that WA1OUB's two-way contact with GJ3YHU was not the first from the U.S. to the U.K. A number of transatlantic QSOs were made in 1947 when Gs could still get on 6 meters; however, those were via F2. Bob's was the first via the E Layer.

W1AIM wants it known that all QSLs for FPØSM should go to him at his *Callbook* address. Those who worked FPØGZZ should QSL to K1TOL. Speaking of QSLs, I often hear complaints of difficulty in receiving cards from W2SZ. WA2SPL asks that anyone wanting a card from W2SZ/1 for contacts up to 10 years back should address Joe Krone, P.O. Box 7, Grafton, NY 12082. I am sure that an s.a.s.e. would be appreciated. Joe says that many cards addressed to the *Callbook* address for W2SZ are probably lost.

W4WD passes along information on a new book that sounds very interesting. It's called *Our Turbulent Sun* by Kendrick Frasier, and is published by Prentice Hall. Russ terms it as "must reading" for anyone interested in the sun's influence on E and F layer propagation. In particular, the book has some interesting things to say about the repeatability of major solar events from one cycle to the next.

Word has reached me of a step in the right direction Down Under. Australian authorities have agreed to allow VK hams to use 50.0 to 50.15, provided that such operations does not result in destructive interference to Channel 0 TV stations, which operate on 47 to 52 MHz. This means that stations in and near the larger Eastern cities will be allowed to use that part of the band only at night after TV sign-off. On the other hand, those who are far from Channel 0 TV transmitters should be able to operate the low end of the band at all times. The same goes, of course, for the many Australian-controlled islands in that part of the world. Thanks to VK2BA and others for passing along this information.

2 Meters — The E_s opening of Sunday evening, July 24, is the major piece of news for this band this month. W5UWB Kingsville, Texas, says that he never saw such an opening! John lists the beginning as 0150Z on the 25th, and he says that signals did not fade out until two hours later. In all, he worked 90 stations and picked up two new states, N8II West Virginia and W3IOH Pennsylvania. I know that he was heard here in Maryland by WB3LJK. W5UWB's state total is now 35. Best DX for the evening were VE3s DVR and ESE. Fellow Texan WA5WDB in the Dallas/Fort Worth area had similar results, except that the band faded out and reopened several times during the period. Among others, Wayne lists N8II, W3WFM Maryland, and WA4DSK Virginia. From the other end of the circuit, W8LXJ in southwest Ohio came up with KA5EBL New Mexico for a new state as well as a number of Texas stations. He says that opening lasted 1½ hours at his location. For WAØVJF Wichita, Kansas, the action was to the Southeastern states, with W5HUQ/4, WB4NMA, WA4NJP, WD4MDJ, WD4MBK and WA4LYS being among those worked.

WA4LDU Lexington, South Carolina, never thought he had anything worth reporting to the column before, but decided that this opening provided the exception. Joe says that he had disconnected the equipment because of an earlier thunderstorm, and had gone to bed about 2300 local time without checking the band. He had no more than dropped off to sleep when WB4EPZ called on the phone to tell him that 2 meters was open to Wyoming! Upon stumbling out to the shack and hastily hooking things up, he came across WB7RSM in Wyoming. Joe managed to work that station before he discovered that he had failed to turn on the amplifier. He had made the contact with the rare state with just 3 W.

WA8LLY/6 Santa Rosa caught a short 20-minute E_s opening three days later, on the 28th. Beginning about 0200Z, Steve worked KØGHC near Denver and WB7RSM in Wyoming. His total now is eight states. WA8LLY puts in a plea for people to move off 144.200 when the band is open. He found that he couldn't use it for calling because there were long-winded ragchews taking place.

I have few Perseids reports as yet. I do know that W3ZZ here in the Washington area held several schedules and worked W5JTL Mississippi for state number 35. W1AIM Vermont turns in an interesting report. Chip received a beard report from N7BHC Salt Lake City, a distance of over 2000 miles. The reception report was for Saturday morning, August 13, at a time that he was running m.s. skeds.

In the EME department, VE3EQQ, after working VK5MC, received a list of windows for that station for the remainder of the year. They are Sept. 28, 1452; Sept. 29, 1556; Sept. 30, 1656; Oct. 1, 1752; Oct. 25, 1248; Oct. 26, 1352; Oct. 28, 1548; Nov. 21, 1100; Nov. 22, 1144; Nov. 24, 1344; Nov. 25, 1436; Dec. 19, 0924; and Dec. 22, 1232. These times are all UTC, or Z, and are for the beginnings of each window, not their midpoints. VK5MC transmits first in a 2-minute sequence beginning when the window opens. His frequency is 144.012, and he tunes from 144.000 to 144.010. Each window lasts approximately 10-14 minutes in the beam of his four, stacked 342-foot-long rhombics.

1¼ Meters — Much of the news this month comes via that intrepid booster of the band, Lee Fish, K5FF, and most of it concerns results from the Perseids. The shower started off August 11 on the right foot for her and OM Fred, W5FF, when they worked KØALL North Dakota on a 45-second burst! The following day, they both added NØJA Missouri and WB4NMA Georgia. On the 13th, the FFs put WA4PCS Kentucky and WD5CAN Arkansas in their logs, and Fred added WA4CQG Alabama. On the 14th, he hooked up with W7JF Montana.

Especially for the shower, KØKE journeyed to Wyoming in an effort to hand out a new state to as many 1¼-meter operators as possible. As of this writing, I have not received a report from Keith, but K5FF tells me that he was able to work K9HMB, W9UD, WB5LUA and KAØY. Other Perseids tidbits passed along by Lee include contacts by W1JR, with WA4PCS and a new Tennessee station WD4DGF, on the band. She also informed me that W7JF Montana completed a QSO with VE3EMS. Maybe this year's shower was better than some of us thought.

K5FF also provides some EME news. She says that she recently became the first moonbounce QSO on any band for WA3GOO. Nice to know that Vic is now active on that mode. She also notes that the 220 moonbounce gang have been mulling over the question of frequencies and procedures. There seems to be a consensus to use 220.020 as a random EME calling frequency. Those not working off the moon are asked to refrain from calling those using that frequency for moonbounce work. There also seems to be a lot of support for adopting the 70-cm 2½-minute sequence. It has also been decided to concentrate 1¼-meter moonbounce activity on the second night of the weekend selected for the 70-cm schedules published in the *432 and Down* EME newsletter put out by K2UYH.

K2GK Plattsburg, New York (FN12), took advantage of the aurora on July 27 to work K8DIO and K2OS, and heard WØVB, WA3GOO, K9IMM and W8VPD. Max says that the buzz signals on this band peaked at about 315 degrees.

The Higher Bands — N6CA reports that the June VHF QSO Party was the best ever for 23 cm on the West Coast. Chip says that he worked 22 stations in nine sections for a new record in that part of the country. Although they didn't count for that contest, 11 grids were worked. The UHF Contest was good also. In that affair, N6CA came up with nine grids. One of the best and most interesting contacts was WB5TCO/7 atop Four Peaks, Arizona, at 403 miles. While in contact on Sunday morning, both stations noticed sudden, rapid signal enhancements. Duration was perhaps ¼ to 1 second and amounted to 20-35 dB above the residual signal. They seemed to include a Doppler shift of 30 to 100 Hz. WB5TCO adds that he was able to visually observe meteors from his campsite the previous evening. To check out the theory that meteors were responsible for these "pings," N6CA ran a schedule with K7GNV Tempe, Arizona, on the morning of August 11, which should have been near the peak of the Perseids. No pings were detected on that occasion, however.

WØOHU Rochester, Minnesota, is full of praise for this year's UHF Contest. Ed says that instead of the usual 15 stations in five states on 70 cm, a good tropo enabled him to work 32 stations in 10 states and 22 grids. On 23 cm, he had nine QSOs in six states and seven grids.

After months of trying and experiencing several near misses, W4HHK Collierville, Tennessee, and W8YIO Manchester, Michigan, finally made a two-way contact on 2304 MHz over the 583-mile path. Success came at 1305Z July 28 just before Paul was to catch a plane for Kansas City to attend the Central States VHF Conference. W4HHK says that both stations run 1-kW input. He uses an 18-foot dish, while W8YIO's is 8 feet. At W8YIO, the receiver is headed by a GaAs FET, while W4HHK uses a 64535. The schedules continue daily at 1200 and 0200Z. Congratulations are certainly in order to both of these gentlemen for their great perseverance and technical skill.

According to the August 4 edition of *The ARRL Letter*, the Italian 10-GHz contingent has been out breaking records again this year. On July 8, IØSNY/EA9 Spanish Morocco and IWØBCU/IT9 are reported to have worked over a path quoted as 1600 km (1000 miles). IØSNY is also said to have worked IØYLI/IT9 over a similar distance. As well as being a new apparent record, this also represents the first intercontinental work on 3 cm. Before declaring this to be a new world record, I would like to hear directly from one or both participants, including such details as geographical coordinates of the stations, information on modulation mode, equipment description, signal levels and other information they may wish to include. The previous record, carried in this column for last July, was 1168 km (726 miles), set last year by IØSNY/EA5 and IWØBFZ/Ø. To round out his effort in EA9, IØSNY contacted I8TUS on 23 cm at a distance of 1963 km (1225 miles).

23-CM Standings

Figures are states, U.S. call areas (plus VE and XE call areas plus other DXCC countries not located within the borders of the above) and best DX in statute miles for the farthest terrestrial contact. Compiled August 15, 1983.

K1PXE	13	5	448	K2OVS	3	2	135	WB5LBT	3	2	—	KC6A/6	1	1	295	WB8PAT	3	3	405
K1FO	11	4	405					K5LLL	2	2	847	N6TX	1	1	112				
W1JR	10	4	475	W3HMU	11	5	300	W5LDV	2	2	847	N6VI/6	1	1	94	W9ZIH	10	5	790
W1XP	7	5	300	K3IUV	9	4	290	WB5TCO/5	2	2	218					WB9SNR	8	5	760
KA1GT	7	4	360	WA3JUF	7	4	300	W5UKQ	2	1	365	K7GNV/7	5	3	402	W9UD	5	4	760
W1QXX	6	3	260					W5HPT	1	1	571	N6NB/7	4	2	295	W9JIY	5	3	300
				K4QIF	15	6	790	WA5TBE	1	1	372	KB2M/7	4	2	295	W9WCD	3	3	770
K2UYH	20	9	770	W3IY/4	7	5	274	W5GVE	1	1	366	N6CA/7	3	2	345	W9AAG	2	2	350
WA2LTM*	17	6	770	K4NTD	3	2	847	K5PUF	1	1	290	WB5TCO/7	2	2	403				
W2VC	15	5	537	W4VHH	2	1	350	WA5HNK	1	1	250	WA7JUO	2	1	—	WØOHU	7	4	575
W2DWJ	12	4	200	K4KJP	2	2	670					N6CA/7	1	1	215	WØYZS	4	2	425
K2YCO	11	8	570					K6ZMW	4	3	402	W7LUX	1	1	130	WØPW	3	2	97
K2EVJ	10	6	426	WB5LUA*	14	17	839	N6CA	3	2	338					WØZJY	3	1	170
K2JNG	10	4	305	W5HN	7	3	625	W6XJ	2	3	250	K8WW	12	7	448	WØMDL	2	2	340
WA2VTR	6	4	320	K5MWH	4	2	280	W6OQQ	2	2	200	WA8TXT	10	7	—	WØVB	2	2	290
W2PGC	5	5	473	KR5F	3	2	750	N6NB/6	1	2	360	W8YIO	9	7	551				
WA2FUZ	5	3	125	W5UWB	3	2	720	WB6NMT	1	1	296	WB8BKC	8	5	500	XE2BC	1	1	370
WA2EUS	4	5	320	N4JS/5	3	2	467												

*Indicates some contacts were made via EME.

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

New World Record on 10 GHz

On July 18, IØSNY/EA9 in Ceuta (Spanish Morocco) worked IWØBCU/IT9 at Capo San Vito (near Trapani in western Sicily) over a distance of 1621 km across the Mediterranean Sea. As can be seen from the map, this path is 100% over water. Weather conditions over Europe were unusually hot in July, and this no doubt helped with duct formation over the Mediterranean. Those who have been following the progress of the 10-GHz record will not be surprised to learn that it has been achieved yet again by Nicola Sanna, IØSNY. He held the previous records at 757, 860, 1101, 1117 and 1166 km (see The New Frontier, Nov. 1982 *QST*). Those familiar with Nicola's operation will also not be suprised to learn that later on the same day (July 18th), at 1900 UT, he worked IØYLI/IT9 on the island of Ustica over an all-sea path and extended the record to 1663 km. Ustica is a small island (2 miles across, 239 feet a.s.l.) just to the north of Sicily. It is beginning to seem like every July Nicola goes out and breaks the 10-GHz DX record, a remarkable achievement worthy of our congratulations.

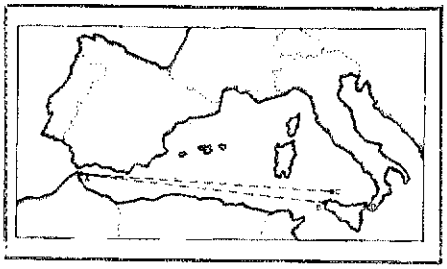


Fig. 1 — Paths of the new 10-GHz DX records: A — IØSNY/EA9 (Ceuta); B — IWØBCU/IT9 (Capo San Vito); C — IØYLI/IT9 (Ustica); D — I8TUS (Calabria).

Not content with the 10-GHz record, on July 5th, IØSNY/EA9 (still in Ceuta) worked I8TUS in Calabria (at the southern tip of Italy) on 1.3 GHz at a distance of 1963 km. This is a new European record on 1.3 GHz, beating the old record of 1396 km (also held by IØSNY with I2KSX/8). I believe the current world record is 1422 miles (2288 km), held by VK6KZ/P and VK5MC/P.

Looking at the map, it is interesting to speculate on what the ultimate trans-Mediterranean DX might be on 10 GHz. Certainly, it looks possible to work a 100% over-water path from Ceuta to the Italian mainland, which would extend the record by a few hundred kilometers. Perhaps next July we will find out!

I have no information at this time about the equipment used for these contacts, but I suspect that the same equipment was used on 10 GHz as was used to set the previous records (1-meter dishes and 30-mW Gunnplexers). I will report more details of these contacts when I receive them.

BELGIAN MICROWAVE PROBLEMS

As mentioned previously in this column, there is the possibility that Belgian amateurs may lose some of their microwave allocations. More information has recently become available concerning this situation. The bands in danger are 1240-1300, 2300-2450 and 5650-5850 MHz (as well as 430-434 MHz at uhf).

There is universally an expanding interest in the commercial and military use of microwave frequencies. One of the reasons put forward to justify the reallocation of microwave bands from amateurs to other services is that the bands are poorly utilized by amateurs (use it or lose it!).

At the time of this writing (mid August), there has been no action on the Belgian proposals. It seems that the matter will be considered again when Parliament reconvenes in September following their summer recess. Let's hope that a compromise can be reached.

TRANSISTOR NEWS

☐ Motorola is now producing low-cost dual-gate GaAs FET's suitable for use on the lower microwave bands. They are type numbers MRF966 (plastic package) and MRF967 (ceramic package). Specifications show up to 18-dB gain and a 1.2-dB noise figure at 1 GHz. Present pricing at the 100-item level is $3.10 for the MRF966 and $9.85 for the MRF967. Prices are expected to fall as soon as quantity production is achieved.

☐ Hewlett-Packard has two new microwave transistors available. They are the HXTR-3645, which shows 12.2 dB gain and a 1.9-dB noise figure at 2 GHz, and the HXTR-3615, which shows 16.6-dB gain and a 1.4-dB noise figure at 1 GHz. Both transistors are bipolar types.

WAVEGUIDE MATERIALS

Recently, I had an inquiry about waveguide for use on the higher microwave bands above 24 GHz. Such waveguide is difficult to find on the surplus market, but substitutes can sometimes be found. For example, WR22 (RG272/U) is the standard waveguide for use at 48 GHz, and has internal dimensions of .224 × .112 inches. The physical dimensions of the waveguide determine the frequency range over which the waveguide can be used; in the case of WR22, it is usable over the range of 33-50 GHz. The internal dimensions, however, do not have to be exactly those of WR22 to be usable at 48 GHz. For a rectangular waveguide of dimensions A × B inches (where A is the larger internal dimension and B the smaller), the following relationships hold when it is desired to propagate a signal of free space wavelength (λ) down the waveguide:

$2A > \lambda$
$A < \lambda$
$2B > \lambda$

In practice, it is desirable to keep A between 0.6 λ and 0.95 λ and B less than 0.45 λ. As long as these conditions are met, the waveguide will be suitable. It is often possible to find rectangular brass tubing for sale in model and hobby shops, which can be pressed into service as waveguide.

It is also possible to use circular waveguide for some purposes. Its main drawback is that is does not maintain the plane of polarization of a signal, and so there can be problems when making rectangular-to-circular (or vice versa) transitions. The criteria for the use of circular waveguide to propagate a signal of wavelength (λ) are

$D > 0.58 \lambda$
$D < 0.76 \lambda$

In practice, D should be between about 0.62 λ and 0.72 λ, where D is the diameter of the circular guide. Again, suitable sizes of copper and brass tubing may be found in model and hobby shops.

*103 Division Ave., Millington, NJ 07946

Strays

QST congratulates...

☐ the following radio amateurs on 60 years as members of the ARRL:

- Lewis E. Elicker, W3ADE, of Harrisburg, Pennsylvania
- William K. McKay, W6CMZ, of Oakland, California
- James H. Platz, W7HA, of Pendleton, Oregon
- Fred J. Elser, KH6CZ, of Honolulu, Hawaii

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

- Thomas Yount, WØKC, of Kirkwood, Missouri
- Earl Dryer, WØDHN, of Kansas City, Missouri
- Charlie Butt, W7GLU, of Eugene, Oregon
- John Wallace, W6EP, of Westgate Village, California
- Chester J. Sherman, W3CXE, of Lebanon, Pennsylvania
- Frederick C. Collings, W2GTN, of Avalon, New Jersey
- C. Friend Stafford, W2AAU, of Spencerport, New York
- Henry R. Pemberton, W3PN, of Wayne, Pennsylvania
- Gordon E. Gray, K4AD, of Pompano, Florida
- John Sumner, K4DM, of Cape Coral, Florida

I would like to get in touch with...

☐ any students or graduates of Wittenberg University in Springfield, Ohio, who are interested in joining a net. Jerry McFarland, KV8O, 1298 Marble Dr., Columbus, OH 43227.

☐ anyone having a schematic diagram of the Spectronics DD-1 digital display. Harold Zimmermann, NA2P, 25 Curaco Ave., Toms River, NJ 08753.

☐ anyone who has successfully developed and interfaced software for using the Hewlett-Packard 86A computer as a cw and RTTY terminal. Howard W. Nelson, NØEML, 1204 Village La., Fort Collins, CO 80521.

YL News and Views

Conducted By Jean Peacor,* K1IJV

One Never Knows; Do One?

When Fats Waller coined the phrase "One Never Knows; Do One?" he didn't exactly have Amateur Radio emergencies in mind. Yet, how fitting it is. You've either participated in, or at least heard, ARRL's Simulated Emergency Test (SET), or volunteered in a local radio club's mock disaster drill. It is hoped that every licensed amateur is prepared to efficiently assist in times of actual emergencies.

Hams in the Greensburg, Pennsylvania, area learned the benefits of being prepared this past spring. It was a Sunday afternoon, May 22, when a tornado ripped through the Greensburg area snapping off thousands of trees and just about destroying an apartment complex of 20 buildings. There were 2000 trees uprooted on the Greensburg Golf Course alone. Miraculously, there was no loss of life, and the only injury was a laceration on the head of one man on the golf course.

The Foothills Radio Club had been actively setting up an emergency radio network for about a year. Stations had been established for 2-meter operation at their 911 Control Center and at the Red Cross office by club members working in conjunction with the Coordinator of Westmoreland County Emergency Services. On May 22, hams sprang to life almost immediately.

K3RHE and WB3AMR manned the 911 control ham station; WB3KJH was at the Red Cross office; KA3EGE and KA3CEO went to the disaster center at Seton Hill College gymnasium, where they found all phone service down. When power was restored, the nearest phone was on the floor below the gym at the control station.

Jeanne Doncaster, KA3CEO.

The apartment center and other disaster sites were covered by W3HWJ, WB3HZM, KA3IXA, KA3KAD/BF WA3HOL, KA3HZS and N3AUJ (who came with a chain saw to assist with the clearing of many of the main roads. W3NDP manned the control station the next day; N3DBE also assisted.

Hams in many outlying districts volunteered their services if needed. Among them were the Allegheny County Emergency Net, the Butler County Emergency Net and the New Kensington Emergency Net.

This was the Foothills Radio Club's first true emergency. Many favorable comments were received on the efficiency with which it was met. *Contacts were brief and to the point.* The Red Cross was kept informed as to the numbers in need of help, their ages and the need for food. The *Tribune Review* praised the assistance of Amateur Radio.

Jeanne Doncaster, KA3CEO, who submitted this news, said: "As hams, we were proud and happy to be of service." Her OM, WB3AJC, a surgeon at the Westmoreland Hospital, can see the need for a radio station at the hospital. Club members hope to soon have this established.

Would members of your radio club have handled such an emergency as efficiently? Emergency training does take time and effort. The Foothills Radio Club is but one example of the meaningfulness of such training, for it's so true that "One Never Knows; Do One?"

YL COLUMN — YES OR NO

In order to obtain a consensus of opinion as to the how's and why's of the YL column or whether should it even exist), two letters offering opposite views were printed in the July 1983 column. The letters were written by request. It was hoped to determine perhaps, why news of YLs has become increasingly difficult to come by.

Sincere thanks to those who took the time to write. The vast majority of letters received favored continuance of the YL column. One opposing view appeared in Correspondence, Sept. 1983 *QST*. Here are excerpts from a sampling of letters received:

"Dear Jean:

"Since the July issue came, we have discussed the continuation of the YL Column on YL nets — some countrywide. I have known Jan, WB2JCE, for a number of years. I felt that her letter expressed the attitudes of the great majority of YL hams and of many OMs. In the past, I have been surprised on numerous occasions when OMs have, either on the air or in correspondence, shown that they are faithful readers of YL News and Views. For the writer of the letter contradictory to Jan's, few people read the entire *QST* word for word, but rather turn to those sections in which they have particular interest.

"I have been a licensed amateur since 1949, and am a Life Member of ARRL. Your section of the magazine is my principal reason for being a Life Member. I am a member of QCWA, YLRL and various other Amateur organizations. The general feeling I have found has been that the League would lose a valuable part of their monthly publication if YLs appeared only incidentally in unrelated articles. 73 and 33, Elizabeth H. Taylor, W7NJS."

"Dear Jean:

"I think the gal who thought that the YL column should be discontinued reflected the view of very few YLs. YLs have special interests for YLs only. We like to know what other gals are doing — clubs, nets, etc.

"I enjoy *QST*, but when it arrives in my mail, the first thing I turn to is YL News and Views. I've talked to a number of YLs in the last few weeks, and they all do the same thing. 33, Harryette Barker, W6QGX."

"Dear Jean:

"I believe, like many YLs, that we need the column, and hope it will continue, to read about YLs' achievements. Considering the number of YLs we have, it is a small portion of *QST* reserved for us. 33, Lia Zwack-Olivier, WA2NFY."

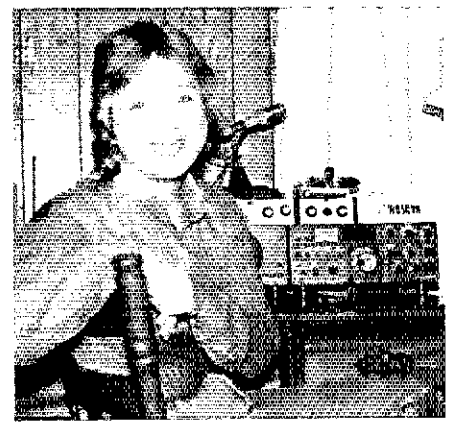
"Dear Jean:

"I kind of like the YL column, even though I belong to the male 'species.' I think it would be a shame if debate about its continuance got into vast metaphysical orbits.

"I'd guess that, historically, the column was initiated as a way of highlighting the efforts and activities of YLs, who were and are fewer in number among hams. I don't think there was anything hypocritically differential and fawning in the establishment of the column. Indeed, if there's to be no YL column, then why not discontinue all YL magazines? Personally, I'd hate to see all unisex magazines, unisex clothes and unisex personalities, thoughts, feelings and moods. I don't think there's one bit of male condescension in having a YL column. And, I am not aware that when a YL has achieved something outstanding, her efforts are, by policy, mandated and restricted to the YL News column. I would like to think that if, historically, YLs had been in the biological majority of hams, there would have been an OM News and that we OMs would receive it with a smile.

"Please record this OM as someone who enjoys your column because it reveals the lives of interesting, imaginative and talented human beings. It gives us all something to think about. 73, Marty Wincott, K2BRY."

Conclusion: News is still difficult to obtain. However, that fact can now be faced with greater assurance — hi!



Debra Stohlman, of New Orleans, the author of the guest editorial that appeared in this column last month.

*Country Club Dr., Monson, MA 01057

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1BVB, Henry E. Moore, Florence, MA
W1DVJ, George A. Timson, Kennebunkport, ME
KA1IXP, Bruce H. Obear, Salem, NH
W1NWC, Edward C. Bates, Milford, CT
*K1PNS, Stuart V. Glenn, Waterford, CT
K1RKR, Arthur J. Moreau, Wakefield, MA
WA1WQU, Kenneth D. Simes, Worcester, MA
K2ACB, Edward A. Driscoll, Albany, NY
W2BT, Allen E. Fitch, Merrick, NY
W2BWU, A. Earle Patterson, Watchung, NJ
K2CAK, Kenneth H. Cary, Gansevort, NY
W2EGD, Gene W. Duckworth, Lancaster, PA
KA2IQX, Joseph Zubek, Jr., Hempstead, NY
K2MIP, Andrew C. Brown, Geneva, NY
WA2PEB, Eugene H. Reid, Midland, TX
K2PI, Kenneth P. Haywood, Pennsauken, NJ
WA2WEJ, William J. Hoenig, Mahopac, NY
N3ACM, Edwin A. Hilbert, Devon, PA
K3BWB, C. Nevin Miller, York, PA
*W3GRS, Richard G. Weiler, Broomall, PA
W3KWG, Wayne C. Lightner, Washington, PA
W3NPQ, Elmer F. Deibler, Silver Spring, MD
W3SCS, Burton W. Jacobs, Mount Airy, MD
W3WBA, Wilbert E. Monola, Erie, PA
W4AFF, Bernard J. "Chris" Christensen, Boca Raton, FL
KB4AIF, Andrew S. Adams, Chincoteague, VA
WD4BDU, Paul A. Lail, Jr., Columbus, GA
K4BDY, Vernon A. Towner, Apalachicola, FL
WA4BJS, Harry A. Reichert, Sr., Dunedin, FL
W4BMF, Raymond J. Green, Port Charlotte, FL
K4BVS, Nelson C. Warner, Sun City Center, FL
KA4CUO, Samuel F. "Penn" Averitt, Tabor City, NC
N4DDJ, Jack L. King, Largo, FL
N4EVH, John C. Johnston, Guston, KY
W4GTX, Lucius D. Drewry, Statham, GA
W4KYH, David O. Beck, Fayetteville, NC
*W4LCB, W. Glenn Clark, Riverdale, GA
KA4LWT, John L. Wilson, Jr., Bradenton, FL
W4ODK, Adolph A. Abraham, Lexington, KY
W4OSC, John H. Ashley, Belton, SC
W4OYJ, Walter E. Ramsey, Bennettsville, SC
K4UYA, Robert W. McDougall, Orange Park, FL
*W4WHN, Max Arnold, Nashville, TN
K4ZLK, Hazen E. Foster, Melbourne, FL
WA5GOF, William M. Sharp, Midwest City, OK
WD5HTL, Nevette A. Gardebled, New Orleans, LA
W5JHF, Charles E. McKee, Pineville, LA
WB5LTB, James R. Manning, Dallas, TX
K5VQA, Ernest C. Priest, Pearl, MS
*K6AYL, Leo M. Nepote, Ripon, CA
WA6BUY, Elmer M. Palmer, San Bernardino, CA
W6EJA, Charles P. Henry, Richmond, CA
W6EQL, Francis Waddingham, Inglewood, CA
WD6GSD, John J. Cockerham, Norwalk, CA
WB6IVZ, Glen E. Kitterman, Fresno, CA
W6IWW, James S. Taylor, Moorpark, CA
WB6RFH, Kenneth D. Thomason, Hanford, CA
WB6RPH, Jess S. Davenport, Laguna Hills, CA
KA6SSM, Angelo "Ben" Bisordi, Sebastopol, CA
*K6SX, Raymond W. Haynes, Valley Center, CA
W6TZ, Harlan R. Fullerton, Pasadena, CA
W6VFS, Robert A. Hansen, Mesa, AZ
K6VG, Louis Statham, Lone Pine, CA
W6WPW, Francis S. Frazier, Kailua Kona, HI
KB7A, Leroy B. Terry, Tacoma, WA
KA7AAZ, Charles W. Nafus, Las Vegas, NV
W7AFL, Robert W. Glaze, Portland, OR
W7BTL, Max E. Roesner, Columbia Falls, MT
W7CS, John S. Ingwersen, Glendale, AZ
N7DYW, Pat McKnight, Cody, WY
W7EGR, Stanley L. Archer, Auburn, CA
W7LPW, Edward B. Atwood, Monroe, WA
W7MSI, Elmer R. Wright, Tacoma, WA
WB7PMD, Warren C. Tubbs, Okanogan, WA
WA7ZSR, Rodney R. Rever, Tacoma, WA
W7ZW, Roy C. Corderman, Sr., Sun City, AZ
N8CWS, Charles R. Newman, Lucasville, OH
W8HKL, Newell D. Saigeon, Petoskey, MI
W8KVP, James H. Hubbard, Sabina, OH
W8MCO, Finley "Bud" Gould, Hillsdale, MI
W8PHJ, J. Walter Ashton, North Las Vegas, NV
KB8RA, Joseph C. Haban, Cincinnati, OH
W8YAT, Robert F. Voyer, Toledo, OH
W9EWC, Herman L. Greve, Hilbert, WI
K9FZX, Annie Thompson, Columbia City, IN
K9ILL, Cecil L. Yelch, Princeton, IN
WB9JIE, Gustavo L. Jimenez, Williamsburg, VA
K9KNC, Alpheus W. Tandy, Verona, WI
W9LRI, Robert S. Cresap, Hinsdale, IL
W9NQB, Arnold F. Stokes, Muncie, IN
W9OFH, Lee A. Stremlau, Chicago, IL
W9ON, Hans P. Zimmer, Waukonda, IL
W9QBW, Gerald O. Huntzinger, Anderson, IN
W9RTB, Paul G. Kompier, Whiting, IN
W9ZUL, Armand R. Beloian, Deerfield, IL
NØAMD, Eugene C. Thurston, Bloomington, MN
WØCO, Sumner B. "Ted" Young, Wayzata, MN
WØDGA, Howard K. Heist, Grand Junction, CO
WAØIJY, Richard L. Carnahan, Harrison, NE
KAØJQC, Donald H. Ida, Boulder, CO
KAØNTK, George H. Love, Kansas City, MO
WBØOSC, Jess O. Weyand, Lincoln, NE
KØPJ, Paul K. Johnson, Joplin, MO
WØQMS, Charles E. Fuller, Wheatland, MO
WØVWP, Harold F. Riedl, Otis, KS
WØYIV, Francis D. Buchanan, Fort Madison, IA
WBØZDB, John A. Owen, Kimberling, MO
VE3AJM, Joseph T. Morton, Toronto, ON
VE6BFU, Archibald Major McMullen, Seba Beach, AB
VP2MW, Ernest H. Welling, Sr., Montserrat, W.I.

*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

October 1933

☐ Technical Editor Jim Lamb makes use of his recently developed "tri-tet" principle for the oscillator of a four-band, two-tube exciter with crystal control. The lone "doubler" gets improved efficiency from regeneration in the circuit.

☐ W6FFP prefers separate rigs for each of the four bands, of course with a common power supply. Type '45 Hartleys do the job on 160 and 80 meters, with 210s on 20 and 40.

☐ Col. Clair Foster, W6HM, had an article in a recent issue of the West Coast *Radio* magazine claiming that the new Madrid treaty practically abolishes amateur traffic handling. Secretary Warner has written, him pointing out numerous errors in the article and stating there is absolutely no change in our traffic privileges.

☐ Realizing that such misinformation could cause uproars in amateur ranks, the Editor discusses at length the background of international conferences, the procedure we must follow to be successful in protecting our bands and privileges, and the progress to date.

☐ W7HV has devised an indicator for true zero beat, using a meter readout since the human ear will not respond to frequencies of a few cycles per second.

☐ The World's Fair (Chicago) convention sponsored a code speed contest; top honors were won by a Press Wireless professional. But among amateur class winners were W5BRD, later "Hoss Trader Ed," and W9ACE, destined for a distinguished career in our foreign service.

☐ Miniaturization is a current fad. VK6FT's "Atom," with its push-pull 210 "valves," and W4JO's "Baby Might" Hartley are examples of early attempts at compactness in transmitters.

☐ In his frequency standard, W8ALK uses an aluminum strap as one plate of a condenser in the oscillator circuit; it bends on a temperature increase, reduces the capacitance and thus compensates for drift that would otherwise occur.

☐ EAR185 (Spain) made high score in the 1933 DX competition, a grueling nine-day continuous activity. W3ZD took top honors in the U.S. (his ½-kw. station is described in this issue), but W8CRA worked the most countries — 42.

☐ Things are humming on 5 meters. G5BY on a 3500-foot "mountain" has reached a record 200 miles with perfect voice copy, yet unmatched elsewhere. Chicago hams maintained pylon-to-pylon communication for the Air Races in that city. And the South Jersey Radio Assn. held a very successful hidden transmitter hunt.

25 Years Ago

October 1958

☐ The Editor recounts numerous bonquets tossed to amateur radio at our national convention in Washington by high brass of the Army, Navy, Air Force and Civil Defense, and topped by praise from Vice President Richard Nixon.

☐ W3HH used every corner of a 6 × 6 × 7-inch cabinet to house his "Pygmy Powerhouse," a 75-watt rig covering major bands. The power supply is in a separate package.

☐ Interest in 6 meters continues to grow, and W1HDQ fills requests for a simple, low-cost transmitter for the newcomer; it uses 8-Mc. crystals in an overtone oscillator, with a 6146 output tube.

☐ The formulae in W2WZR's article on low-pass filters shouldn't scare you; he provides tables of practical data on component values for various passbands.

☐ W5ECP uses helical coils for ground planes on his home antenna to shorten the occupied space, and employs traps for multiband operation.

☐ The low-priced receiver a typical Novice purchases works fine on 80 meters but less so on 15. W1ICP describes a converter for that band (plus 10 meters) that improves reception results.

☐ Two penlite cells power the transistorized crystal-controlled converter W8HHS (now W1FB) has designed to feed his automobile's broadcast receiver; it covers major ham bands.

☐ W8HNX adapted a TV remote-control tuning motor to tune a grid-dip meter, allowing more accurate readings by mounting the g.d.o. up at the antenna itself.

☐ KH6IJ copped top c.w. honors in the 1958 DX contest, with W8BKP leading the 'phone contingent. Potomac Valley again won the club award.

☐ Cerebral palsy prevents VE4VJ from hand key sending, but with a voice-operated keyer he can "hum" the letters for effective communication.

☐ K2POO's electronic keyer worked fine, but the rig had bad clicks; he replaced the relay with a vacuum-tube keyer circuit and solved the problem.

☐ "Operation Alert" was a simulated emergency (enemy attack) test last May, and Communications Manager George Hart reports on the activities of hundreds of amateurs in AREC and RACES who took part.

☐ The Federal Communications Commission has now made final its proposal to withdraw the 11-meter band from amateur use and assign the channels to the Citizens Radio Service. — *W1RW*

Special Events

Conducted By Mark J. Wilson,* AA2Z

Jackson, Tennessee: Jackson ARC will operate K4EP from 1200 to 2400 *Oct. 1* from the Casey Jones' Railroad Museum during Heritage Week. Operation in lower 25 kHz of the 80-15 meter General class phone bands. QSL.

Poplar Bluff, Missouri: Three Rivers ARA will operate WBØUWZ from 1700 to 2400Z *Oct. 1* from a float in the Dallas Days Parade. QSL via Rte. 3, Box 201, Poplar Bluff, MO 63901.

Monmouth County, New Jersey: Garden State ARA will operate W2GSA from Treasure Island in the Manasquan River from 1600Z *Oct. 1* until 1600Z *Oct. 2*. Frequencies: 3.910 7.235 14.235 21.360 28.550. QSL info given on the air.

Southington, Connecticut: Southington ARA will operate W1ECV on *Oct. 1 and 2* and *Oct. 8 and 9* to commemorate the Apple Harvest Festival. Operation during daylight hours on 14.250 and 28.600 phone and on 14.095 and 28.095 RTTY. Certificate via P.O. Box 284, Southington, CT 06489.

Greenwich, Connecticut: Stamford ARA will operate W1ICH from 1600 to 2100Z *Oct. 2* in support of the United Way. Certificate via KK1J, 118 Lockwood Rd., Riverside, CT 06878.

Houston, Texas: Brazosport ARC will operate KM5J from the ARRL National Convention from 1700 to 2300Z *Oct. 7* from 1400 to 2200Z *Oct. 8* and from 1400 to 1800Z *Oct. 9*. Frequencies: cw — 75 kHz up from lower band edges; phone — 5 kHz up from lower General class band edges; RTTY — 14.080. QSL via P.O. Box 1328A, Clute, TX 77531.

Columbus, Ohio: Columbus ARA members and other Columbus-area hams will be active from 1400 to 2400Z *Oct. 8 and 9* to commemorate Columbus Day. Frequencies: Oct. 8, 28.600; Oct. 9, 21.400. Work club station W8TO and four other Columbus hams, or work 10 Columbus hams (excluding W8TO) for award. Certificate via 280 East Broad St., Columbus, OH 43215.

Salisbury, Maryland: Peninsula Radio Operators Society will operate KB3QV from 1600 to 2100Z *Oct. 8 and 9* from the Delmarva Folklife Festival. Operation in hf General class phone bands. QSL via P.O. Box 2315, Salisbury, MD 21801.

Motherwell, Scotland: Mid Lanark ARS will operate GB2MOD from *Oct. 8 to 14* from the National Mod Festival. Frequencies: phone — 3.670 7.060 14.210 21.310 28.510; cw — 3.570 7.020 14.070 21.070 28.070. QSL via the bureau.

Moultrie, Georgia: Colquitt Co. Ham Radio Society will operate WD4KOW from 1300 to 2100Z each day *Oct. 11 to 13* during the sixth annual Sunbelt Agricultural Exposition. Operation in the General class hf bands. QSL via P.O. Box 813, Moultrie, GA 31768.

San Diego, California: North Shores ARC will operate K6HAI from Shelter Island from 1700 to 2300Z *Oct. 15* to commemorate the gift of the Bell of Friendship to San Diego from the citizens of Yokohama, Japan. Operation around 14.240 and 21.365. QSL via 2410 Deerpark Dr., San Diego, CA 92110.

Kirksville, Missouri: Alumni of N.E. Missouri State Univ. will operate WAØQWW *Oct. 15* during the annual Homecoming Festivities. Operation in lower 25 kHz of hf General class bands.

Wallace County, Kansas: Western Kansas DX Society will operate KØEQH from Mt. Sunflower from 1800Z *Oct. 22* until 1800Z *Oct. 23*. Operation 60 kHz up from lower phone and cw band edges.

Grand Caymans, West Indies: Amateurs in the Cayman Islands will be active with special ZF1Ø and ZF2Ø prefixes from 0500Z *Oct. 22* until 0500Z *Oct. 30* during Pirates Week. Certificate for working five special stations. Send QSLs and 3 IRCs to Pirates Week, P.O. Box 1029, Grand Caymans, B.W.I.

Knokke, Belgium: Belgian amateurs will operate OS1NOV from *Oct. 28 until Nov. 2* to commemorate the liberation of parts of Belgium by Canadian troops during World War II. Operation on 14.141, 21.212, 28.282, 14.025, 21.025 and 28.025.

Sycamore, Illinois: Kishwaukee ARC will operate WA9CJN from 2300Z *Oct. 28* to 0400Z *Oct. 29* and 1300 to 2200Z *Oct. 29* to commemorate the city's 125th birthday. Operation on 7.235/14.260 on Oct. 28 and 7.135/7.060 on Oct. 29. Certificate.

Cheraw, South Carolina: Chesterfield Co. ARS will operate KA4ABW from 1000 to 1600Z *Oct. 29* during the second annual Greater Pee Dee Pig Pickin'. Operation in 20-meter General class phone band.

Jasper County, South Carolina: Island ARC will operate KB4GY from this rare county from 1700Z *Oct. 28* until 1700Z *Oct. 29*. Operation on the County Hunter net frequencies.

Jacksonville, North Carolina: Onslow ARC will operate WD4FVO from 2200 *Oct. 29* until 1100Z *Oct. 30* during Witch Watch. Operation 20 kHz up from lower General class band edges, and 21.150. QSL via P.O. Box 841, Jacksonville, NC 28540.

Ponce Inlet, Florida: Daytona Beach ARA will operate K4BV from 1400 to 2100Z *Oct. 29 and 30* to celebrate the centennial of the Ponce De Leon Lighthouse. Frequencies: phone 7.275 14.275 21.373; cw — 7.125 21.125. Certificate via P.O. Box 9852, Daytona Beach, FL 32020.

Baltimore, Maryland: Laurel ARC will operate K3LDE aboard the *USS Constellation* from 1200 to 2200Z *Oct. 30* during Navy Week. Operation on 7.225 14.225 21.400. Certificate via Box 259, Annapolis Jct., MD 20701.

Gaithersburg, Maryland: NBS-BRASS will operate K3AA *Nov. 3 to 6* in observance of the dedication of the first active NBS club station. Operation on cw, phone and RTTY near the lower hf band edges. Certificate via BRASS, c/o National Bureau of Standards, Mailroom, Washington, DC 20234.

Rocky Point, New York: Radio Central ARC will operate WA[illegible]EC from the former RCA High Frequency Radio Station, now a state park, on *Nov. 5 and 6*. Operation 10 kHz above lower General class hf band edges and 7.110. QSL via P.O. Box 680, Miller Place, NY 11764.

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 October 15 to make the December issue.

*Assistant Communications Manager, ARRL

In Training

Conducted By Jonathan Towle,* WB1DNL

RECRUITMENT TAKES TO THE ROAD

A new program will begin this fall — a tremendous recruitment drive called Ham Radio on the Road (HROTR). This will be an organized system of Amateur Radio demonstrations taken to young people at the places they spend their time. The active corps of HROTR "roadies" will go to Boy and Girl Scout meetings, 4-H clubs, middle and high schools, and other youth groups to promote the hobby through short, effective demonstrations that will include on-the-air contacts. Complete details are given in this issue, starting on page 56.

Amateur Radio generates its own excitement. Once someone is given a *good* tour of the wonders and capabilities of our hobby, it is easy to make a new ham of him or her. The problem is getting these demonstrations to the "people out there." HROTR solves this simply and easily.

We have to capitalize, however, on the excitement that will be generated. What good is it to an enthusiastic future ham if he or she cannot start studying for a Novice license right away? That is where you come in: You, the organized cadre of Official Instructors, hold the key to the future of Amateur Radio. Once we bring out a prospective ham's interest, we must be able to provide a well-planned, effective and interesting licensing course, and he or she must be able to attend it *immediately*.

Fall classes have begun in many places, but there are alternatives to offering only a fall-and-spring series of classes. Although this has been the traditional cycle for many clubs and instructors, there is really no reason for it to continue as the *only* thrust toward bringing new hams into the fold. Indeed, the entire Volunteer Examining program is based on a flexible, continuing examination system. So why not extend this to Amateur Radio courses?

HROTR will be running constantly and will always be enticing people to get their tickets. Consequently, Novice licensing courses should also be run frequently, perhaps even concurrently, if you can muster the resources. You, the instructor, should always be ready to help these soon-to-be hams, to encourage and to teach, and to replenish the ranks of the service. — *Leo D. Kluger, WB2TRN, Recruitment Program Manager, ARRL*

HAM IN SPACE

Another event this fall that is providing a great deal of excitement is the upcoming STS-9 mission. During the flight of the Space Shuttle *Columbia* (scheduled for launch on October 28), Dr. Owen Garriott, W5LFL, a NASA mission specialist, will attempt to make contacts from space via 2-meter fm. The actual number of contacts will be limited because of the small amount of operating time he will be allowed, but there is no reason we can't all listen.

This will be a great opportunity to introduce someone to the wonders of Amateur Radio. For the first time in history, a radio amateur will be operating outside the Earth's atmosphere. Many of us who were not around during the pioneering days of Amateur Radio now have a chance to help break ground in this new frontier!

We are doing all we can to ensure that Dr. Garriott's activities will not go unnoticed by the general public. We expect that his activity will generate a surge of interest in Amateur Radio. As instructors or sponsors of Amateur Radio courses, you can now take advantage of a ready-made publicity campaign. Though most fall classes will have started by the time the STS-9 mission is underway, you will still be able to use this event to your advantage. If you begin now and schedule a media campaign to coincide with the mission, you will get commitments from those persons interested in your next class. This certainly is not the optimum situation, but it is effective nevertheless. A short note as a reminder before classes start will help to keep interest high.

As part of your media campaign, you'll want to schedule a showing of *Amateur Radio's Newest Frontier*, a videotape produced and narrated by NBC Science Editor Roy Neal, K6DUE. This videotape describes Dr. Garriott's involvement with Amateur Radio and his plans for operation from space. The tape is available in VHS format (with accompanying promotional material) from ARRL Recruitment Program Manager Leo D. Kluger, WB2TRN, to clubs that will make a commitment to showing the material to youth or other general-interest groups. Broadcast-quality 3/4-in. U-Matic copies for television or cable use are available from ARRL Public Information Coordinator Peter O'Dell, KB1N.

The Training Branch is standing by to help. We can provide the materials you need to get your course off the ground. We have the instructor guides, code tapes and slide sets to make your course a success. But the hardest part of any course is to nurture the interest of your students. The ability to more than simply interest a student can make the difference between someone who will let his or her Novice license go to waste in a desk drawer or a person who will upgrade all the way to Extra.

HROTR and STS-9 are two exceptional opportunities to show off our fun and exciting hobby. Keep the momentum going and take advantage while you can. Need more help? Contact the Club and Training Department and let us help you get started.

*ARRL Training Program Manager

Hamfest Calendar

By Marjorie C. Tenney,* WB1FSN

Arizona: The Arizona Repeater Assn. presents HAM-COM '83 Saturday, Oct. 22, at the Edelweiss Chalet, 1431 E. Dunlap, Phoenix, from 7 A.M. to 3 P.M. — a ham-and-computer swap meet featuring commercial exhibits and computer demonstrations. Indoor and outdoor booth space available. Tailgate swap space $1. Talk-in on 34/94. Free admission. For further info, contact Wayne Willett, WB9VMP, 7733 W. Wagoner, Peoria, AZ 85345, tel. 602-938-7132.

Connecticut: Tri-City ARC Auction: Oct. 29, at St. James Parish Hall, Poquonock, 1½ miles east of Rte. 12 and Rte 2A. Setup at 9 A.M.; auction from 10 A.M. until sold out. Food available. Admission free. Bring your equipment to be auctioned. Talk-in on 146.73, 67 or 94 repeaters. For further information, call WA2RYV, tel. 203-848-9670.

Connecticut: The Southcentral ARA (SCARA) will hold its 4th Annual Electronics Show and Flea Market on Sunday, Nov. 12, in the North Haven Recreation Center on Linsley St., North Haven. The show will feature the latest in ham radio, computer, and domestic electronics and software. Free technical seminars will include state-of-the-art ATV, and easy homemade pc-board techniques. The Connecticut Section ARRL leadership will be present for information and related programs. New this year is a Christmas/Chanuka gift bazaar featuring unusual nonelectronic gifts for the entire family. Admission for all events all day is $1.50; children under 12 free with an adult. Tables are $7 in advance, $10 at the door, but available only in advance for the gift bazaar. Doors open at 8 A.M. for vendors, 9 to 3 for the show. Food available all day. A bake sale will also be held. Checks should be made payable to "SCARA" and sent to Ed Goldberg, WA1ZZO, 433 Ellsworth Ave., New Haven, CT 06511. Send s.a.s.e. for confirmation, directions, etc. Call 203-773-0646(H) or 203-852-7876(W) for further information.

†**Georgia:** The Amateur Radio Club of Savannah will sponsor a hamfest on Saturday, Oct. 22, from 9 to 4, and Sunday, Oct. 23, from 9 to 3, at the National Guard Armory on Eisenhower Dr., Savannah. Admission is $2 for adults; children under 12 free. Tables are $7 for the first table, which includes one admission ticket, and $5 for each additional table. Dealers, flea market, ARRL, refreshments and plenty of free parking. Talk-in on 37/97 and 28/88. For further information, write to ARC of Savannah Hamfest, P.O. Box 13342, Savannah, GA 31416.

Georgia: The Alford Memorial Radio Club, Inc., is hosting its 11th Annual Hamvention at beautiful Stone Mountain Park, Stone Mountain, Nov. 5 and 6. Hours are 9 A.M. to 5 P.M. Saturday and from 9 A.M. to 3 P.M. Sunday. FCC exams, seminars, dealers, gigantic flea market, free parking. Admission fee of $3 includes Saturday night cookout for the entire family and variety entertainment. Talk-in on 16/76. Camping and other amusements available at the park. For further details, send an s.a.s.e. to Lew Howard, W4LHH, 4132 Creek Stone Ct., Stone Mountain, GA 30083, or call him at 404-292-5469.

Illinois: The Chicago Citizens Radio League 2nd Annual CCRL Hamfest is Sunday, Oct. 16, from 7 A.M. to 2 P.M., at American Legion Post 21, 6040 N. Clark St., Chicago. Admission is $1 in advance, $1.50 at the door; $2 per table. Talk-in on 145.03 simplex. For information, write to John Ibes, KA9FUI, 2934 N. Mobile, Chicago, IL 60634, or Fred Marlette, KA9FUO, 1851 W. Chase, Chicago, IL 60626.

Illinois: Waukegan Squadron, Civil Air Patrol, will hold its third annual hamfest at Lake County Fairgrounds, Rtes. 120 and 45, Grayslake, on Saturday, Oct. 29, from 7 A.M. to 5 P.M. Large indoor flea market, cafeteria. Tables $5. Admission $3. Talk-in on 52. For further info, send an s.a.s.e. to Civil Air Patrol, 637 Emerald St., Mundelein, IL 60060.

Indiana: The Hoosier Hills Ham Club will have its 22nd Annual Hoosier Hills Hamfest, Sunday, Oct. 9, at the Lawrence County 4-H Fairgrounds, 4 miles southwest of Bedford, on U.S. Hwy. 50. Registration is $3 per person; swap shop $2.50; bring your own tables. Talk-in on 13/73; set up on 3910 kHz. Free fish fry, campfire, entertainment, coffee, and overnight camping on Saturday, Oct. 8. Gate will open at 10 A.M. Saturday for campers and flea market setup (registration required). Food served on the grounds on Sunday. For further information, contact, Dick Reistter, KA9JTZ, Secretary, Hoosier Hills Ham Club, Box 891, Bedford, IN 47421.

Kentucky: The Owensboro ARC will be holding a ham/computer fest Oct. 29 at the Owensboro National Guard Armory from 9 A.M. to 4 P.M. Since Owensboro is the Barbecue Capital of the world, the fest will feature a great barbecue, an indoor flea market, forums and women's activities. All tables, while they last, $1; admission $3. Free parking. Talk-in on 81/21. If you like Amateur Radio, barbecue or computers, y'all come. For more information, contact Bob Darling, P.O. Box 231, Owensboro, KY 42302.

†**Louisiana:** Amacom '83, sponsored by the Jefferson ARC, will be held at the Delgado Community College, City Park Campus, New Orleans, Saturday, Oct. 15, from 9 A.M., and Sunday, Oct. 16, from 9 A.M. to 5 P.M. Admission: advance, including two tickets, $5; at door, no ticket, $5; family member, no ticket, $1, additional tickets, six for $5. Activities include forums on MSOs, RBBS, CB radio conversion, ssb audio processing, DXing, Novice introduction and transistor-amplifier design; expanded flea market; meetings of QCWA, MARS and ARRL; FCC exams; tours of New Orleans; and a banquet. Talk-in on W5GAD/R, 147.285/885 and 449.0/444.0. Info and advance reservations from P.O. Box 73665, Metairie, LA 70033, tel. 504-887-5022. This is the 10th consecutive Amacom, or New Orleans hamfest-computerfest sponsored by Jefferson ARC.

Maryland: The Columbia ARA will hold its 7th Annual Hamfest at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Rte. 144, 1 mile west of Rte. 32) on Sunday, Oct. 23, from 8 A.M. to 3 P.M. Admission is $3. Indoor tailgating and tables are $6 additional. Outdoor tailgating is $3 additional. Food is available. Talk-in on 147.735/135 and 52. For table reservations and information, write to Ed Wallace, K3EF, 9905 Carillon Dr., Ellicott City, MD 21043.

Massachusetts: The 19-79 ARA of Chelsea will hold its annual fall flea market on Sunday, Oct. 16, from 11 A.M. to 4 P.M. (sellers admitted at 10 A.M.), at the Beachmont VFW Post, 150 Bennington St., Revere. Admission is $1. Sellers tables are $6 in advance, $8 at the door if tables are still available. Talk-in on 19/79 and 52. For table reservations, send check to 19-79 Amateur Radio Assn., P.O. Box 171, Chelsea, MA 02150.

Massachusetts: Oct. 23 is the date of the Wellesley ARS annual fall tailgate flea market, to be held at the Wellesley High School, Rice St. (just off Rte. 16), Wellesley. The flea market will start at 9 A.M., and admission will be $1 per person, whether buying or selling. Plenty of space available for sellers. Talk-in on 63/03. For more information, contact Nels Anderson, K1UR, tel. 617-872-5259.

Massachusetts: The Framingham ARA, Inc., will hold its 9th annual fall flea market on Sunday, Oct. 30. This is the largest indoor ham flea market in New England! Because of the overwhelming success of our previous flea markets, we will remain in the *new* facility — the Framingham Civic League Bldg., 214 Concord St. (Rte. 126), downtown Framingham. Doors open at 10 A.M. (sellers may begin setup at 8:30). Admission is $2 and tables are $10 — pre-registration required. Talk-in on 75/15 and 52. Radio equipment, computer gear, food in-house, bargains galore! Contact Ron Egalka, K1YHM, 3 Driscoll Dr., Framingham, MA 01701.

Massachusetts: The 1983 "New England DXCC Dinner" will be held Nov. 5 at the Concord Lodge of Elks, Baker Ave., W. Concord (near Rte. 62 and Rte. 2). Action begins at 2 P.M. with a variety of DX talk and slide programs. Charge for the afternoon session is $2. Cocktail hour is at 6 P.M.; a seven-course family-style dinner featuring roast beef is at 7:30 P.M. Banquet speaker is VKØCW (K8CW). Cost for the evening is $14.95. Reservation forms will be mailed in September. Contact Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776.

Michigan: The Central Michigan ARC and Lansing Civil Defense Repeater Assoc. will hold their annual Ham Fair on Sunday, Oct. 9, from 8 A.M. to 3 P.M., in Grand Ledge, at the high school, 7 miles west of Lansing. Amateur Radio equipment, antennas, computers, publications, demonstrations, films, cafeteria, dealer sales, swap shop, and handcrafted items. Donations are $2.50 for adults; tables are 75¢/foot. Additional information from Rowena Elrod, KA8OBS, 111 Lancelot Pl., Lansing, MI 48906, tel. 517-372-5462, or from Hamfair 83, P.O. Box 18044, Lansing, MI 48901.

Michigan: A hamfest and electronic flea market, sponsored by the Ham 10 FM Club of Kazoo will be held on Sunday, Oct. 23, 10 A.M. to 4 P.M., at the Kalamazoo County Fairgrounds, Kalamazoo. Dealer setup at 9:30 A.M. Over 400 four-foot table spaces. Rooms to accommodate over 3000 people. Refreshments available. Four-foot table rental: $3 at the door, $2.50 in advance. Trunk sales are $2 if tables sold out. Admission tickets are $2.50 at the door, $2 in advance. Talk-in on 19/79, 52 and 29.500. For table reservations and tickets, send remittance and an s.a.s.e. to Ham 10 FM Club of Kazoo, Ken Losey, KA8RUA, 2825 Lake St., Kalamazoo, MI 49001.

Michigan: RADAR Seventh Annual Hamfest, Flea Market and Swap will be held Sunday, Nov. 6, from 8 A.M. to 3 P.M. (dealers, 7 P.M. Saturday and 6 A.M. Sunday). Admission $2. Reserved tables must be paid for in advance — $1 per foot, 8-foot tables. Send check or money order to RADAR, Inc., P.O. Box 386, Taylor, MI 48180. Talk-in on 93/33 and 52. For information, call Bea Johnson at 313-561-3911.

†**North Carolina:** The CARS 5th annual hamfest, sponsored by the Cabarrus ARS, will be held at the Boy's Club, Spring St., N.W., Concord, on Sunday, Nov. 6. Doors open from 9 A.M. to 5 P.M. Setup at 7 A.M. Advance admission is $2.50; at the door $3.50. Amateur forums, ARRL booth, flea market, food available. Talk-in on 146.055/655; parking info on 52. For further information and advance tickets, contact Charlie Menius, KD4WB, P.O. Box 1093, Kannapolis, NC 28081.

Ohio: The Northwest Ohio ARC will sponsor the 9th annual hamfest on Sunday, Oct. 9, at the Allen County Fairgrounds, Lima (Exit 125/126 east, 1 mile from I-75). Admission is $3 in advance, $3.50 at the gate. Tables $6; half tables $3.50. All advanced sales must be accompanied by a check. Gates open at 6 A.M. Free camping; electrical hookup $7. For information/reservations, write to N.O.A.R.C., Box 211, Lima, OH 45802. Talk-in on 07/67, 63/03 and 52.

Ohio: The Marion ARC will hold its 9th annual "Heart of Ohio Ham Fiesta" on Sunday, Oct. 30, from 8 A.M. to 4 P.M. at the Marion County Fairgrounds Coliseum. Large parking lot, food. Tickets are $3 advance, $4 at the door. Tables $5. Check-in on 52, 90/30 or 223.34/224.94. For information, tickets or tables, contact Paul Kilzer, W8GAX, 393 Pole Lane Rd., Marion, OH 43302, tel. 614-389-5573.

Pennsylvania: The Irwin Area ARA will sponsor a Swap & Shop on Saturday, Oct. 15, at the Circleville, V.F.D., just off US Rte. 30, 3.5 miles west of Pennsylvania Turnpike, Exit 7. Talk-in on 925/325 and 52. For further information, contact Rick Jackson, N3DAA, 39-D Lower Boone Dr., Turtle Creek, PA 15145, tel. 412-829-1953.

Pennsylvania: The Red Rose Repeater Assn. and Sercom, Inc., will sponsor the Red Rose Computerfest on Sunday, Oct. 23, from 9 A.M. to 4 P.M., featuring computers and Amateur Radio equipment, at the Guernsey Sales Pavilion (East of Lancaster, at the junction of Rtes. 30 and 896). Admission $3; women and children under 14 free. Tables available inside by reservation; tailgating $2. Talk-in on 615/015, 01/61 and 52. For more information, contact the Computerfest

*Convention/Travel Coordinator, ARRL
†ARRL Hamfest

Committee, P.O. Box 5029, Lancaster, PA 17601.

†**Pennsylvania:** The 15th annual hamfest sponsored by the Foothills ARC, Inc., will be held at St. Bruno's Church, South Greensburg, from 8 A.M. to 3 P.M. on Nov. 5. Admission is $2. Refreshments and food. Talk-in on 07/67. For further information, contact Foothills ARC, Inc., P.O. Box 236, Greensburg, PA 15601.

†**Texas:** The Austin ARC will have its annual swapfest at the Manchacha Firehouse, Manchacha, just south of Austin, starting at 8 A.M. on Oct. 22. No charge or fees. Tables available at no charge. Barbecue dinner available by reservation only. Contact Edward L. Linde, N5DOT, 3900 Sorrel Cove, Austin, TX 78732.

[Attention those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.]

Note: Sponsors of large gatherings should check with League Hq. for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance. QST

Coming Conventions

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

TENNESSEE STATE CONVENTION
October 22-23, Chattanooga

The ARRL Tennessee State Convention and Hamfest Chattanooga will be held October 22-23 at the Chattanooga State Technical Community College, Amnicola Highway, Chattanooga.

Activities will include forums, contests and nonham activities. The college cafeteria will be serving breakfast and lunch both days. Ramada Inn-East Ridge (I-75 & US 41) will be offering special Hamfest rates. A Hospitality Party will be held Saturday, October 22, at the Ramada Inn. Phone 615-894-6110 for reservations, and be sure to ask for "Hamfest Chattanooga" rates.

Inside dealer area and inside and outside flea market spaces are available. For further information, contact Hamfest Chattanooga, P.O. Box 3377, Chattanooga, TN 37404, or call Nita Morgan, N4DON, at 404-820-2065. QST

Club Corner

Conducted By Sally O'Dell,* KB1O

A CONTEST? YES!

The season begins this fall. It is time for a contest, and your club is being asked to participate in this event! The new Special Service Club program for affiliated clubs does not yet have a permanent logo to symbolize all their activities. Why don't you find the people in your club who are artists and draw their attention to this information? We need a design or a symbol to rally around. This logo will be used by Special Service Clubs on their way to the local outing, picnic, club meeting or emergency.

Your work will be judged on how well it symbolizes Amateur Radio clubs, expresses superior achievement and is aesthetically pleasing. The design must include some specific details. The ARRL logo must be in a prominent location. You must spell out the words "Special Service Club." The design must be legible when reduced and embroidered in a size of roughly 4-6 inches.

All original designs must be submitted on 8½- × 11-in. white paper to Special Service Club Logo Contest, ARRL Hq., 225 Main St., Newington, CT 06111, and must arrive at Hq. no later than January 15, 1984. Don't forget to include your name, address and call sign with your submission. From Hq., all designs will go anonymously to the Membership Affairs Committee and finally to the Board of Directors for a decision. Their decision will be final.

The design artist will receive an engraved plaque and a cloth-bound *Handbook*, and the design will have photo coverage in *QST*. This contest is for ARRL members *only*, and all entries become the property of the ARRL. They cannot be returned. Enter your logo today. Feel the excitement and pleasure when you are notified that *your* design will be the one used by every Special Service Club in the country!

STS-9 AND YOUR CLUB'S PARTICIPATION

The STS-9 launch date has been postponed until October 28 (see Aug. and Sept. *QST* for details on the mission). Is your club planning to operate? If so, you are preparing for the best public relations event your club could find for many years. On this mission, Dr. Owen Garriott, W5LFL, will carry the first Amateur Radio transceiver into space, and your club may be able to talk to him! Imagine what it will feel like to speak to a man in space as you sit in the club shack or at a local school.

Just remember that you are responsible for some advance steps if you are going to successfully promote this adventure. One of the most important areas of involvement is good press coverage. Here are some tips on how to get good media response:

1) Decide on a plan of action among your club members, then spread the word to all hams in town.

2) Choose someone in the club who can best handle the club Public Information Assistant (PIA) job. Then, contact your Section Public Information Officer (PIO), requesting that this be made an official ARRL appointment.

3) Locate all possible media outlets, such as newspapers, radio, local cable-TV stations and company newsletters.

4) Send to the ARRL Hq. Public Information Office a list of all reporters and editors, indicating the type of organization they represent. Hq. will send you a press kit for *each* outlet.

5) Distribute your press kits well before the launch date (preferably as soon as you receive them).

6) Follow through.

One club, Marissa (Illinois) ARC, is preparing for the STS-9 event by scheduling an antenna workshop at a local plant. Many of the 188 members made turnstile antennas (See Aug. 1983 *QST* p. 50, for construction details) in preparation for the flight. Then, with antennas in hand, they are ready to show ARRL's new videotape to the local schools one day, and either try to make a contact or listen to others make contacts the next day. (This club plans a "workshop" every other month. Club members really anticipate these building sessions.)

You don't have to make contacts to participate. Anyone who has a confirmed contact *or* hears a contact may request one of the specially designed QSL cards prepared for this occasion. Send all reception and confirmed contact reports to ARRL, STS-9, 225 Main St., Newington, CT 06111.

Plan your efforts to consist of a minimum of three people. One person does the actual operating, a second keeps track of equipment, antenna location, etc., and the third keeps the press informed of what is happening at all times. This three-person team contains the minimum number of people that will ensure good operating and good press coverage.

Your contact with local schools and youth will help them become more involved in a topic that will be of interest to them. Your contacts with youth groups or adults can be a potential source of future club members and therefore, can help your club to grow. Use this Shuttle launch as an opportunity to schedule your next class. Plan one for January with the Shuttle PR as advance notice to all. Your club is ready to help others become involved in our great hobby — Amateur Radio QST

*Club Program Manager, ARRL

SSC Kudos and Contacts

Congratulations to the League's newest Special Service Clubs. These clubs are recognized for extended efforts on behalf of Amateur Radio and service to their communities. For further information on these clubs, contact them at these addresses.

Great Bay Radio Association
c/o P.O. Box 911
Dover, NH 03820
Club membership — 48

Hancock Amateur Radio Club
c/o 614 N. State St.
Greenfield, IN 46140
Club membership — 28

Madison County Amateur Radio Club, Inc.
c/o 921 Isabelle Dr.
Anderson, IN 46013
Club membership — 34

Shelby County Amateur Radio Club
c/o P.O. Box 815
Alabaster, AL 35007
Club membership — 47

Yellowstone Radio Club
c/o 2626 Burlington Ave.
Billings, MT 59102
Club membership — 61

Charles Fields, Sr., K3IFB, was honored recently by members of his club (Mountain ARC, Cumberland, Maryland). Charles was presented with the club's Ham of the Year award for his involvement in numerous club and Amateur Radio activities. Joyce Smith, N3BLP, club secretary, made the presentation.

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

NASA OKAYS RADIO FOR AMATEUR SPACE OPERATION

The radio built for use by Astronaut Owen Garriott, W5LFL, during the nine-day STS-9 mission (scheduled for launch on October 28) has passed NASA specifications with flying colors and has been accepted for amateur operation aboard the Space Shuttle *Columbia*. The radio, a 2-meter fm hand-held transceiver, was specially built by members of the Motorola ARC in Fort Lauderdale, Florida, who delivered it to the Kennedy Space Flight Center for testing on August 19, 1983.

In a related item, two frequencies have been added for the amateur operation during the STS-9 flight. They are 145.575 (space-to-earth) and 144.990 (earth-to-space). See Amateur Satellite Program News, Sept. 1983 *QST*, for the remainder of operating frequencies, and recent past issues of *QST* for more details on working W5LFL during this historic flight.

Who built the radio for Owen Garriott for the STS-9 mission? A proud team of volunteers who are employed by Motorola at the Ft. Lauderdale, Florida plant. This combination of engineering talent hand-built the radio and designed and built the interface equipment. Seated is Motorola ARC President WA4ZLS. Standing (l-r) are WB4TTA, Project Manager WA4KXY, WB4BFS, WB4YUC and W1SL. Not present for the photo was Ruth Fike. *(photo courtesy Motorola)*

AMSAT-OSCAR 10 Status Report

Operation of the Mode B transponder has provided excellent communications for all users. Most experienced satellite operators are very happy with the transponder performance, but everyone is surprised by the time delay. The delay is enough to make it nearly impossible to monitor your return signal. This is a small price to pay for the increased communication time and distance. Receiving is the name of the game, so make an effort to get the best receiving setup possible. If you receive the satellite's signals and they are running 6 to 7 "S" units above the noise, you are getting very close to perfection.

The most significant components of your receiving system should be a gain antenna with switchable circular polarization, a low-noise preamplifier (2 dB or less) and a low-loss coax with proper connectors. If your feed line is going to be in excess of 50 feet, consider mounting the preamp at the antenna.

It is now possible to have multi-country, intercontinental roundtables or nets commonplace. It may be a little strange at first, but it is unlike any operating you have ever done. It is possible to QSO 10 to 15 countries in just a few hours, leave your rig and come back in a few hours and do the same thing again. What is real exciting is having nearly half the world's Amateur Radio operators within reach, all at the same time.

Activity will gradually increase as the news of the OSCAR 10 satellite's potential is realized. Even though you may have no experience with satellites, now is the time to get started. There is good reading in April, May, August and September *QST*, and AMSAT has two excellent publications available — *ORBIT* magazine, which comes with AMSAT membership, and *ASR*, the Amateur Satellite Report. All these publications should give you a good working knowledge of OSCAR 10 operation.

Keplerian Elements for AMSAT-OSCAR 10

Amateurs using computers to track AMSAT-OSCAR 10 will only have to update the orbital parameters in their programs a few times each year. This set provided by AMSAT is very accurate and can be used for many months.

Epoch Time:	83223.48180313
Thur. Aug. 11, 1983,	11:33:48 UTC
Element Set:	41
Inclination:	26.2024 Degrees
RA. of Node:	246.8822 Degrees
Eccentricity:	0.6039871
ARG. of Perigee:	193.5343
Mean Anomaly:	137.3886 Degrees
Mean Motion:	2.05851948 Rev/Day
Decay Rate:	-4E-08 Rev/Day
Epoch Rev:	121
Semimajor Axis:	26105.861 Kilometers
Anom. Period:	699.53187 Minutes
Apogee:	35495.548 Kilometers
Perigee:	3960.341 Kilometers
Translate Freq:	581.0050 MHz
Beacon:	145.88100 MHz

What Is a Transponder?

The transponder aboard AMSAT-OSCAR 10 is made of a receiver and a transmitter operating simultaneously on different frequencies. As with terrestrial repeaters, the receiver is connected to the transmitter. The big difference is that, for the terrestrial repeater, the signal from a single user is demodulated in the receiver, and then remodulates the transmitter. Thus, only a single 5-kHz fm signal can work through the repeater. On the other hand, satellite transponders are designed to have a moderately wide passband (in the order of several hundred kilohertz for OSCARs), so many stations can share the use of the "bird." The satellite transponders are really just frequency translators with linear power amplifiers.

Another difference between a typical fm repeater and an OSCAR transponder is that stations transmitting through the transponder are obligated to use linear modes, such as ssb and cw, rather than fm. The reason for this becomes obvious when one electric power is limited to a few dozen watts for the entire spacecraft. It doesn't make much sense to use power-gobbling modes, such as fm (F3) and a-m (A3A), since these modes consume power even when there is no modulation. Rather, ssb (A3J) and cw (A1) are the accepted modes, since they dissipate power only when there is modulation or keying.

A final difference between a typical terrestrial repeater and an OSCAR transponder is that most terrestrial fm repeaters receive and transmit simultaneously on the same band. To do this, the repeaters must be provided with extraordinary filtering to prevent the strong local transmit signal from overloading the local receiver. Large duplexers and separate sites for transmit and receive antennas are often employed to overcome desensitization problems. Neither of these problems is suitable on a spacecraft, of course, since the weight and space are costly commodities on satellites. Most spacecraft are smaller than a typical automobile, so the transmit and receive antennas cannot be separated by more than a few feet. Therefore, the amateur satellites have adopted the same solution used on commercial satellites: Receive and transmit simultaneously on widely separated frequencies (different bands). With the new OSCAR, two transponders will be available that offer two distinct uplink-to-downlink combinations. (from *ASR* 60/61, Aug. 1, 1983)

AMSAT Annual Meeting

AMSAT will hold an Amateur Radio satellite symposium in conjunction with its annual meeting on Saturday, November 12, 1983. Located at the Johns Hopkins University Applied Physics Laboratory, just off I-95, between Baltimore and Washington. The planned programs include: How to get on the new OSCAR 10 satellite, Tracking OSCAR 10 with/without a computer, A report on the W5LFL Space Shuttle operation, PACSAT, and much, much more! Admission is free, but advance reservations are required. For further information and reservations, contact AMSAT, P.O. Box 27, Washington, DC 20044, or call 301-589-6062.

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.

*OSCAR Program Manager, ARRL

Results, 1983 ARRL International DX Contest

By Mark J. Wilson,* AA2Z and Bill Jennings,** K1WJ

If it wasn't obvious before that the sunspot cycle is on the down side, this year's ARRL International DX Contest brought it into focus with crystal clarity. The ole reliable 10-meter band — which was so outstanding last year and good even during the December 1982 10-Meter Contest — finally went flatter than a pancake. However, the low bands are showing signs of life. Guess it's time to take down the monster 10-meter stacks and put up a big band-stompin' 40-meter Yagi, some Beverages and a bobtail curtain for 80.

Of course, 10 meters wasn't totally dead. The JAs were plentiful on phone; good multipliers from Africa, Oceania, North America and South America abounded on both modes; the Europeans worked some W/VE types (especially W4s and W5s); and the South American and Caribbean stations had the undivided attention of most of the U.S. amateur population on the band those weekends.

With declining sunspots, the number of logs received is also declining. This year marked the first time since 1977 that the number of entrants dropped below 3000. This year, we received a grand total of 2942 — 1463 for code and 1479 for phone. Not quite last year's 3705, this total is nevertheless respectable in light of punk conditions.

W/VE Highlights

This year's W/VE single-op cw plaque turned out to be one of the most hotly contested awards of the contest. Veteran N2LT, who says he's been trying to win this event for 20 years, fought off some stiff competition from Greg, W1KM, to win with an outstanding multiplier total. Congratulations, Lew. Does this mean you have an antenna farm for sale? Most of the other Top-Ten call signs are familiar. Note that N4AR and N8II are the only non-Northeasterners on the list.

Compared to the cw results, the phone single-op Top-Ten is a mixed bag. Rich, N6KT, operated AI6V to top position, beating second-place-finisher Jeff, K1ZM, at W1ZM by a healthy 350K. This is the first time since 1976 that a West Coast station has won this event. Rich played the game by the books, winning by sheer QSO totals, while Jeff came close to breaking the 400 mark in multipliers. Only four of the Top Ten phone finishers came from the Northeast, as the Midwest and West Coast ops turned in outstanding scores.

N5AW and W2TZ set the pace in the low-power competition this year. These two guys show up every year and usually share top honors. This year, N5AW came in first on cw, while W2TZ grabbed the phone plaque. Looking at the single-op QRP scores, it's apparent that the south was the place to be. AA4AK led the small but dedicated pack on cw, while WB4BBH cleaned up on phone. With declining sunspots, the low-power and QRP categories will require more and more patience. It's refreshing to see that some people still know how to work DX without a kilowatt amplifier.

This year, for the first time since the introduction of single-band categories, we have included a table showing the top single-band scores. These single-band listings give clues about how the various bands were in different parts of the country. For instance, the top 160- and 80-meter scores generally come from the East because of the plentiful European contacts and multipliers. The top scores by VE1YX and W8LRL (160) and K1PT and KR2N (80) show that this year in no exception. On 40-meter phone, the big Eastern multiplier totals are no match for the barrage of West Coast JA QSOs, as demonstrated by N6BV. Down at 7.001, however, it's a different story. The close race between N5EA at NA5R and K1UO in Maine was decided by a modest number of QSOs; the multiplier totals are virtually identical. As usual, 20 was anybody's guess. N2PP and KI3P/1 showed a slight Eastern advantage on phone, while K8NA and other Midwesterners showed an advantage on cw. On 15, what can we say? WØZV moved down a band after last year's 10-meter phone win. Bill spent this year's time wisely and brought home not one, but two 15-meter plaques. Of course 10-meter scores are down dramatically. WB4TDH's winning cw score is but a fifth of last year's top score (not that Andy didn't work as hard), while WA6DBC's winning total, great for this year, is a far cry from last year's 676K.

The multioperator classes underwent a major reorganization this year. Based on extensive membership input, the ARRL Contest Advisory Committee voted to return the multi-single class to one transmitter only and to create a new intermediate multiop class that allows the use of two transmitters simultaneously. Comments received with the multiop, single transmitter and multiop, two transmitter logs were positive. Frankford Radio Club's very own W3BGN pulled a neat trick this year and won the multi-single class on both modes. Nice job, Steve! K5RC, the former multi-single wizard, orchestrated the top two-transmitter multi cw effort this year. The competition wasn't even close. W4QAW narrowly squeezed past K2TR for the two-transmitter phone award; both stations submitted outstanding scores. Monster-multi N2AA turned the unlimited multi-multi competition into a rout, taking both modes by about 600K. K1OX finished second and K2UA took third on both modes. How's that for consistency?

DX Highlights

North and South America dominated the DX single op competition this year. On cw, N6TJ operated as 8P6J, cleanly whipping all comers.

1984 ARRL International DX Contest

CW	Phone
February 18-19	March 3-4

These four members of the Guernsey ARS helped to operate station GU3HFN in a multi-single phone effort (l-r): GU6JSC, GU6TDE, GU6RIS and GU6SYK.

*Assistant Communications Manager, ARRL
**Communications Assistant, ARRL

DX Plaque Winners

Phone

Category Single Operator	Winner	Donor
World	ZF2FL (N6RJ)	North Jersey DX Assn.
Africa	CN8CO (W3EMH)	John Shinall, K4BYK
Asia	JI1QPU	Acadiana DX Assn.
Europe	EA2QU	Murphy's Marauders
North America	V3CH (KØGU)	Chod Harris, VP2ML
Oceania	KH6ND	Ray Stone, W5RBO
South America	P42J (W1BIH)	ARRL
1.8 MHz	T32AF (KH6UR)	Dana Atchley, W1CF
3.5 MHz	FM7WS	Robert Peterson, W3YY
7 MHz	FM7CD	Alfredo H. Caviedes Vega, HC1HC
14 MHz	YT3A (YU3SO)	Don C. Wallace, W6AM
21 MHz	VP2MKD (K9MK)	ARRL
28 MHz	CP6EL	Mike Badolato, W5MYA
QRP	TG9GI	Gerry Griffen, W8MEP
Multioperator Single Transmitter		
World	KP4BZ	Delta DX Assn.
Africa	ED9EA	David Vogel, NL7P
Asia	JG1ZUY	ARRL
Europe	I5MPN	Metro DX Club
North America	XE1MDX	Nick Lash, K9KLR and Phil Buzolitz, W9SC
Oceania	H44SH	Carl L. Smith, WØBWJ
South America	OA8CW	Hamfesters Radio Club
Multioperator Two Transmitter		
World	VP5KMX	ARRL
Africa	CN8CX	ARRL
Asia	JH7YJF	ARRL
Europe	4N9YU	ARRL
North America	KL7RA	ARRL
South America	YV3BRF	ARRL
Multioperator Unlimited		
World	VK2WU	Gloucester County ARC
Africa	ZS6WB	Dan Robbins, KL7Y
Asia	JA2YKA	ARRL
Europe	I3EVK	Tom and Joy Middleton, WB4CKY
North America	—	Megahertz Manor Maniacs
Oceania	—	Dale Meyers, W4BIM/3D2DM

DX Plaque Winners

CW

Category Single Operator	Winner	Donor
World	8P6J (N6TJ)	North Jersey DX Assn.
Africa	SMØGMG/CT3	San Diego DX Club
Asia	JA7FWR	Alamo DX Amigos
Europe	I2UBI	Clarke Greene, K1JX
North America	VP2EU (K8MR)	Peter Grillo, KNØE
Oceania	KH6ND	Ray Stone, W5RBO
South America	P42J (W1BIH)	Herb Twitchell, W6BL
1.8 MHz	F8VJ	Jim Dionne, K1MEM and Bill Poellmitz, K1MM
3.5 MHz	CT2AK	Columbus ARA
7 MHz	9Y4VU	Kansas DX Assn.
14 MHz	OH8AV (OH8PF)	Bencher, Inc.
21 MHz	ZY5X.FR	Southern New England DX Assn.
28 MHz	LU5DVO	ARRL
QRP	JA1MCU	ARRL
Multioperator Single Transmitter		
World	AH6BK	George Schultz, WØUA and John Brosnahan, WØUN
Africa	5Z4CM	Red Stick DX Assn.
Asia	UKØCAA	Red Stick DX Assn.
Europe	IØMGM	Mile Hi DX Assn.
North America	TI2BEV	Tom Taormina, K5RC
Oceania	ZL2AH	ARRL
South America	4K1D	ARRL
Multioperator Two Transmitter		
World	VP5FUX	Tom Frenaye, K1KI
Asia	JA3YKC	ARRL
Europe	SMØAJU	ARRL
North America	KL7IIA	ARRL
Multioperator Unlimited		
World	YU1EXY	*QRZ DX*
Asia	JA7YAA	Dr. and Mrs. Charles J. Ellis
Europe	YU7BCD	W2PV Memorial — Schenectady ARA
North America	—	Willamette Valley DX Club

United States and Canadian Plaque Winners

Phone

Single Operator	Winner	Donor
All Band	AI6V (N6KT)	Frankford Radio Club
1.8 MHz	VE1YX	ARRL
3.5 MHz	KR2N	Lance Johnson Engineering — KØCS
7 MHz	N6BV	Dave Thompson, K4JRB/K5MDX
14 MHz	N2PP	Mark Michel, W9OP and Richard Loehning, N9ACP
21 MHz	WØZV	John Allyn, W7XR
28 MHz	WA6DBC	Larry Emery, K1UO
QRP	WB4BBH	Rochester DX Assn. — AJ7S
Multioperator		
Single Transmitter	W3BGN	The VP2E Contest Operators
Two Transmitter	W4QAW	George Taft, W8UVZ and Donald Lenard, WB8LDH
Unlimited	N2AA	Buffalo Area DX Club — W2RR

CW

Single Operator	Winner	Donor
All Band	N2LT	Frankford Radio Club
1.8 MHz	W8LRL	W1TX Memorial Trophy
3.5 MHz	K1PT	Northern Illinois DX Assn.
7 MHz	NA5R (N5EA)	Chuck Gullian, KØRF and George Schultz, WØUA
14 MHz	K8NA	Neenah-Menasha ARC
21 MHz	WØZV	Carl Luetzelschwab, K9LA
28 MHz	WB4TDH	Mike Badolato, W5MYA
QRP	AA4AK	Hollywood ARC
Multioperator		
Single Transmitter	W3BGN	The VP2E Contest Operators
Two Transmitter	K5RC	George Taft, W8UVZ
Unlimited	N2AA	Colorado Contest Conspiracy

Special Plaque Winners

Category Single Operator	Winner	Donor
World Combined Score	8P6J (N6TJ)	Yankee Clipper Contest Club
W/VE Highest Combined Total Multiplier (both modes)	W1ZM (K1ZM)	*The DX Bulletin*
Japan Combined Score	JI1QPU	Northern California Contest Club
W/VE Operator Combined Score	K1ZM	*National Contest Journal*
W/VE Low Power (cw)	N5AW	Wireless Institute of the Northeast
W/VE Low Power (phone)	W2TZ	Rochester DX Assn.
Great Lakes Division (phone)	WA8YVR	Livonia ARC
Fifth Call Area (cw)	KZ5M	W5GO Memorial - Red Stick DX Assn.
California (phone)	AI6V (N6KT)	Dave Bell, W6AQ
Texas (cw)	—	Dennis Motschenbacher, KZ5M
Texas (phone)	N5JJ	North Texas Contest Club
Caribbean Resident (phone)	NP4P	Arturo Gigante, HI8GB
Australia (cw)	VK3DXI	Jay Carr, W6FAY
Japan (cw)	JI1QPU	Tom Morrison, K5TM and Randy Thompson, K5ZD
Japan (phone)	JA1ELY	Western Washington DX Club
Israel (cw)	4Z4AB	Martin Hartstein, N6WW
Israel (phone)	4Z4AB	Martin Hartstein, N6WW
Scandinavia (either mode)	OZ1LO	John Lindholm, W1XX
Multioperator		
Caribbean Multi-single (cw)	TI2BEV	The YASME Foundation
Caribbean Multi-single (phone)	KP4BZ	Mike Badolato, W5MYA
West Coast Unlimited Multi-multi (phone)	W7RM	Morris J. Young, KN6M
California Multiop, Two Transmitter (cw)	N6TR	Southern California Contest Club
Most Improved Club (points per entry)	Southern California Contest Club	Steve Place, WB1EYI

K8MR, operating as VP2EU, took second, while perennials HH2VP and P42J battled it out for third. SMØGMG/CT3 is the lone African on the list, while KH6ND upheld Oceania's honor and I2UBI represented Europe.

On phone, we witnessed one of the closest races in a long time. N6RJ piloted ZF2FL to the top of the heap again, followed *very* closely by KØGU a.k.a. V3CH. 'CH had a couple of hundred more QSOs, but experience paid off as 'FL won it on multipliers. 8P6J (N6TJ) also turned in an excellent 6-meg-plus effort. Congratulations to all in the Top Ten boxes.

The single-band DX scores show that, while all continents can be competitive, North or South America is again the place to be. Note that the five 160-meter cw scores listed represent five different continents, and that most bands have big scorers from at least three continents.

Multi-single action on cw was hot and heavy between AH6BK and TI2BEV, while IØMGM managed a respectable score from Europe. On phone, North America swept this class, with ED9EA being the only across-the-pond station to break 3 million points. *Turks and Caicos* Islands must be the place to set up a two-transmitter, multiop effort, as both expeditions

Affiliated Club Program

Unlimited Category	*Score*	*Entries*	*CW Winner*	*Phone Winner*
Frankford Radio Club	52,636,200	96	N2LT	N2LT
Yankee Clipper Contest Club	43,914,834	96	W1KM	W1ZM
Potomac Valley Radio Club	26,188,287	62	N8II	N4MO
Medium Category				
North Texas Contest Club	15,899,430	35	N5TP	K5RX
Mad River Radio Club	14,786,434	33	K3LR	WA8YVR
Texas DX Society	8,507,493	18	KZ5M	N5JJ
Northern California DX Club	8,251,410	46	N6GG	K6HNZ
Rubber Circle Contest Club	6,492,120	12	N7TT	N7TT
Murphy's Marauders	6,434,739	27	K1TO	K1TO
Dixie DXers	2,716,008	10	NQ4I	NQ4I
Southeastern DX Club	2,686,167	7	KX4R	KX4R
Eastern Iowa DX Assn.	2,678,052	25	WØWP	KØCF
Southern California DX Club	2,474,273	17	N6AR	KM6B
Southern California Contest Club	2,315,046	6	—	—
Red Stick DX Assn.	1,900,791	7	W5XZ	W5XZ
Kansas DX Assn.	1,551,261	14	WAØTKJ	WAØTKJ
Western Washington DX Club	1,550,097	17	W6RR	W7BUN
Sheboygan Co. DX Assn.	1,473,816	3	—	—
Order of Boiled Owls of NY	1,313,510	3	K2LE/1	—
Ohio Valley ARA	1,239,984	14	W8JIN	W8JIN
Columbus ARA	1,086,033	18	W8LNO	W8LNO
Mile Hi DX Assn.	1,061,832	12	WØZV	WØZV
Rochester DX Assn.	1,043,742	8	—	W2TZ
South Jersey Radio Assn.	866,802	16	W2PAU	K2JLA
Mississippi Valley DX/Contest Club	830,136	5	—	—
South Florida DX Assn.	822,045	12	AA4CM	WB4MAI
Northern Ohio ARS	783,768	11	K8NA	W8ANM
Grand Mesa Contesters	781,515	10	KJØG	KØUK
Eastern Michigan ARC	289,095	13	K8JLB	K8DD
Long Island DX Assn.	144,537	7	W2AYJ	K2MFY
Local Category				
Central Virginia Contest Club	9,950,022	7	—	—
Kansas City DX Club	2,827,770	9	KBØG	—
Meriden ARC	1,646,058	10	KA1FGH	N1API
Greater Milwaukee DX Assn.	1,638,180	4	—	—
Ashtabula Co. ARC	1,296,570	9	N3BJ	—
Fraser Valley DX Club	1,265,196	8	VE7IN	VE7IN
Morton Area DX Assn.	1,216,101	9	K9ZO	K9MFI
Central Arizona DX Assn.	1,159,398	5	N7IR	—
Redwood Empire DX Assn.	871,746	5	K6ZUR	—
San Diego DX Club	815,658	7	N6ND	—
Gloucester County ARC	766,869	4	—	—
Grumman ARC	719,922	9	—	WB2FMP
Reading Radio Club	715,206	4	—	—
Four Lakes ARC	702,483	3	—	—
Southwest Ohio DX Assn.	593,048	3	—	—
Dauberville DX Assn.	520,176	9	—	KA3DSW
Willamette Valley DX Club	464,782	3	—	—
Chaut. Co. Amateur FM Assn.	430,548	3	—	WA2ETU
Hollywood ARC	422,265	4	K8UNP	—
Stu Rockafellow ARC	355,113	4	—	KB8IO
Delta DX Assn.	351,409	10	N5JR	W5OB
Northern Illinois DX Assn.	346,130	6	K9AB	—
Central Kentucky DX Assn.	355,247	4	—	—
Point Radio Operating Society	330,687	4	—	—
Ill Wind Contesters	283,266	5	—	WB9POH
Flyweight DX Group	261,225	4	W4VBH	—
Sevier Co. ARC	256,401	4	—	—
Ventura Co. ARC	233,073	8	—	K6VMN
Fox River Radio League	229,341	8	—	K9BQL
Split Rock ARA	212,022	5	WA4PFN/2	—
Alamo DX Amigos	208,386	6	N5HB	N5DDO
Northern Ohio DX Assn.	188,043	4	—	AD8O
Rappahannock Valley RC	153,972	5	WB4LNT	—
University of Pennsylvania ARC	99,233	3	—	—
Lynchburg ARC	79,461	6	AA4FF	—
Utica ARC	77,037	6	WB2SZY	KK2B
Fort Wayne RC	58,320	4	—	W9LT
Hampden County Radio Assn.	55,923	5	—	W1DGJ
Boeing Employees ARS	55,647	3	—	—
West Park Radiops	29,928	4	—	W8IMF

It took a Snow Cat tractor to get KL7RA and AL7CQ to the KL7RA multioperator-two transmitter station site.

Top W/VE Single Band Scores — Phone

160		*20*	
VE1YX	3276	N2PP	272,934
AB1A	1848	KI3P/1	248,133
N4SU	912	K5GA	224,352
WB3GCG	810	NA5C	186,660
		KCØAT (KØCL)	176,085
80		*15*	
KR2N	44,091	WØZV	410,958
WA4SVO	25,137	K3LR	384,129
W4PZV	18,645	NA5R (K5GN)	335,712
NE4G	16,800	K1UO	314,253
WB2VFT	16,380	WB9POH	231,210
40		*10*	
N6BV	105,672	WA6DBC	201,782
W6AQ (WA6OTU)	72,828	WA5IHS	153,510
W9ZRX	64,638	K5RC (KN5H)	149,436
K1XA	43,875	WDØASM	127,617
K3LR (K8CX)	37,674	WØGOR	83,055

Top W/VE Single Band Scores — CW

160		*20*	
W8LRL	6300	K8NA	119,520
WA2SPL	4350	W1YN	110,946
N4IN	2112	WA9ZPR	104,400
N4SU	1932	K7ZA	100,800
		K9AB	87,822
80		*15*	
K1PT	83,877	WØZV	184,500
KM1H	43,740	W5VX	165,438
KØRF	26,700	K6LL/7	151,731
N7DF	18,762	N2PP	140,220
W4OO	17,787	VE3KZ	135,351
40		*10*	
NA5R (N5EA)	135,900	WB4TDH	34,608
K1UO	126,084	W8WPC (N9AG)	29,574
AD8C (AD8P)	92,430	K5TSO	24,336
W5JW	84,822	KM9P	10,767
N3BJ	83,250	NØJR	9477

Top W/VE QRP Scores (Less than 10 W)

Phone		*CW*	
Call	*Score*	*Call*	*Score*
WB4BBH	103,680	AA4AK	90,420
WD4AVY	91,524	WB4BBH	84,582
K7BTB	87,042	W9OA	54,126
W6CN	63,600	W9PNE	47,025
W6YVK	61,104	NN4Q	43,884

W/VE Division Leaders — Single Operator

Phone	*Division*	*CW*
K3NZ	Atlantic	N3BB
W9RE	Central	W9RE
KØQQ	Dakota	WØUO
W5XZ	Delta	W4XJ
WA8YVR	Great Lakes	N4AR
N2LT	Hudson	N2LT
WAØTKJ	Midwest	K4VX/Ø
W1ZM	New England	W1KM
N7TT	Northwestern	W6RR
AI6V	Pacific	N6GG
N4UH	Roanoke	N8II
WØZV	Rocky Mountain	WØZV
NQ4I	Southeastern	W8ZF/4
KM6B	Southwestern	W7IR
N5JJ	West Gulf	KZ5M
VE6OU	Canadian	VE2AYU

to that spot turned in terrific scores. YU1EXY netted top spot on cw in the multi-multi unlimited category on cw, while VK2WU won phone from the other side of the globe. The VK2WU effort came as a big surprise, as did ZS6WB's African multi-multi. We hope that they will be back next year.

Club Competition

Frankford Radio Club flexed its muscles again this year and captured the Unlimited Category gavel. The Yankee Clipper Contest Club finished second again, even though they found 16 more logs than last year. Is it time to concede that Frankford is unbeatable? In the Medium Category, the North Texas Contest Club finally won the gavel that has eluded them for several years. Despite some close competition from the reborn Mad River Radio Club, NTCC pulled ahead by a million points. In Local Category competition, there was no comparison between the Central Virginia Contest Club and the others. The good ole Southern boys pulled the coup by fielding their usual assortment of multiop entries. Nice job!

Thanks to everyone who operated for making the most of the declining sunspots to make this contest fun. There are still a few months to prepare for the '84 contest, so start working on those 6-element 20-meter Yagis and hope for the best.

SOAPBOX

I just spent a few days going back over my logs and old *QSTs* to see how many ARRL DX Competitions I have been in, and was quite surprised by my findings: 39 of the 49. My first was in the second Trans-Atlantic Test in 1922. I was issued a five letter code by the ARRL. Considering my small antenna system and the fact that I missed two of the 10 scheduled nights, I did quite well. I had no idea that my signals were being heard in Europe; otherwise, I would have transmitted on those other two nights. The Test ran from December 12 through 31. On the first 10 nights, U.S. and Canadian stations transmitted; on the other 10 nights, we listened for European stations . . . In 1932, it was called

Top Ten — W/VE Phone

Call	Score	160	80	40	20	15	10
AI6V (N6KT)	1,998,975	2/2	54/24	375/49	293/73	1244/70	455/57
W1ZM (K1ZM)	1,641,027	22/20	95/52	127/54	538/105	465/104	152/56
K1AR	1,466,934	11/10	66/45	95/51	616/108	394/98	136/59
W9RE	1,414,584	12/10	49/37	124/59	349/96	484/94	314/58
WA8YVR	1,310,520	8/7	68/43	101/44	465/99	482/83	216/50
W1RR	1,294,380	20/18	121/55	152/54	532/80	326/74	118/74
N2LT	1,292,508	4/4	50/31	93/53	575/96	441/78	173/60
KM6B	1,211,760	0/0	72/21	360/44	124/53	1031/59	249/43
K6HNZ	1,196,910	2/2	86/26	276/23	196/45	779/51	707/48
N1GL	1,094,112	10/10	64/42	81/49	255/95	440/97	198/55

Top Ten — W/VE CW

Call	Score	160	80	40	20	15	10
N2LT	1,521,330	13/11	117/51	370/70	649/82	339/67	82/42
W1KM	1,491,543	5/5	241/63	360/66	586/79	353/62	64/34
W1ZM (K1ZM)	1,377,513	27/19	134/52	343/59	596/77	306/69	61/37
N4AR	1,335,756	7/7	92/51	286/72	456/76	509/72	68/37
K1JX	1,289,700	11/11	150/49	374/64	528/76	305/60	68/40
K1TO	1,286,637	12/11	107/51	278/59	561/81	375/69	64/36
N3BB	1,123,620	4/4	91/49	248/65	399/73	414/73	64/43
K1BW	1,109,016	11/10	101/40	245/62	527/83	329/65	53/32
W1RR	1,047,696	15/12	187/52	181/57	405/69	314/60	94/42
N8II	1,028,160	2/2	100/47	242/57	447/78	376/64	57/32

Top Ten W/VE Low-Power Scores (Less than 200 W)

Phone

Call	Score	160	80	40	20	15	10
W2TZ	358,545	0/0	14/12	25/19	168/64	227/69	129/41
KA2AEV	267,330	0/0	6/6	10/9	166/58	173/67	114/50
KB3WX	196,392	0/0	34/25	59/42	103/57	96/44	42/28
N8CXX	161,634	0/0	3/5	18/13	103/56	154/56	63/28
WA4PFN/2	153,984	0/0	0/0	0/0	220/62	115/35	66/31

CW

Call	Score						
N5AW	445,680	4/3	35/25	154/48	158/63	164/58	104/43
W2TZ	335,775	0/0	23/22	98/40	200/53	261/52	23/18
KC2FV	244,296	0/0	45/27	55/32	240/42	163/43	19/12
W7XN	230,400	0/0	4/2	130/30	131/38	345/34	29/16
WA1FCN	205,587	0/0	18/12	53/29	201/60	138/43	21/15

Top W/VE Multioperator Scores — Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
W3BGN	1,569,726	6/9	90/48	127/69	580/97	428/95	187/51
K6XT	1,362,240	3/3	45/24	264/40	238/65	867/59	475/49
W3MA	1,089,360	6/6	55/36	86/53	423/103	382/91	116/52
K3TUP	1,081,590	8/7	37/28	120/52	357/86	455/85	186/52
K2VV	997,542	11/10	50/32	69/39	406/82	422/75	73/56

Two Transmitter

Call	Score						
W4QAW	2,791,068	14/13	93/49	154/75	629/126	887/109	309/74
K2TR	2,768,112	27/23	85/50	106/57	997/112	833/107	208/60
K4CG	2,078,505	14/14	112/53	155/75	512/114	617/103	205/70
K4VX/Ø	1,967,640	6/6	65/36	186/60	497/107	653/101	319/70
ABØI	1,932,066	3/3	46/28	176/49	554/104	885/89	270/60

Unlimited

Call	Score						
N2AA	5,602,131	37/29	255/77	347/86	1175/129	1172/133	453/89
K1OX	5,053,020	30/23	184/68	282/88	1362/140	924/122	416/90
K2UA	4,846,815	33/26	278/82	274/88	1194/143	797/126	335/90
N5AU	4,727,712	7/7	96/49	509/79	723/142	1231/114	690/93
W7RM	4,222,125	7/5	125/36	476/60	931/118	1757/88	472/68

Top W/VE Multioperator Scores — CW

Single Transmitter

Call	Score	160	80	40	20	15	10
W3BGN	1,460,916	20/19	164/58	266/63	581/79	391/65	81/40
N4UM	1,137,063	3/3	102/50	249/57	413/67	540/58	122/34
K8ND	1,031,429	11/13	48/32	176/64	448/72	540/69	41/22
K5LZO	1,026,207	2/2	36/20	364/63	310/77	469/66	72/45
W3GRF	993,240	5/5	91/46	213/62	435/71	457/62	39/22

Two Transmitter

Call	Score						
K5RC	2,600,169	14/12	126/51	685/83	425/92	764/81	284/58
K4CG	2,107,314	26/21	173/60	406/77	672/92	555/73	82/44
K3VW	1,644,780	12/12	180/60	210/66	586/83	508/79	84/47
K2VV	1,483,629	7/7	132/44	223/64	731/82	500/74	49/30
WB8JBM	1,266,143	4/4	101/48	229/67	446/83	504/68	78/40

Unlimited

Call	Score						
N2AA	4,294,695	28/21	387/79	738/92	1110/105	769/86	185/62
K1OX	3,687,648	31/24	331/66	697/89	962/101	679/90	172/58
K2UA	3,245,436	35/26	345/72	707/76	840/100	674/84	160/56
W3LPL	3,151,548	45/30	191/60	644/98	839/98	695/81	138/54
N5AU	2,749,680	12/10	111/52	698/73	553/97	787/88	251/60

Bill, WØZV, used this HP desktop computer to dupe his 15-meter single-band entries on both modes. By the way, Bill turned in the top single-band 15-meter scores for W/VE stations on both modes.

Budding contester Mike, K3UOC, went portable from YV4-land and took home top honors on both modes as the all-band single operator in Venezuela.

the International Goodwill Test — B.B. (before beams). I was the cw winner for ENY (in 1947, '48 and '49). No chance after that, as I was using my little 66-ft flat-top antenna, which was fed with open-wire line. I still enjoy the tests and consider myself old-fashioned, as I have yet to send a "CQ TEST," but I may break down yet (Hi!) (W2AWF since 1920). I remembered half way through the contest that the rare U.S. multipliers were more likely to be worked outside the U.S. Extra-only frequencies . . . more Ws could have picked up DX multipliers by listening instead of calling CQ (7P8CG/KB3R). I thought that this was the best cw contest yet, as there was excellent cooperation by everyone in the pileups (K6DR). I must tell you that I didn't have much luck during the contest because propagation was not all that great for QRP. Other signals from Europe were much too strong into the U.S. and Canada for my 1 W to be heard well (EA8EY). Activity was surprising on 10 and 40 meters. We held the frequencies for as long as we wanted with high QSO rates. Things were a little tougher on 15 and 75 meters, especially on 75 the first night. We were grateful for each 75-meter QSO (VK2WU). I operated from Goot-frontier in the northeast part of Namibia (ZS3) while I was there on a project for the South African Government (ZS6BPJ/ZS3). Many thanks for the new two transmitter multi-multi class. It's just the thing that a small club like ours needed. Many thanks for proper rules to avoid violations and other pigholes. Propaga-

Top DX Single Band Scores — Phone

160		20	
T32AF (KH6UR)	1749	YT3A (YU3SO)	145,179
YV2IF	405	ZY5OC	144,372
		KH7AA	115,056
80		YV7QP	82,350
		ON5FS	72,200
FM7WS	106,704		
HC1HC	99,954	15	
CT2AK	66,435		
CT4KQ	26,826	VP2MKD (K9MK)	545,661
YU4BR	24,738	LU2MM (K1MM)	350,112
40		F2SI	323,232
		JA2APA	183,975
FM7CD	240,408	JA8WKE	152,595
HI8GB	134,037		
XE1LCH	111,540	10	
CT1AQZ	93,000		
LU8DQ (LU6ETB)	74,088	CP6EL	374,880
		XE1LLS	252,054
		V3TV	202,113
		VK5ARO	172,536
		LU1VK	151,368

Top DX Single Band Scores — CW

160		20	
F8VJ	3600	OH8AV (OH8PF)	204,003
KH6IJ	3240	LU9EIE	179,355
G3SZA	3168	G3FXB	151,845
KØGVB/C6A	2394	YT3A (YU3TVI)	145,800
JA2YEF	84	KP4FV	126,360
80			
		15	
CT2AK	66,285		
DL1JW/HP1	65,274	ZY5XFR	124,578
I4EAT	53,520	G4GIR	116,547
G4CNY	46,398	OH6AM (OH6LK)	100,650
W9NXD/HR2	40,764	JA3YOP (JF3PLF)	82,950
40		HA4ZZ	81,585
9Y4VU	200,070	10	
YU3EY	129,300		
CT1AOZ	108,900	LU5DVO	132,888
YU2SD	85,407	VK4XA	46,440
UR2RRR	72,765	PY2SHI	25,764
		JJ1NUB	20,160
		PY2CAR	17,082

Top DX QRP Scores — Phone and CW

Phone		CW	
TG9GI	936,144	JA1MCU	100,605
NP4FR	208,760	JR2BNF	74,046
JI3BFG	30,576	HA5KD	30,240
JH3LCU/1	25,110	DF4ZL	21,624
JR2BNF	23,760	DL9GE	18,753

Top Ten — DX Phone

Call	Score	160	80	40	20	15	10
ZF2FL (N6RJ)	6,578,928	82/31	510/56	648/56	1451/57	1281/57	3012/57
V3CH (KØGU)	6,576,471	50/24	334/50	944/56	1112/55	1600/56	3341/56
8P6J (N6TJ)	6,079,200	86/26	361/51	376/50	1891/57	1516/57	2570/57
HH2CQ (K4JPD)	4,447,440	54/43	491/50	474/51	1447/55	1286/56	1360/55
VP2MBA (W7FP)	4,081,230	22/14	229/42	573/49	867/57	1348/57	1926/55
P42J (W1BIH)	3,485,133	0/0	427/48	187/42	854/57	1116/57	1867/57
KH6ND	3,041,595	1/1	384/48	488/52	614/53	685/53	1683/56
KH6RS (AI6V)	2,699,250	10/4	251/46	321/43	614/50	1715/55	688/52
LU1BR	2,596,438	0/0	14/11	130/33	1129/57	1169/54	1704/56
K3UOC/YV4	2,170,674	0/0	52/20	198/38	1406/56	1488/55	318/40

Top Ten — DX CW

Call	Score	160	80	40	20	15	10
8P6J (N6TJ)	4,050,144	55/25	258/45	488/52	1521/56	1184/55	1198/54
VP2EU (K8MR)	3,620,535	119/33	426/47	563/51	923/53	923/56	1137/55
HH2VP	3,437,769	164/31	379/49	703/54	906/65	976/54	783/51
P42J (W1BIH)	3,420,576	85/30	370/49	647/50	840/56	939/56	971/56
SMØGMG/CT3	2,689,638	0/0	378/42	734/46	1131/53	922/53	598/44
8P6GG (N8DCJ)	2,376,360	0/0	242/45	571/48	779/51	1137/56	491/46
K8WW/VP9	2,234,793	0/0	512/48	660/52	987/54	623/50	309/37
KH6ND	1,928,850	30/18	349/46	475/55	470/52	627/52	387/52
K3UOC/YV4	1,654,029	0/0	0/0	815/51	841/53	757/52	330/45
I2UBI	1,222,416	0/0	247/33	477/44	532/49	592/54	111/28

Top DX Multioperator Scores — Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
KP4BZ	5,363,631	6/5	371/49	495/51	1528/57	1684/56	2519/56
XE1MDX	4,114,893	0/0	468/49	451/53	923/55	956/55	2301/57
V2AXA	3,486,276	0/0	320/43	62/21	1175/51	1779/54	1806/57
ED9EA	3,000,330	28/19	331/38	502/44	1515/53	1310/56	236/45
ZF2GW	2,876,385	0/0	211/42	155/39	571/45	1007/54	2071/53

Two Transmitter

Call	Score						
VP5KMX	9,954,537	196/40	849/56	1151/56	2220/57	2778/57	3079/57
YV3BRF	6,779,985	/25	/51	/53	/55	/56	/55
CN8CX	4,194,405	0/0	302/39	557/43	1332/56	2135/56	1289/55
KL7RA	1,729,887	0/0	33/6	101/22	360/54	1089/55	1438/54
JH7YJF	1,127,976	0/0	1/1	187/24	343/46	1002/52	653/49

Unlimited

Call	Score						
VK2WU	3,261,996	0/0	22/12	515/53	1553/54	534/52	2145/57
JA2YKA	1,931,997	0/0	156/29	333/43	598/52	953/52	797/51
JA9YBA	1,695,267	0/0	109/18	308/42	451/49	998/54	787/50
JA7YAA	1,615,464	0/0	68/16	392/46	438/47	652/53	943/54
I3EVK	1,572,651	39/16	299/33	327/36	1016/55	970/50	10/7

Top DX Multioperator Scores — CW

Single Transmitter

Call	Score	160	80	40	20	15	10
AH6BK	2,813,748	8/5	420/46	800/54	785/53	928/54	585/54
TI2BEV	2,663,100	21/12	450/51	578/48	780/53	739/55	732/50
IØMGM	1,741,707	0/0	238/35	782/47	820/55	671/50	140/32
F3TV	1,597,298	0/0	384/39	494/41	765/50	623/53	222/31
YT3M	1,282,902	0/0	245/38	668/44	522/49	627/51	55/20

Two Transmitter

Call	Score						
VP5FUX	6,048,456	78/25	761/52	1360/56	1704/57	1823/57	950/55
KL7RA	855,162	0/0	6/2	62/15	848/52	752/55	183/30
SMØAJU	644,412	0/0	71/25	180/36	763/55	276/47	4/3

Unlimited

Call	Score						
YU1EXY	1,815,516	0/0	326/36	589/51	768/55	928/51	115/29
YU7BCD	1,405,332	2/2	146/25	554/47	748/49	609/50	215/33
EA3MM	1,275,750	0/0	316/36	452/44	677/48	356/45	225/37
JA7YAA	940,188	1/1	105/22	359/44	523/53	562/53	117/15

tion was poor, especially on 21 MHz, because of the aurora . . . The night opening on 10 meters was very unusual, and I think that many stations missed it (OH3AA/OH3RF). An example of the poor conditions was that on the first night we had three operators working for eight hours to make only 27 QSOs, and we worked *everything* that we heard. (G4BP). Please observe that this log (phone) contains the calls of some stations which were not worked. The reason is that they were listening in the cw portion of the 40-meter band. I am very sorry that they missed the extra points that I could have given them. However, what they might have lost in missing my points they obviously compensated for in working a number of other European stations. I regret that some operators on this side do not respect the band plan of the region, which recommends cw only between 7000 and 7040 kHz and phone between 7040 and 7100 kHz. Contesters should be informed of this band plan, and should not encourage this kind of "out of band" operation (LA2EG). I would like to thank all the stations who worked me, with a special "Doomo Arigatoo" to all of my JA friends (N5DDO). I found it hard to believe that this was the same 10-meter band that was so good three months ago for the 10 Meter Contest. I worked more JA stations than Europeans (N3AZS). Now that everybody has RIT on the rigs, there is an increasing tendency to call a station a few hundred hertz off, thus creating more QRM than necessary (VK4VU). What kind of credit can I get for working 27 states and 3 provinces in response to my "CQ Contest?" (N4QB). [The only credit we can give you for that, Joe, is credit for a lot of patience! — Ed.] We recorded the lowest solar flux for this contest since 1977. Ten meters was not as good as in recent years. No strong, direct European signals were noted here. That made the intensity of the pileups on the Caribbean/Central and South American stations even rougher. JA stations provided the bulk of the activity on 10 meters here, although the opening did not last as long as in recent years (WA5IYX). I wonder if those ops who called "CQ TEST" all day actually worked anybody? They must be given credit for persistance (WØLP). Where were all the Europeans looking for Wyoming on 40 meters (WB7RGN)? I had lots of fun, but sure miss the old days of "high band/low band" entries (W9LT). It was more difficult working the contest with my QRP rig, but at least I avoided TVI problems with my neighbor (DF4ZL). We operated out of my shack (WP4BVU) and used NP4EJ's call (since I must have severely upset someone at the FCC to get such a call) (WP4BVU/NP4EJ). I did QRP operation in both the phone and code sections of the contest, and I am glad that the stations on the other end of the QSO have good ears to pick out my signal (Hi!) (JR2BNF). With 20 meters closing early (cw) on Friday, 40 meters was impossible from the West Coast to anywhere. I made nine QSOs and went to bed (W7XN). I called 7P8CG for 20 minutes and finally worked him. I then went down the band to CQ, and 7P8CL answered right off the bat. Talk about being flabbergasted! I then worked some good multipliers up high in the band, with no competition. I guess the Big Guns' rigs don't go above 50 kHz from the bottom of the band (WD8IXE).

FEEDBACK

Please note the following corrections to the results of the 1982 ARRL International DX Contest starting on

CT2AK took top European honors on both cw and phone on 3.5 MHz.

DX Continental Leaders — Phone

	Africa	Asia	Europe	North America	Oceania	South America
All Band	CN8CO	JI1QPU	EA2QU	ZF2FL	KH6ND	P42J
1.8 MHz	—	—	—	—	T32AF	YV2IF
3.5 MHz	—	—	CT2AK	FM7WS	—	HC1HC
7 MHz	ZS6DW	JA2BAY	CT1AOZ	FM7CD	—	LU8DQ
14 MHz	W3KHQ/ZS	JH3DPB	YT3A	KP4FIX	KH7AA	ZY5OC
21 MHz	ZS6ZS	JA2APA	F2SI	VP2MKD	W7PSO/KH6	LU2MM
28 MHz	ZS6OX	JJ1NUB	CT1AV	XE1LLS	VK5ARO	CP6EL
QRP	—	JI3BFG	OK1DKS	TG9GI	AH6EK	—
Multi-Single	ED9EA	JG1ZUY	I5MPN	KP4BZ	H44SH	OA8CW
Multi-Two TX	CN8CX	JH7YJF	4N9YU	VP5KMX	—	YV3BRF
Multi-Unlimited	ZS6WB	JA2YKA	I3EVK	—	VK2WU	—

DX Continental Leaders — CW

	Africa	Asia	Europe	North America	Oceania	South America
All Band	SMØGMG/CT3	JA7FWR	I2UBI	8P6J	KN6ND	P42J
1.8 MHz	—	JA2YEF	F8VJ	KØGVB/C6A	KH6IJ	—
3.5 MHz	—	JA2NDQ	CT2AK	DL1JW/HP1	ZL2TX	PY1BOA
7 MHz	5N6SKD	JI1QQI	YU3EY	VP2ES	VK3AEW	9Y4VU
14 MHz	ZS6ME	UAØSAU	OH8AV	KP4FV	ZL3AGI	LU9EIE
21 MHz	EA5YU/EA8	JA3YQP	G4GIR	—	KH6WT	ZY5XFR
28 MHz	—	JJ1NUB	YU3C	W2KN/PJ7	VK4XA	LU5DVO
QRP	EA8EY	JA1MCU	HA5KD	—	VK4SF	PY2TU
Multi-Single	5Z4CM	UKØCAA	I6MGM	TI2BEV	AH6BK	4KID
Multi-Two TX	—	JA3YKC	SMØAJU	VP5FUX	—	—
Multi-Unlimited	—	JA7YAA	YU1EXY	—	—	—

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Phone: In the Santa Clara Valley section, K6HNZ is incorrectly listed as a single op. His score should be listed as the second-place sixth call area multi-single. In Kansas, WAØTKJ's multiplier should read 256, not 156. KN6M (+JE3s CYV, EPK, JF3OLF, JG3RPL, JH3DPB, KB6s YF, XN, KD6T, N6BPL, W6SZN, WA6AVS, WB6KNU, WD6DVP) 5,441,100-5182-350-C-EB should be listed as the number 7 multi-multi. CT2CE should be shown as the 3.5-MHz European continental leader. SM5DQC's first-place 14-MHz score should have been listed as the second-place phone 14-MHz score.

CW: The call sign of the number two all-band Maritime-Newfoundland entrant should read VE1CEG, not VE1AEG. KA3CRC, listed as the top EPA QRP scorer, really belongs in WPA. KO7G's 10-meter single-band score was incorrectly listed as a phone entry; he should be listed as the top WA 10-meter cw entry. K3WGR in EPA should have been listed as a multi-single entry with second op WB3CAC. The K5WA (K5GA, opr) 25,272-162-52-C STX 40-meter single-band winner wasn't listed. We discovered his entry wrapped up in K5WA's 15-meter single-band dupe sheet. Sorry, Mr. Bill! The operator of 9U5WR was SP6BAA, not SP6FER; SP6FER is the QSL manager.

SCORES

The scores are listed by mode — phone and cw. For both W/VE and DX scores, single operators are listed first, followed by multioperator, single transmitter, then multioperator, two transmitter, and then multioperator, unlimited. W/VE single-operator scores are broken down by call area and ARRL Section. W/VE multi-single scores are broken down by call area only. All W/VE multiop two-transmitter and unlimited scores are grouped together in descending order by score. DX single-op and multiop scores are broken down by contingent and country. Under each ARRL Section (and country for DX), single-op scores are listed in descending order by category. All-band scores are listed first, followed by 160, 80, 40, 20, 15 and 10-meter single-band scores. QRP scores follow single-band scores.

Each line score lists the following information: call, score, QSOs, multipliers, power input used (A = 10 W or less, B = 11-200 W; C = more than 200 W). The first station in each category has a designator following the power indicator (AB indicates all band; single-band entries are indicated by 160, 80, 40, 20, 15 or 10; QRP entries are indicated as QRP). W/VE multiop entries have their ARRL Section abbreviation after their power designator. Example: In Connecticut, the top all-band phone scorer is W1ZM. The top low-power (200 W or less) entrant is K1YRP. KM1R has the top 80-meter single-band score, K1XA the top 40 m, K8HVT/1 the top 20 m, K1RM the top 15 m, K1EM the top 10 m and KA1CZF the top QRP score.

W/VE — Phone

Single Operator

1

Connecticut

W1ZM (K1ZM,opr)
1,641,027-1399-191-C-AB
K1YQ 230,158- 962-239-C
K1WA 638,844- 766-278-C
K1KI 595,128- 774-274-C
N1APT 310,245- 681-215-C
KA1YR 291,096- 622-156-C
W1AW (WA1ZD,opr)
153,012- 311-164-C
K1WJL 126,840- 307-140-C
K1VDF 90,735- 263-115-C
K1XN 85,725- 225-127-C
AB1D 61,200- 204-100-C
K1LG 34,650- 150- 77-C
W1DO 30,000- 100-100-C
K1YRP 26,134- 114- 77-B
W1VH 17,700- 100- 50-C
W1WEF 16,146- 117- 46-C
AA2Z 9660- 70- 46-C
K1BV 7182- 63- 38-C
W1IMV 6174- 49- 42-C
K1WJ (AA2Z,opr)
5850- 50- 39-C
KA1DN 5508- 51- 36-B
KA1DSQ 4836- 52- 31-B
WA1TCA 3465- 35- 33-C
KA1JFJ 2574- 33- 26-B
WC1A 2175- 29- 25-C
KM1R 11,178- 81- 46-C-80
K8IF 2925- 39- 25-C
WB1BAZ 2850- 38- 25-C
K1XA 43,875- 195- 75-C-40
K8HVT/1 9804- 76- 43-B-20
K1RM 61,824- 322- 64-C-15
K1YXG 22,272- 128- 58-C
K1EM 58,800- 280- 70-C-10
WA1FCN 14,933- 113- 47-B
KB1N 162- 9- 6-B
EB1O 3- 1- 1-B
KA1CZF 3120- 40- 26-A-QRP

Eastern Massachusetts

K1AR 1,466,934-1318-371-C-AB
KA1GG 628,551- 907-231-C
W1RM 255,474- 498-171-C
N1RG 73,152- 192-127-B
W1DYH 59,784- 212- 94-C
W1FM 41,055- 161- 85-B
WA1EKR 35,867- 139- 86-B
KA1CLV 34,263- 141- 81-B
8C1X 18,117- 99- 61-C
N1BTW 9945- 65- 51-B
W1PLJ 1620- 27- 20-B
AB1A 1868- 28- 22-C-160
W1HX 4644- 63- 36-C-80
K1VUT 330- 11- 10-C
AJ1I 3- 1- 1-B
WA1AER 2997- 57- 27-C-40
W1DA 54,984- 232- 79-C-20
K1RB 2995- 65- 41-B-15

Maine

K1JB 201,912- 376-179-C-AB
K1BZ 53,915- 153- 85-B
K1SA 3132- 36- 29-C-80
K1JP/1 248,133- 773-107-C-20
KB1CV 2875- 75- 35-B
K1DO 114,275- 927-113-C-15
KB1U 18,450- 123- 50-C
KA1ALF 2622- 38- 23-B-10

New Hampshire

WIRH 1,294,380-1769-340-C-AB
AK1A 976,575-1065-309-C
W1BNZ 259,324- 534-162-C
AB1L 137,172- 322-142-B
K1GW 48,160- 260-150-C
W1VY 30,438- 114- 89-C
WA1PAX 20,604- 101- 68-C

Rhode Island

K1VSJ 735,404- 903-156-C-AB

Vermont

K1HKT 5832- 54- 36-C-AB
K1TK 6120- 60- 34-C-80
W1KQ 37,557- 285-108-C-20

Western Massachusetts

W1GG 411,936- 613-224-C-AB
KB1W 223,080- 440-169-C
N1TZ 195,264- 339-192-C
KA1RE 89,535- 235-127-C
WB1ABF 19,344- 104- 62-B
WB1CHB 13,440- 80- 56-C
W1RED 3627- 39- 31-C
K1BE 2016- 28- 24-B
KA1DNK 624- 16- 13-B
W1RR 13,680- 95- 48-C-80
N1KZ 11,808- 82- 48-C
WA1ZAM 9720- 72- 45-C
W1DGJ 27,108- 130- 78-C-20
KA1CDG 93,480- 180- 82-C-15
N1BZG 51,894- 279- 62-C-10
K1KNQ 6144- 64- 32-C

2

Eastern New York

K2BD 897,390-1014-295-C-AB
K2EK 462,861- 651-237-C
K2QE 133,540- 510-218-C
W2NC 114,258- 278-137-C
KB2CB 87,453- 317-123-C
KA2NC 76,245- 221-115-C
N2JJ 61,396- 177-116-C
N2FS 31,950- 142- 75-C
W2XL 19,800- 100- 66-C
KU2W 16,974- 82- 69-B
K2HN 6273- 51- 41-B
KF2O 8979- 73- 41-C-80
K2XA 3104- 73- 16-C-40
W2KDQ 19,344- 124- 52-B-15

N Y C & Long Island

W2DN 6138- 66- 31-C
WB2LXL 4602- 59- 26-C-10

N Y C & Long Island

KA2AEV 267,330- 469-190-B-AB
KE2E 261,387- 461-189-C
W2MOY 148,050- 350-141-C
WB2FMF 57,920- 174-110-C
W2YG 50,400- 175- 96-C
W2CKZ 36,636- 142- 86-C
W2AYJ 19,251- 93- 69-C
K2KTT 17,748- 87- 68-B
WB2PXA 6930- 55- 42-C
KM2X 6678- 53- 42-C
KC7DH 4655- 47- 33-B
K2CRV 864- 18- 16-B
N2GAX 270- 10- 9-B
KR2M 46,091- 207- 71-C-80
N2KA 504- 14- 12-C
WB2DBY 145,236- 532- 91-C-20
AG2P 12,978- 103- 42-C
WA2DWG 1661- 37- 23-C
K2HPC 2205- 35- 21-C
WB2AMU 19,398- 122- 53-B-15
WB2RNT 5760- 64- 30-B
WB2PUE 612- 17- 12-B
WB2CBA 378- 14- 9-B
K2MFY 22,101- 139- 53-B-10
W2KZE 12,792- 104- 41-C
K2DOD 462- 14- 11-B

Northern New Jersey

N2LT 1,782,508-1348-322-C-AB
W1GD 965,788- 809-246-C
K2NJ 268,647- 492-182-C
K2BK 212,931- 401-177-C
WB2VLR 164,004- 346-158-C
WA4PKN/2 173,984- 401-178-B
W2VJN 108,468- 278-131-C
N2RQ 79,929- 244-107-C
WA2PID 35,256- 214-118-B
N2UWM 32,175- 165- 65-B
K2RF 912- 19- 16-B
KC2D 675- 15- 15-B
K2FCR 390- 13- 10-C-160
WA2LES 8,480- 110- 56-C-AB
K1ZN 273- 13- 7-B
K2GRV 1,783- 137- 53-C-20
KA8NC 15,288- 98- 52-B-15
WJ8BK 330- 11- 10-C

Southern New Jersey

WA2OOS 376,371- 491-227-C-AB
N2MR 210,678- 458-197-C
KB2LA 201,372- 388-173-C
WC2PAU 161,075- 285-165-C
N2QIL 12,112- 318-128-B
N2VW 101,088- 234-144-C
K2SNK 91,260- 234-130-C
WA2VXA 61,230- 215-126-C
W2PGY 60,442- 218-123-C
W2SBO 52,290- 166-105-C
W2BLV 35,328- 128- 92-B
KA2JMM 27,903- 131- 71-C
K2ZSY 26,280- 120- 73-C
W2GHY 25,047- 121- 69-C
WA2ERI 14,256- 88- 54-C
N2DN 6765- 55- 41-C
WA2AWS 6052- 56- 39-B
N2AWC 900- 20- 15-B
WB2VFT 16,380- 105- 52-C-80
WA2NBM 1404- 26- 18-C-40

Western New York

W2TZ 358,545- 583-205-B-AB
WA2ETU 186,813- 407-153-C
WB2YDD 128,035- 415-143-C
KB2SE 88,908- 239-124-C
KB2WN 28,648- 232-113-C
WA2RKO 65,700- 219-100-C
KG2UZ 58,806- 198- 99-C
KB2NO 57,120- 170-112-C
KB2B 35,763- 131- 91-B
W2FUT 31,950- 150- 71-B
W2PHT 23,595- 121- 65-B
WA2LEZ 3741- 53- 29-B
KA2CDE 12,282- 89- 46-C-40

N2PP 272,934- 771-118-C-20
KS2F 25,830- 109- 82-C
KB2SG 79,816- 317- 81-C-15
WA2LOG 29,070- 170- 52-C
KC2VT 25,137- 147- 57-B
W2UC 23,100- 140- 55-C
WB2SZY 20,349- 133- 51-C
KA2PBQ 8016- 44- 23-B
WA2JXC 31,150- 150- 47-B-10
WA2FBE 4002- 46- 29-B

3

Delaware

W1XU 289,291- 941-279-C-AB
AD3V 119,712- 332-177-C
W3CL 102,455- 245-153-C
KB3XD 90,768- 256-124-B

Eastern Pennsylvania

K3NZ 845,529-1003-281-C-AB
W1AF 466,560- 668-240-C
K3OO 392,236- 576-227-C
N3DW 291,237- 503-193-C
WB3CIW 236,964- 434-182-C
AD3Z 221,757- 383-193-C
KA3OSW 220,320- 408-180-C
W3GK 190,284- 404-157-C
W3ORM 185,652- 324-191-C
K3YFV 178,016- 352-161-C
WB3KTL 152,079- 317-163-C
W3EVW 132,060- 284-155-C
W3KV 129,996- 276-157-C
W3ARR 127,746- 302-141-B
KI3N 59,860- 190- 98-C
KC3AF 44,175- 155- 95-B
WA3YOB 41,850- 150- 93-C
WB3FYL 41,613- 141- 97-C
KB3YY 30,480- 127- 80-C
K3DYX 27,000- 120- 75-B
W3GRS 26,973- 111- 81-C

N3CHL 25,404- 116- 73-B
W3WJC 20,808- 102- 68-C
N3CIX 16,836- 92- 61-B
W3KFQ 13,992- 88- 53-B
K3VYA 11,664- 72- 54-C
WB3EPW 9828- 63- 52-B
WA3YTI 5850- 50- 39-B
WB3JZE 2688- 32- 28-B
N2CBZ 1512- 24- 21-B
K3CYD 18,630- 115- 54-C-40
KM3T 81,054- 347- 79-C-20
WB3FPA 14,259- 97- 49-B-15
KK3R 9072- 72- 42-C
KC3CB 4320- 48- 30-B
N3CQM 20,880- 145- 48-C-10
N3AZS 19,980- 148- 45-B
KH6CP/W3 4644- 43- 36-A-QRP
KC3AK 3960- 40- 33-A
K3YD 2835- 35- 27-A
N3OCG 1848- 28- 22-A

Maryland D.C.

KI3L 560,280- 805-232-C-AB
N3RL 421,890- 574-245-C
W3UJ 411,312- 656-209-C
W3ICM 378,830- 485-226-C
K3AV 210,120- 412-170-C
W3CM 108,927- 247-147-B
K3SA 58,200- 200- 97-B
K4CGY 53,406- 207- 86-C
W3AOE 31,125- 125- 83-B
WB3BRF 27,156- 124- 73-B
W3EE 20,196- 99- 68-B
W3FQE 19,776- 103- 64-C
W3HVM 10,224- 71- 48-C
K3SO 6888- 56- 41-B
W3YHR 5850- 50- 39-C
W3GNQ 5328- 48- 37-C
N3API 1764- 28- 21-B
WB3CCC 810- 18- 15-C-160
W3PWO 12,900- 100- 43-B-10
WA3VPL 76,136- 121- 77-A-QRP
K3ZR 3560- 22- 35-A

Western Pennsylvania

KB3WX 196,392- 334-196-B-AB
KM3J 48,888- 168- 97-B
KF3C 16,038- 81- 66-C
K4JLD/3 8307- 71- 39-C
K3UA 8487- 69- 41-C-80
K3LR (K8CX,opr.)
37,674- 182- 69-C-40
K3UA (W3FSB,opr.)
6498- 57- 38-C
WB3KKX 43,512- 196- 74-C-20
W3DPH 5664- 59- 32-C
K3LR 384,129-1041-123-C-15

4

Alabama

W4NTI 711,323- 347-203-C-AB
WA4VEK 264- 11- 8-C
N4AJZ 13,386- 97- 46-C-40
N4KG (N4QB,opr.)
183,960- 584-105-C-15

Georgia

NQ4I 808,236- 942-286-C-AB
KX4R 490,464- 624-262-C
N4DVW 233,037- 411-189-C
W6OKX/4 145,722- 298-163-C
KU4OB 79,296- 224-118-C
K4BAI 66,126- 206-107-C
KE4XW 51,015- 179- 95-C
WB4SLM 3528- 42- 28-C-80
W4JFL 13,338- 114- 39-B-15

Kentucky

NIGL 1,094,112-1048-348-C-AB
N4BS 371,555- 485-221-C
NA4D 30,375- 135- 75-C-20
WA4YOF 810- 18- 15-B-15

North Carolina

N4UH 635,145- 805-263-C-AB
N4MO 469,635- 655-239-C
K4KZZ 342,828- 534-214-C
KF4HK 170,625- 325-175-C
N4AA 118,104- 266-148-C
K8CFU 504- 14- 12-C
N4SU 912- 19- 16-C-160
W4UW 5220- 60- 29-C-40
WB4QWM 22,950- 150- 51-C-10
WD4AVY 91,524- 263-116-A-QRP

Northern Florida

W4IIB 106,896- 262-136-C-AB
W4WKQ 93,015- 265-117-C
WB5YLT 10,656- 96- 37-B
WC4E 5808- 44- 44-B
WA4SVO 25,137- 133- 63-C-80
KT4P 16,023- 109- 49-C-40
W4VQ 7881- 71- 37-C
WA4HOJ 25,650- 150- 57-C-20
ND4J 88,218- 377- 78-C-15

South Carolina

W3VT/4 611,736- 718-284-C-AB
WR4D 9600- 64- 50-B
NE4G 16,800- 100- 56-C-80

Southern Florida

K8UNP 313,908- 518-202-C-AB
WB4MAI 197,112- 344-191-C
K4CEF 65,637- 187-117-C
AA4CM 54,495- 173-105-C
W5OG/4 15,015- 77- 65-C
W4HVU 3465- 35- 33-C
N4TL 2418- 31- 26-C
KA4OBC 1452- 22- 22-B
W4PZV 18,645- 113- 55-C-80
W4BAA 8733- 71- 41-C
K4KUZ 17,496- 108- 54-C-40
WZ5DB/4 576- 16- 12-B-15
KD4FX 44,604- 252- 59-C-10

W4YN 5580- 60- 31-B
WB4BBU 103,680- 256-135-A-QRP

Tennessee

WB4SFX 145,854- 333-146-C-AB
WA4X 30,336- 128- 79-C
KD4PP 20,079- 97- 69-B
N4BSN 18,648- 84- 74-C
WB4VMS 13,833- 87- 53-B
WA4ZZU 702- 18- 13-B
W4KJ 135,000- 450-100-C-20
K4XO 1875- 25- 25-C-15
KE4HX 36,081- 211- 57-C-10

Virginia

N4BLX 420,204- 722-194-C-AB
AI2C 415,440- 577-240-C
K4GKD 283,836- 436-217-C
K8ØC/4 159,795- 335-159-C
N4MM 66,744- 206-108-C
K4FPF 60,990- 190-107-B
WB4LUT 57,960- 184-105-C
K4OD 50,367- 163-103-C
W4KMS 40,800- 136-100-C
KA4RLJ 31,945- 135- 79-C
W4KFC 28,548- 122- 78-C
WC4B 22,557- 103- 73-B
W4TQ 19,656- 91- 72-C
W4YE 11,520- 80- 48-C
K4IM 5250- 50- 35-B
N3RC 1872- 26- 24-B
K2BA 10,086- 82- 41-C-40
AA4FF 4230- 47- 30-C
KV4P 79,464- 308- 86-C-20
KE4MM 23,250- 125- 62-B
WB4FIH 20,280- 104- 65-C-15
KC4BN 16,830- 110- 51-C

5

Arkansas

W5ELJ 12,996- 76- 57-B-AB

Louisiana

W5XZ 1,039,533-1199-289-C-AB
WA5IGD 187,110- 385-162-C
WA5POK 111,384- 273-136-C
W5OB 58,200- 194-100-C
KB5GL 55,836- 188- 99-C
WA5YFQ 29,412- 129- 76-C
W5CB 13,950- 93- 50-C
K5BLV 12,474- 77- 54-C
WA5IEV 7482- 58- 43-C
WB5TEQ 5904- 48- 41-B
W5NVU 5304- 52- 34-C
WA5ZLJ 8052- 61- 44-C-20
N5NO 1056- 22- 16-C

Mississippi

WA5OYU 137,280- 304-145-C-AB
ND5M 27,563- 109- 69-C
N5FG 1056- 22- 16-B-40
W5OSL 11,856- 104- 38-C-15

New Mexico

N5ACP 53,820- 156-115-C-AB

Northern Texas

K5RX 765,000- 850-300-C-AB
N5JB 313,200- 522-200-C
K5LP 256,620- 455-188-C
K5RR 245,244- 428-191-C
KA5W 214,113- 479-149-C
W5LKP 176,802- 373-158-C
N5HA 155,928- 356-146-C
W9PL/5 118,950- 305-130-C
AF5K 66,150- 210-105-C
K9LA/5 47,700- 150-106-C
N5AW 35,802- 153- 78-B
WD5FLK 34,560- 160- 72-C
W5AE 33,660- 165- 68-C
W5IMG 30,375- 175- 81-C
K5HM 21,756- 98- 74-C
W5FO 70,980- 260- 91-C-20
WB5UDX 118,854- 558- 71-C-15
WB5LYT 10,206- 81- 42-C

Oklahoma

W5IMK 144,420- 332-145-C-AB
K5WE 1026- 19- 18-C-40

Southern Texas

N5JJ 1,037,043-1239-279-C-AB
KZ5M 492,075- 729-225-C
K5DX 251,856- 424-198-C
KC5CP 180,072- 366-164-C
WA3AHQ/5 71,094- 289- 82-C
K5RF 32,745- 185- 59-C
WA5IYK 23,838- 137- 58-B
W5ASP 2610- 58- 15-B
K5BZU 1764- 28- 21-C-80
K5SF 17,202- 127- 47-C-40
KB5FU 12,150- 90- 45-C
K5GA 224,352- 608-123-D-20
NA5C 186,660- 510-122-C
NA5R (K5GN,opr.)
335,712-1076-104-C-15
W5VX (K5TSQ,opr.)
229,353- 859- 89-C
WA5LHS 153,510- 595- 86-C-10
K5RC (KN5H,opr.)
149,436- 593- 84-C
N5DDO 77,775- 425- 61-C
W8MEP 2337- 41- 19-B

6

East Bay

WB6FCR 528,360-1258-140-C-AB
KB6JK 130,968- 428-102-C
K6CSL 5148- 66- 26-B
NN6Y 2916- 36- 27-C
N6RO 6804- 84- 27-C-80
W6BSY 81,066- 458- 59-C-15

AD6D 15,120- 144- 35-C
KS6H 2592- 96- 9-C-10
KS6Q 1377- 51- 9-C

Los Angeles

KM6R 1,211,760-1836-220-C-AB
N6AR 524,250- 750-233-C
AD7G/6 73,164- 264- 91-C
N6AA 41,448- 157- 88-B
WB9HRO/6 34,587- 189- 61-C
W6AQ (WA6OTU,opr.)
72,828- 476- 51-C-40
W6OK 18,444- 116- 53-C-20
N6IC 18,900- 150- 42-C-10
W6CN 63,600- 265- 80-A-QRP

Orange

K6LEB 57,096- 244- 78-C-AB
K6EBK 49,920- 256- 65-B
K6QEH (AB6R,opr.)
46,860- 355- 44-C
NC6W 16,512- 86- 64-C

Sacramento Valley

AI6V (N6KT,opr.)
1,998,975-2423-275-C-AB
K6SG 285,948- 611-156-C
K6DR 209,040- 520-134-C
AA6UX 35,235- 261- 45-C-10
N6JM 675- 15- 15-B

San Diego

KD9K/6 141,282- 334-141-C-AB
K6MC 30,450- 145- 70-C
AA6EE 8946- 71- 42-C
W6UVO 7308- 87- 28-C
N6ADK 4824- 67- 24-B
W6KBD 4380- 73- 20-B
W6XJ (WB6OKK,Opr.)
19,080- 170- 53-C-20
WA6DBC 201,762-1019- 66-C-10
K6JYO 58,797- 417- 47-C

San Francisco

K6ANP 746,430-1390-179-C-AB
N6OJ 735,136-1459-168-C
WB6NBK 101,010- 481- 70-C
NA6T 14,508- 124- 39-C-80

San Joaquin Valley

KA6BIM 131,967- 361-129-B-AB
WD6FLB 95,256- 378- 84-C
K6BPY 78,435- 249-105-C
W6SX 8214- 74- 37-C
W6BYH 1035- 23- 15-C
W6GR 60,125- 315- 65-C-20

Santa Barbara

WB6BDG 314,940- 724-145-C-AB
K6VHN 88,565- 261-108-C
N6HK 20,932- 237- 92-C
KD6LB 39,780- 170- 78-C
WA6FGV 32,568- 236- 46-C
N6VK 6150- 50- 41-C
W6OHL 5940- 66- 30-C
KD6CR 5856- 61- 32-C
N6CPQ 2546- 66- 28-B
W7CB 62,928- 304- 69-C-20

Santa Clara Valley

K6HNZ 1,196,910-2046-195-C-AB
WA6TKT 224,976- 688-109-C
N6AN 193,473- 581-111-C
N6HB 115,773- 259-149-C
K6ITL 112,728- 427- 88-C
N6HW 40,158- 194- 69-C
W6HXW 23,517- 117- 67-C
W6SC 17,528- 87- 48-C
W6SSA 11,349- 97- 39-B
KD6XY 10,560- 88- 40-C
NG6X 8832- 92- 32-C
N6ST 4020- 67- 20-B
W6OKK 1200- 30- 8-C
N6BV 105,672- 629- 56-C-40
NI6C 143,202- 823- 58-C-15
W6SZN 60,858- 441- 46-C-10
KA6HTC 40,824- 324- 42-B
W6YVK 61,104- 304- 67-A-QRP

7

Arizona

WB7FDQ 161,944- 914-137-C-AB
KC7V 140,070- 406-115-C
N7BUP 11,664- 81- 48-B
W7JKA 4599- 73- 21-C
W7KIR 3108- 37- 28-B
N6BAJ/7 35,376- 268- 44-B-10
W7AYY 29,867- 237- 42-B
K7BTB 87,042- 326- 89-A-QRP
KD7A 378- 21- 6-A

Idaho

KN7W 3300- 44- 25-A-QRP

Montana

KC7UO 98,604- 249-132-C-AB
KS7T 76,368- 344- 74-C
W7LR 52,200- 200- 87-C
K7LUR 8640- 90- 32-B-10

Nevada

WA7CWM 120,564- 788- 51-C-AB
WA7UTM 74,730- 265- 94-B
K7SEN 17,766- 94- 63-C

Oregon

KI7M 569,148-1103-172-C-AB
N7AVK 183,738- 547-113-C
W7CUR 102,060- 315-108-C
KA7LPO 16,368- 124- 44-B
KA7FEF 7254- 78- 31-B

AI7B 131,322- 509- 86-C-20
WA7QXH 3120- 65- 16-B-15
W7YAQ 4368- 56- 26-B-10

Utah

WB5TJP/7 87,948- 349- 84-B-AB

Washington

N7TT 916,776-1498-204-C-AB
W7BUN 141,312- 512- 92-C
W7IIT 20,418- 166- 41-C
W7EKR 9933- 77- 43-C
K7UU 4455- 45- 33-C
K7RS 900- 25- 12-B
W7ERH 468- 13- 12-B
N7BA 5310- 59- 30-C-80
K7UR 17,892- 142- 42-C-40
K7LXC 2898- 42- 23-C
N7AM 630- 15- 14-C
WB7WQE 54,069- 269- 67-C-20
AG7M 136,896- 736- 62-C-15
KC7GX 48,195- 315- 51-C
K7MX 64,449- 341- 63-C-10
K7IDX 13,545- 105- 43-C
KR7L 16,647- 179- 31-A-QRP
EA5GIS/7 2679- 47- 19-A

Wyoming

WB7RCN 8208- 72- 38-C-40

8

Michigan

WA8YVR 1,310,520-1340-326-C-AB
W8UA 647,064- 836-258-C
N8CXX 161,634- 341-158-B
KC8K 137,898- 326-141-C
WB8WZT 100,812- 271-124-B
N8BTD 87,801- 259-113-C
KB8IO 66,181- 203-109-C
KS8Q 63,840- 190-112-C
N8ERV 62,750- 190- 75-C
K8SS 12,600- 84- 50-C
KI8W 11,205- 83- 45-C
KB8KT 5616- 48- 39-B
KB8TD 5148- 44- 39-C
WA8WMT 520- 14- 10-B
N8CJX 9954- 79- 42-C-40
AC8Y 6771- 61- 37-C
AC8W 1071- 21- 17-C
W8TWA 108,864- 378- 96-C-20
W8NWO 42,750- 190- 75-C
K8DD 86,775- 325- 89-C-15
KA8T 49,725- 221- 75-C
KD8BP 27- 3- 3-B
K8HJX 29,576- 376- 67-C-10
N8CNT 36,300- 220- 55-C
KJ8A 11,124- 103- 36-B
N8CQA 21,114- 102- 69-A-QRP
WB8TGY 528- 16- 11-A

Ohio

K8AZ 641,160- 780-274-C-AB
KC8JH 294,336- 448-219-C
W8KKF 247,044- 476-173-C
W8JLB 233,100- 444-175-C
N8BJQ 206,028- 388-177-C
WB8VPA 203,670- 365-186-C
W8LNO 174,408- 344-169-C
W8UPH 93,372- 251-124-C
W8ANM 92,964- 244-127-C
W8RSW 71,820- 210-114-C
AD8O 70,875- 189-125-C
WD8BKT 59,691- 197-101-C
KO8X 56,055- 185-101-C
W8FDN 52,689- 193- 91-C
W8KPF 48,888- 168- 97-C
K8EF 46,875- 125-125-C
N8AVK 46,170- 162- 95-C
K8EF 46,128- 124-124-C
W8ZCQ 45,900- 170- 90-C
K8YRN 44,700- 149-100-C
WA8RYD 43,407- 159- 91-C
KC8PQ 35,964- 148- 81-B
WB8BLI 37,571- 141- 77-C
N8DFO 31,872- 128- 83-C
K8GJC 29,736- 118- 84-C
W8FFN 23,436- 124- 63-C
K8MR 21,600- 100- 72-C
WA8BIN 21,216- 104- 68-B
WB8PAT 19,380- 95- 68-B
W8LI 19,110- 98- 65-B
K8EM 16,854- 106- 53-B
W8VZE 10,716- 76- 47-C
W8IMF 9702- 66- 49-C
W8STW 9288- 72- 43-C
W8DWP 7353- 57- 43-C
W8CGG 5814- 51- 38-C
KB8KT 5382- 46- 39-C
KB8ON 3690- 41- 30-B
KC8F 3348- 36- 31-B
K8PYD 2184- 28- 26-C
KI8B 900- 20- 15-B
WB1DM 48- 4- 4-C
KU8K 864- 18- 16-C-80
AD8C 29,388- 158- 62-C-40
N8RA 76,100- 145- 60-C
N8LL 4284- 51- 28-C
W8FN 84,906- 318- 89-C-15
KB8WB 3240- 40- 27-B
N8DPO 479- 13- 11-B
WD8KTM 36- 4- 3-C
WD8MRF 12,600- 100- 42-C-10
KA8CGF 3456- 48- 24-B
WA8ACH 12,864- 67- 64-A-QRP

West Virginia

W8VEN 26,565- 115- 77-C-AB
KB8FJ 6912- 72- 32-C
W3IJT 4182- 41- 34-B
WA4HIT 135,036- 484- 93-C-20
W8WVM 6732- 66- 34-B-10

9

Illinois

W9NUF 300,042- 474-211-C-AB
K9MFT 275,808- 442-208-C
KM9L 146,292- 292-167-C
K9BQL 99,456- 296-112-C
KB9DD 85,725- 225-127-C
WD9CIG 52,170- 185- 94-C
W9TNZ 40,716- 156- 87-B
AI9U 33,060- 145- 76-C
KC9UM 29,970- 135- 74-C
N9CNF 27,477- 129- 71-C
KB9AW 22,140- 90- 82-C
W9QWM 7830- 58- 45-B
W9REC 7560- 60- 42-B
W9ZGP 4500- 50- 30-C
KC9LP 1320- 22- 20-C
KA9KDZ 504- 14- 12-C
KB8AC 27- 3- 3-B-160
W9CH 13,662- 99- 46-C-40
KK9A 13,608- 84- 54-C-20
W9NB 117,450- 450- 87-C-15
WA9MAG 68,756- 316- 77-C
KC9N 29,250- 195- 50-C-10
WB9JKI 27,540- 170- 54-C
KA9JOW 3078- 38- 27-C

Indiana

W9KE 1,414,584-1332-354-C-AB
E9VQR 40,128- 157- 88-C
W9XD 38,640- 161- 80-B
WB9ZGY 11,172- 76- 49-B
N4FKF/9 4176- 58- 24-C
W9ZRX 64,638- 266- 81-C-40
W9LT 32,844- 161- 68-C
W9YB (N9NB,opr.)
429- 13- 11-C-20
WB9POH 231,210- 734-105-C-15
KK9G 46,410- 238- 65-C
KK9W 2276- 42- 26-C
KA9DOO 26,400- 176- 50-B-10
W9TC 8040- 67- 40-C

Wisconsin

W9OP 227,529- 477-159-C-AB
KQ9L 70,875- 225-105-C
N9BUS 35,640- 132- 90-C
W9GXR 31,950- 150- 71-C
WA9BZW 21,762- 117- 62-C
W9RN 19,494- 114- 57-C
WB9NOV 17,574- 101- 58-C
WB9UIO 8640- 64- 45-B
W9YCV 1296- 24- 18-C
KB9S 216- 9- 8-C-80
W9AMM 43,848- 203- 72-C-15
W9XT 43,512- 259- 56-C-10

Ø

Colorado

WØOSK 150,552- 369-136-C-AB
KDØU/MØ 22,230- 114- 65-C
WØJF 5186- 48- 36-B
KDØM 1092- 26- 14-C
WØGW 684- 19- 12-C
WØBWJ 624- 16- 13-C
KCØAT (KØGL,opr.)
176,085- 559-105-C-20
KAØFPJ 1311- 23- 19-B
WØZV 410,958-1363-102-C-15
8ØUK 207,132- 847- 82-C
WDØASM 127,617- 721- 59-C-10
WØGOR 83,055- 565- 49-C
WØIZV 2496- 52- 16-B

Iowa

KØCF 165,240- 340-162-C-AB
WØPPF 53,835- 185- 97-C
KØVZR 38,088- 138- 92-C
KKØR 31,125- 125- 83-C
KAØO 18,600- 100- 62-C
WØMJN 15,624- 93- 56-C
WAØDCB 13,338- 78- 57-C
WØUZ 11,076- 71- 52-C
WØSPF/Ø 2952- 41- 24-B
WØEJ 2232- 31- 24-C
WØSML 243- 9- 9-C-40
NØEEN 6371- 47- 31-C-20
AGØM 16,974- 123- 46-B-15
NØAFL 7659- 69- 37-C
WAØETC 49,104- 264- 62-C-10
NØJR 45,135- 255- 59-C
KØCT 31,875- 125- 85-A-QRP

Kansas

WAØTKJ 429,660- 620-231-C-AB
WBØISW 214,812- 442-162-C
WDØBNC 138,618- 302-153-C
WØIYR 92,394- 261-118-C
WØUQD 53,976- 173-104-C
WDØCFZ 51,600- 172-100-C
WDØCCM 51,207- 169-101-C
WØCY 45,684- 162- 94-C
KØLD 32,562- 134- 81-C
WAØNIK 24,522- 134- 61-C
KDØBD 12,642- 86- 49-C
ACØA 2688- 32- 28-C-40
KBØU 13,431- 121- 37-C-10
KØVUA 11,070- 90- 41-C

Minnesota

WØLF 34,383- 157- 73-C-AB
WØYA 15,510- 110- 47-B
KØTT (WAØMHJ,opr.)
8364- 68- 41-C-40
NØAT 82,917- 333- 83-C-20
NØBSH 62,568- 264- 79-C-15
WAØFBS 8256- 86- 32-B-10

Missouri

KØIFL 104,538- 266-131-C-AB
ACØN 96,921- 267-121-C
WAØNOK 69,264- 208-111-B
AKØW 810- 18- 15-C

Nebraska

KVØI 66,775- 199- 75-C-AB
KBØYK 504- 14- 12-B

North Dakota

KØQQ 116,973- 317-123-C-AB
KIØE 10,881- 93- 39-C
KCØCU 9450- 90- 35-C-15

South Dakota

WDØBHV 55,350- 225- 82-C-AB
NØEAL 12,852- 84- 51-B
WØWUU 11,562- 82- 47-C

VE

Maritime — Newfoundland

VE1CCM 42,848- 192- 73-C-AB
VO1QU 32,688- 227- 48-B
VE1YX 3776- 39- 28-B-160
VO2CW 139,230- 546- 85-B-20

Quebec

VE2CE 44,583- 193- 77-C-20
VE2ON (VE1BHA,opr.)
121,770- 495- 82-C-15
VE2FJR 5850- 65- 30-B-10

Ontario

VE3CCO 176,670- 390-151-C-AB
VE3LDT 116,280- 255-152-C
VE2WA/3 108,882- 263-138-C
VE3LAJ 58,590- 186-105-B
VE1IRF 2808- 36- 26-B
VE3YV 2178- 33- 22-C
VE3GWM 2070- 30- 23-C
VE3BBN 192- 8- 8-C-160
VE3CUI 108- 6- 6-C-40
VE3LTQ 360- 17- 10-B-15
VE3NBE 17,202- 122- 47-C-10
VE2AEJ/3 1890- 35- 18-A-QRP

Manitoba

VE4RP 85,707- 321- 89-C-AB
VE4CCC 52,323- 163-107-B
VE4AEX 4212- 54- 26-B-10

Saskatchewan

VE5RA 430,800- 718-200-C-AB
VE5AE 37,590- 135- 78-B
VE5ADA 37,830- 194- 65-C-20

Alberta

VE6OU 806,820-1190-226-C-AB

British Columbia

VE7IN 372,294- 962-129-C-AB
VE7AAQ 344,598- 727-158-C
VE7BSH 11,316- 92- 41-C-20

N.W.T. — Yukon

VY1DD 2394- 18- 21-B-20

W/VE — Phone

Multioperator
Single Transmitter

1

AG1C (+W1YN)
955,434- 986-323-C-EMA

KB1H (+K9ZO)
687,690- 810-283-C-CT
KG1D (+K1NYK, KA1VC)
537,840- 747-240-C-CT
K1XM (+K1PR,KA1GHR,N1CW)
501,015- 635-263-C-EMA
N1AU (+AJ1I,WA1WZJ)
265,115- 419-195-C-EMA
KM1C (+KB1T)
137,700- 300-153-C-NH
W1IHN (+KA1FBY)
136,323- 297-153-B-EMA
KM1P (KA1AJZ)
2166- 38- 19-B-CT

2

K2VV (+N2JJ)
997,542-1131-294-C-WNY
K2FL (+W3SOH)
591,360- 704-280-C-SNJ
W2BHK (+W2NM)
566,928- 744-254-C-SNJ
WA2IQO (K2s DOD,OB,UAT,
KB2UB,KC2DN,N2DYE,W2DKM,oprs)
382,788- 588-217-C-NLI
W2AZO (+N2ECD)
367,992- 538-228-C-ENY
K2TD (+ net)
266,526- 442-201-C-SNJ
W2UI (+N3KR)
242,721- 467-181-C-SNJ
N2AIF (multiop)
76,230- 210-121-C-ENY
W2BMW (N2RB,WA2PMU,oprs)
15,510- 94- 55-B-NLI

3

W3BGN (+KB3AG,N3BB)
1,569,726-1418-367-C-EPA
W3MA (+K3ZA)
1,089,360-1068-340-C-EPA
K3TUP (+AI8S,KO3A,KB8IZ,KJ3L,
N3BJ,W8CY)
1,081,080-1163-310-C-WPA
WB3EKV (+KA3IFG,WA3EUL)
134,836- 574-213-B-EPA
WA3SPJ (+KB3WM,N3AQL,WA3KBH,
WB3FPL)
329,130- 530-207-C-EPA
N3ARK (+KB3MM)
786,700- 450-212-C-EPA
K3HP (+KB3HE)
225,522- 402-187-C-EPA
N3GB (+ net)
223,965- 395-189-C-MDC
KC3O (multiop)
135,525- 125-139-C-MDC
K3UEI (+net)
120,012- 274-146-C-EPA
WB3HYX (+WA3VUE)
91,881- 249-123-B-EPA

4

AA4VK (+K4NYV,N4SF,NW4B,
W4YZX,WA4s JJW,TLJ)
718,479- 823-291-C-NC
WA4QQV (+N4AOC,WA4QMQ,WD4MUY,
WM4N)
534,936- 719-248-C-KY
K4CXY (+WA4LTA,WB4PRX)
451,485- 635-237-C-TN
W4VBH (+N4DW)
128,520- 280-153-C-TN

N4TX (+Net)
5700- 50- 38-C-VA

5

K5QY (+KM5K,KY5P,N5s BQQ,EG)
508,320- 706-240-C-NTX
WB5TTU (+KA5KAV,WD5FUK)
132,660- 335-135-B-OK

6

K6XT (+N6ND)
1,362,240-1892-240-C-SDG
W6BTP (+WA6s AUE,DJI)
472,935- 769-205-C-SF
W6UE (AA6RX,N6DLU,WB6s RJH,
YTU,oprs.)
274,383- 709-129-C-LAX
KB6GV (+Net)
81,840- 220-124-C-SCV
KE6PQ (+Net)
75,828- 356- 71-B-SCV
W6OAT (+Net)
65,988- 188-117-C-SCV
N6CCL (+Net)
57,684- 253- 76-C-EB
KE6WL (+AC0P, KD6NT)
43,092- 266- 54-B-SF
KF6AB (+Net)
16,698- 121- 46-B-SCV

7

N7RO (+W7s DDN,ERM,WA7ZGK,
WB7CLU)
621,606- 982-211-C-WA
WA7UEC (+KW7R,KY7N,NA7J,N7EQD,
WA7s HVU,OHU,WB7SDY)
119,548- 859-126-C-NV
W7UC (KA7s JBW,IVW,HWE,KUK,
WA7ILV
WA7ICC,WB7s PRL,UUT,oprs.)
209,880- 583-120-C-WA
WB7DHC (+KA7GKK,N7CFO,W7FRD)
186,219- 513-121-C-WA
W7DK (K7s ETU,GYP,QLC,KA7NSR,
KC7V,KL7UR,N7DRT,W7DWW,WA7s
IVO,OII,RWK,WB7QCW,oprs)
92,796- 418- 74-C-WA
WB7NCN (+KC7MM)
69,204- 316- 73-B-WA

8

WB8JBM (KC8XK,KQ8M,KV8M,KW8N,
N8s ATR,DMM,EDE,WD8IJP,oprs.)
851,928- 922-308-C-OH
K8CC (+N8s DET,DKJ,WA8RRR)
695,016- 788-294-C-MI
WB8UCW (+WB8HDO,WD8MKC)
259,308- 441-196-C-OH
W8LT (KC8YH,WB8PBI,WD8IXE,oprs)
132,696- 291-152-B-OH
N8II (+ net)
122,472- 252-162-C-WV
K8US (+Net)
89,661- 249-121-C-OH
WB8TMF (+WB8SGL)
51,552- 179- 96-C-OH

9

WØAIH/9 (+KØs FVF,TG,KMØO.
WØUC,WAØRBW)
508,896- 684-248-C-WI

W9QQ (+KB9YW,N9GB,WB9RGA)
441,768- 632-233-C-IL
KS9W (+KC9X)
155,450- 350-149-C-IL

Ø

NØST (+ADØO,NØs DV,EBM,KYØS)
604,404- 978-206-C-CO
KØJSY (+KBØPR,KDØQ,WØWP)
543,864- 731-248-C-IA
KØSR (+KFØP)
429,840- 597-240-C-MN
KRØB (Multiop)
422,304- 664-212-C-MN
WAØQMU (+AE5W,KØMAT,KCØTH)
361,197- 599-201-C-KS
KBØV (+AKØM)
336,587- 547-207-C-IA
KØSCM (+KØDI,KBØQH,WAØWRI)
313,020- 564-185-C-NE
WBØUFL (+KAØJUJ)
264,228- 454-194-C-IA
WØUN (+KØRF, NØCQJ)
210,795- 611-115-C-CO
KMØR (+KMØP,WØHRH)
140,598- 371-146-C-MO
WØEAN (+KCØXK)
69,201- 233- 99-C-IA
KCØWP (+WAØBBT)
61,608- 302- 68-C-CO
ACØE (NØs BKW,CPC)
55,755- 177-105-C-KS
KØINB (+KBØFP)
2511- 31- 27-C-IA
KJØG (+KØGAS)
900- 25- 12-B-CO

VE

VE6AO (VE6s WR,CCL,CGQ,CPT,
CQC,oprs.)
11,424- 112- 34-C-AB

W/VE Phone

Multioperator
Two Transmitter

W4QAW (+CX1EK,K3s EST,RV
N4EA,W3ZZ)
2,791,068-2086-446-C-VA
K2TR (+AC2X,K7XA,N3CM,WA2SPL)
2,768,112-2256-409-C-ENY
K4CG (K3s TW,WUW,K4PQL,K7SV,oprs)
2,078,505-1615-429-C-VA
K4VX/Ø (+KM9D,N9NC,KRØY)
1,967,640-1726-380-C-MO
ABØI (+ABØX,KØs CS,RWL,TLM,UAA,
KBØs U,WD,KMØL,WØJLC)
1,932,066-1934-333-C-MO
K8ND (+AD8I,K3JT,K8EM,KC8WR,
KU8E,W9OBF)
1,851,048-1641-376-C-OH
K1RX (+K1CC)
1,719,903-1537-373-C-CT
N4RJ (+AA4s GA,NC,KC4CR,W8ZF)
1,707,552-1568-363-C-GA
KC3E6 (+K3s VW,WW,W3RJ)
1,661,922-1454-381-C-EPA
AA6T (+KA6LAE,NS6G,WA6HKP)
1,457,195-2037-245-C-SCV
W5JW (+AA5B,K5TA,KD5VV,N5s HH,RR)
1,473,736-1654-297-C-NM
KS9K (+K9CJK,KB9OC,KE9U,KS9Z,
WB9s AUK,OJE,SM7DZT)
1,376,550-1425-322-C-WI

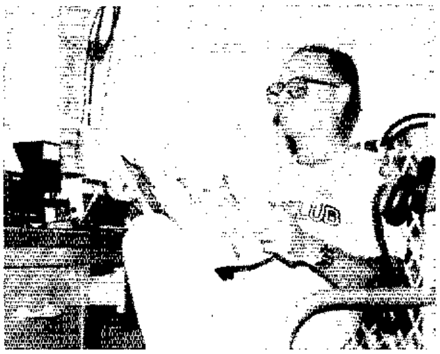
K9GM (+KE9A,KR9R,KR9S,KO9Q,W9s
MYG,RF,WA9s OVU,TZR,WB9s YXY,
ZBB)
1,123,332-1205-311-C-WI
N3AD (+N3DAY)
995,379- 973-341-C-EPA
KØDD (+KØKX)
950,472-1032-307-C-MN
K1EA (multiop)
912,168- 984-309-C-EMA
K6ZM (+AK6T,K4VUT,NB6L)
839,139-1289-217-C-EB
W9JZ (K9s BIL,QXY,KC9s JP,LM,
N9CXJ,WB9RNF,oprs)
676,269- 891-253-C-WI
KB8TI (multiop)
284,622- 533-178-C-MI
KC3Z (+K3FD)
155,832- 302-172-C-WPA
W9VCF (KA9s ACL,ATV,JRY,JXQ,MFR,
MNN,KB9VE,N9s AVQ,BMW,DEZ,DHD,
WA9s CYG,LVB,JWL,RYX,WB9s ZBG,
ZBH,WD9s AQA,JDP,oprs.)
99,825- 275-121-C-IN
WB3JRU (+ net)
24,624- 114- 72-C-MDC

W/VE Phone

Multioperator
Unlimited

N2AA (+K2s BQ,GL,GM,NG,SS,TT,TW,
K3NA,KC2X,KR2J,KR2Q,KR2W,N1ARP,
W2RQ)
5,602,131-3439-543-C-ENY
K1OX (+K1s DG,GQ,XX,KA1R,KG1F,
KC4WJ,W1s FJ,FV,WB8BTH)
5,053,020-3178-530-C-NH
K2UA (+AG2S,K1PT,K2BU,K3s JLT,
WJV,K82XZ,N2s BA,MM,N3RD,WA2HGM)
4,846,815-2911-555-C-SNJ
N5AU (+K5s FHV,MM,MR,LJ,ZD,N5s
UR,TP,KM5X,WB5s VZL,YOT)
4,727,712-3256-484-C-NTX
W7RM (+K7s LR,QQ,KB7G,N7UA,NA7P,
W7WA)
4,272,125-1753-375-C-WA
W3LPL (+AI3M,K3OI,KC8C,WJABC,
WA3KCY,WD4AXM)
3,715,911-2533-489-C-MDC
W4DR (+K3RZR,K4QX,KA4EVH,N4ND,
NB4A,W4s PDG,RNP,WA4s HOT,IZK,
WD4IMC)
3,163,344-2234-472-C-VA
KX4S (+AB3P,K4WHN,KAJDTE,KG4W,
N4EHJ,WA4BKD,WB4BVY,WK4Y)
3,074,640-2228-460-C-VA
W3GM (+K3s GM,ND,ZUF,N3VV,W3FV)
2,549,952-1864-456-C-EPA
N2RM (+WB2YOF,K3KNB,KB3TN)
2,053,134-1773-386-C-SNJ
K5LZO (+K5s IY,KG,KD5SP,KY5A,
N5DU,W5ASP,WD5GXI,WB5RUS,WBØNFY)
1,569,696-1576-332-C-STX
K3ON (+K3ZZ,KA3BCZ,KC3s EK,FL,
WA3EKL)
1,143,876-1102-346-C-MDC
K3II (+KQ2O,K3s JJG,JLK,NL,WA3IMY)
995,880- 965-344-C-EPA
W3GU (+N3ATQ)
651,240- 810-268-C-EPA
KF3R (multiop)
598,644- 723-276-C-EPA
W8NGO (+K8s ZE,ZZU,N8DNC,W8s
KR,ONA)
495,504- 666-248-C-MI
W14B (+W1UA,K4VHC,KA4KMB,KE4s
XW,XY,N4s LBZ,HLR,WA4QZR,WG4P)
361,680- 548-220-C-GA

The W3BGN station won the W/VE multi-single plaque on both modes. This is the phone crew (l-r): W3BGN, N3BB and KB3AG.



HI3AMF took time out from his all-band phone operation for a little light reading and some relaxation.

The CN8CX phone gang (l-r): K4BF and WB4YFD (seated), and AA4SC, KC4CD and KU4V. The CN8CX 4.1-million point score was the top multioperator-two transmitter score from Africa.

DX — Phone

Single Operator

Africa

CN8CO (W3EMH,opr.)
1,220,550-1975-206-B-AB
CN8EU (W6AXX,opr.)
110,025- 815- 45-C-10
EA8ZI 840,420-2001-140-B-AB
EA8ADY 144,480- 560- 86-B
VQ9CI 50,232- 299- 56-C-AB
ZS6DW 32,640- 272- 40-C-40
W3KHQ/ZS6 6216- 74- 28-B-20
ZS6ZS 39,984- 272- 49-B-15
ZS6OX 151,293-1073- 47-C-10
5H3BB (SMØEAJ,opr.)
229,824- 684-112-C-AB

Asia

AP2HM (K4YT,opr.)
1728- 32- 18-B-20
DU1CPL 13,566- 238- 19-B-10
HL5BCB 3749- 53- 11-B-AB
HZ1HZ 106,260- 460- 77-C-AB

JE1QPU 817,944-1576-173-C-AB
JA1ELY 734,820-1324-185-C
JA6LOD 311,148- 804-129-C
JF1EEK 76,500- 340- 75-B
JRØLPE 67,482- 326- 69-B
JA7VSO 62,100- 276- 75-B
JA1FKY 46,482- 254- 61-B
JR3BOT 40,500- 225- 60-B
JA1QZC 33,060- 190- 58-B
JA6IP 31,200- 200- 52-B
JR3WXA 31,164- 212- 49-C
JA1VZM 23,184- 184- 42-B
JM1LZT 19,272- 146- 44-B
JA1JCP 18,837- 161- 39-B
JA1OHP 6,359- 113- 41-B
JA1ALX 3,332- 101- 44-B
JA1SGX 1,514- 101- 38-B
JL1EJO 9504- 99- 32-B
JR7DUD 8928- 96- 31-C
JA1ADU 7344- 102- 24-B
JE3EPK 6300- 100- 21-B
JA4HCK 4056- 52- 26-B
JA7EDZ 3696- 56- 22-B
JE1GZB 3276- 78- 14-B
JR4ISK 3060- 60- 17-B
JA3BBG 2058- 49- 14-B
JA1AAV 1998- 37- 18-B
JR6PCB 1836- 36- 17-B
JH1FJK 1080- 30- 12-B
JH5IRT 870- 29- 10-B
JJ1VTE 513- 19- 9-B
JHØEPI 315- 15- 7-B
JA5EO 180- 12- 5-B
JA2BAY 56,070- 445- 42-C-40
JE1GNC 6138- 93- 22-C
JA6BEF 558- 31- 6-C
JR6LDI 432- 24- 6-B
JR7IVR/1 414- 23- 6-B
JAØVHI 396- 22- 6-B
JA7FFY 360- 20- 6-B
JA1CTF 306- 17- 6-C
JH7DUM 306- 17- 6-B
JH7BDS 252- 14- 6-C
JH9CAV 210- 14- 5-B

JF3NWY 150- 10- 5-B
JA1BOK 60- 5- 4-B
JN1MKZ 48- 8- 2-B
JR4SRW 18- 3- 2-B
JH3DPB 78,600- 524- 50-B-20
JA7RXU 504- 21- 8-B
JA2TKO 120- 8- 5-B
JA4PA 36- 6- 2-B
JA2APA 183,975-1115- 55-B-15
JA8WKE 152,295- 923- 55-B
JA3YQP (JG3VKW,opr.)
171,338- 749- 54-C
JK1OLT 105,264- 688- 51-C
JA7YAI (JK1CYV,opr.)
64,722- 469- 46-C
JR3TSM 49,410- 366- 45-B
JA7BNN 53,560- 330- 44-B
JH6ZHF (JH6DOG,opr.)
32,832- 288- 38-C
JI1QLB 30,873- 251- 61-B
JA8UJY 19,380- 170- 38-B
JH7NPF 16,530- 145- 38-B
JM1DBZ 11,928- 142- 28-B
JL1EJU 11,658- 134- 29-B
JI1LLD 10,800- 120- 30-B
JN1ISD 8900- 150- 22-B
JA1HGY 8667- 107- 27-B
JA7GYR 6552- 84- 26-B
JH8TDZ 6336- 88- 24-B
JE7DDT 5760- 80- 24-B
JI3UMO 5016- 76- 22-B
JO1BHV 4860- 81- 20-B
JJ3OKZ 4284- 68- 21-B
JF7XPL 2664- 24- 12-B
JA3FZT 2208- 48- 16-B
JA7YKD (JF7NXS,opr.)
2160- 48- 15-B
JE7UCO 2142- 51- 14-B
JA1DCD 1911- 49- 13-B
JA7WKG 1530- 51- 10-B
JI3JGJ 1754- 38- 11-B
JE7RDV 1080- 36- 10-B
JH1MTR 990- 30- 11-B
JJ3JOB 960- 32- 10-B
JN1CDD 900- 30- 10-B
JE7GRW 779- 27- 9-B
JR1UCC 702- 26- 9-B
JA1AJA 693- 21- 11-B
JH2KTV 360- 15- 8-B
JJ1BDX 342- 19- 6-B
JN1QWG 336- 14- 8-B
JA2DHL 260- 16- 5-B
JH7OIF 234- 13- 6-B
JP1FZA 144- 12- 4-B
JE7SWJ 132- 11- 4-B
JA0RLM 63- 7- 3-B
JH3NBL 54- 9- 2-B
JN1ENK 45- 5- 3-B
JA9XWR 36- 4- 3-B
JK3FXF 9- 3- 1-B
JJ1NUB 137,436- 881- 52-B-10
JR7COO 119,799- 783- 51-B
JA1ZLO (JH7PKH,opr.)
109,980- 705- 52-B
JA7JWF 74,088- 504- 49-B
JH1EVE 72,912- 496- 49-B
JR6GIM 52,650- 390- 45-B
JA1CQT 14,322- 154- 31-B
JA1DFQ 12,672- 132- 32-B
JA1NTK 8874- 102- 29-B
JR7ICN 8640- 96- 30-B
JF3KNQ 7371- 117- 21-B
JH1DUT 7098- 91- 26-B
JA6GUD 6696- 124- 18-B
JA1LOM 3192- 56- 19-B
JA1AAT 2166- 38- 19-B
JH0WCN 1914- 58- 11-B
JG3HGO 1782- 54- 11-B
JA4KWU 1530- 30- 17-B
JA1BCW 1500- 50- 10-B
JA6QDU 1470- 35- 14-B
JA0CGJ 1440- 48- 10-B
JA2DHG 1332- 37- 12-B
JG3NKP 1110- 37- 10-B
JE1PJR 1107- 41- 9-B
JH1CNN 720- 30- 8-B
JA6ADA 660- 22- 10-B
JR1OYL 630- 30- 7-B
JA3BCT 204- 17- 4-B
JA2SAP/1 180- 20- 3-B
JA6PL 72- 12- 2-B
JI3BHG 30,576- 196- 52-A-QRP
JH3LCU/1 25,110- 186- 45-A
JR7BNF 23,760- 165- 48-A
JA1GBA 6804- 81- 28-A
JH8XSD 2916- 54- 18-A
JR7PAH 1260- 35- 12-A
JA9XBW 1089- 33- 11-A
JH8RCQ 486- 18- 9-A
JF1JLW 306- 17- 6-A
JK1PEC 294- 14- 7-A
JK1LRH 3- 1- 1-A

UA9FAT 63,336- 406- 52-B-20
UA0SAU 57,150- 381- 50-B
UA9ND 2331- 37- 21-B
UM8MDX 5994- 74- 27-B-20
UM8MCY 420- 14- 10-B-15

YK1AO 6000- 80- 25-B-20

4Z4AB 215,628- 604-119-B-AB

9K2BE (L4BWF,opr.)
27,936- 194- 48-C-AB

Europe

CT4KQ 26,826- 263- 34-C-80
CT1AOZ 93,000- 620- 50-C-40
CQ4NR 49,569- 403- 41-B
CR9UA 131,820- 845- 52-C-15
CT1AV 2862- 53- 18-C-10
CQ1BWY 459- 17- 9-B

CT2AK 66,435- 515- 43-C-80

DJ0BA 137,781- 567- 81-C-AB
DL1BO 1596- 28- 19-B
DL0CJ (DF6XB,opr.)
15,048- 152- 33-C-40
DL8PC 6352- 84- 26-C
DL7AFJ 4941- 61- 27-B-20
DL7AHD 4392- 61- 24-B
DJ8RT 85,587- 607- 47-C-15

EA2QU 765,600-1595-160-C-AB
EA5AMW 409,875-1093-125-C
EA1BDB 86,940- 414- 70-B
EA7CFW 40,188- 197- 68-B
EA4BKM 29,733- 187- 53-B
EA7BVL 20,670- 130- 53-B
EA7IM 2496- 52- 16-B-80
EA7AZJ 21,735- 207- 35-B-40
EA3AUE 17,285- 117- 35-C-20
EA4ZO 9021- 97- 31-B
EA5BVG 432- 16- 9-B
EA2IA 67,473- 441- 51-C-15
EA3DFA 62,700- 418- 50-C
EA4LEZ 59,784- 424- 47-B
EA1CIM 59,040- 410- 48-B
EA5ANR 13,608- 126- 36-B
EA3KT 8835- 95- 31-B
EA3CSR 6804- 81- 28-B

EA6GP 966- 23- 14-B-AB

F5BV 19,997- 136- 49-B-AB
F5LL 9462- 83- 38-B
F6DKP 858- 22- 13-B
F2MO 4539- 89- 17-B-80
F6BRK 7626- 82- 31-B-20
F2SI 323,737-1976- 56-C-15
F6CLM 9021- 97- 31-B
F6EPO 4884- 74- 22-B

F0BLZ/FC 1620- 27- 20-B-15

G3XBY 152,460- 462-110-C-AB
G2OT 91,791- 379- 93-B
G5DPP (W4UON,opr.)
5580- 60- 31-B
G3KWZ/A 19,494- 171- 38-B-20
G3NT 9072- 112- 27-B-15
G3ZBL 7140- 85- 28-B
G3JKY 1632- 32- 17-B
G3WQG 1710- 30- 19-A-QRP

GM4KHE 240- 10- 8-C-40

GW4DRS (GW4HOZ,opr.)
33,078- 298- 37-C-15

HA4XX 56,712- 278- 68-B-AB
HA4ZZ 73,743- 523- 47-B-15
HA7PP 54,954- 426- 43-B

HB9AAA 328,104- 868-126-C-AB
HB9DX 20,091- 181- 37-C-15

I4AVG 589,632-1328-148-C-AB
I2CZQ 196,209- 559-117-C
I4CSP 47,652- 209- 76-B
IT9GSF 75,305- 261- 35-C-40
I2MQP 3234- 49- 22-C
IT9KZW 112,608- 736- 51-C-15
I4UFH 44,280- 328- 4[illegible]

IS0LLJ 8190- 78- 35-B-AB

LA1HCA 12,996- 114- 38-B-AB
LA2AD 12,600- 105- 40-B
LA4TE 5280- 55- 32-B
LA8DY 21,260- 177- 40-C-20
LA4TG 11,526- 113- 34-C
LA5KK 3024- 42- 24-B
LA3YW 1530- 34- 15-B
LA3JT 1173- 23- 17-B
LA9DL 2112- 32- 22-B-15
LA9ZV 2451- 43- 19-B-10

OE5CWL 18,240- 160- 38-C-AB

OH1PS 91,314- 342- 89-C-AB
OH1OR 29,070- 170- 57-C
OH2BAH 8670- 85- 34-C
OH2BIF 624- 16- 13-B
OH6DX 72,738- 449- 54-C-20
OH5OL 5427- 67- 27-B
OH7NW 216- 12- 6-C
OH6AN (OH6LK,opr)
62,930- 418- 45-C-15
OH1PY 1620- 45- 12-C
OH2BUU 1554- 37- 14-C

OK1AJN 54,528- 256- 71-B-AB
OK3RJB (OK3TCL,opr.)
41,391- 219- 63-B
OK2BSA 11,349- 97- 39-B
OK1KZ 2040- 34- 20-B
OK1MSN 12,788- 128- 32-C-80
OK2FD 7623- 121- 21-C
OK1TO 58,506- 398- 49-C-20
OK2PBM 44,640- 310- 48-C
OK1ALW 43,974- 349- 42-C
OK2PDE 26,880- 224- 40-B
OK1DWA 144,828- 894- 54-C-15
OK1ARI 47,760- 398- 40-B
OK2RU 24,309- 219- 37-B
OK1AGN 23,712- 208- 38-C
OK3KAG 20,091- 181- 37-C
OK2BLD 7650- 85- 30-B
OK2KMR (OK2BQZ,opr.)
5538- 71- 26-B
OK1DMJ 1710- 30- 19-B
OK1TW 570- 19- 10-B
OK1OPT (OK1IAY,opr.)
210- 10- 7-B
OK1DKS 10,760- 90- 38-A-QRP
OK3CGP 3969- 49- 27-A

ON5YS 79,200- 550- 48-B-20

OZ5EV 59,976- 294- 68-C-AB
OZ1TBN 19,500- 130- 50-B
OZ2BM 10,944- 96- 38-B
OZ2OL 13,152- 411- 32-B-20
OZ4ZT 9030- 86- 35-B
OZ1ACB 8400- 80- 35-B
OZ1CVT 3600- 48- 25-B
OZ1BQA 3384- 47- 24-B
OZ8T 3036- 44- 23-B
OZ6XR 726- 22- 11-B
OZ3ZR 390- 13- 10-B
OZ1XV 60- 5- 4-B
OZ1DYC 1674- 31- 18-B-15
OZ1APA 126- 7 6-B

PA0KDM 7752- 68- 38-B-AB

SM6EKA 6696- 62- 36-C-AB
SM0COP 1620- 27- 20-B

SM0CHA 840- 20- 14-B
SM6BCC 16,218- 159- 34-C-40
SM2TWU 29,565- 219- 45-C-20
SM5ALJ 12,543- 113- 37-C
SM0BDS 8160- 85- 32-C
SM5CAB 7176- 92- 26-C
SM7TV 4872- 58- 28-B
SM5DEV 3381- 49- 23-C
SM5AAY 1536- 32- 16-C
SK7NK (SM7AIO,opr.)
974- 27- 14-B
SK7PP (SM7AIO,opr.)
750- 25- 10-B

SV1JG 178,020- 645- 92-C-AB

UV3HM 6603- 71- 31-B-AB
UA3FAL 990- 30- 11-B-80

UA2EC 4914- 63- 26-B-20

UB5IFN 1638- 42- 13-B-80
UB5UAT 37,752- 286- 44-B-20
UB5VAZ 24,960- 208- 40-B-15
UY5XE 459- 17- 9-B

UO5OHH 24,465- 233- 35-B-20

UP2BAO 62,913- 313- 67-B-AB
UP2PBW 10,800- 100- 36-B
UP2BBF 3591- 63- 19-B-20

UR2OI 15,096- 148- 34-B-20

Y27YH/A 13,395- 95- 47-B-AB
Y75BL 4371- 47- 31-B
Y30AHB 4284- 51- 28-B
Y59HN 1404- 26- 18-B
Y33TA 72- 6- 4-C-40
Y25HL 12,096- 112- 36-B-20
Y27FN 10,098- 99- 34-C
Y58ZA 4992- 64- 26-B
Y22PF 4209- 61- 23-B
Y51UE 2223- 39- 19-B
Y38YE 2214- 41- 18-B
Y22BC 1785- 35- 17-B
Y30FLN 220- 20- 12-B

YO9HT 52,200- 232- 75-B-AB
YO6KEA (YO6AWR,opr.)
13,635- 101- 45-B
YO3KSC 3591- 63- 19-B-40
YO5BRZ 450- 15- 10-B-20
YO4KRF (YO4AIW,opr.)
540- 18- 10-B-15
YO3JW 48- 4- 4-A-QRP

YO7SF 4200- 50- 28-B-AB
YU4BR 24,738- 217- 38-C-80
YU4EBL (YU4WCN,opr.)
60,737- 367- 37-C-40
YU3EY 17,626- 119- 28-C
YT3A (YU3SO,opr)
145,179- 849- 57-C-20
YU4KHA (YU4VFF,opr.)
122,772- 787- 52-C-15
YU1OW 106,500- 710- 50-B
YT3T (YU3TUX,opr.)
81,438- 554- 49-C
4N9OLY 65,898- 523- 42-C
YU3TXD 405- 15- 9-C
YU7AV 12- [illegible] 2-C

North America

FM7WS 106,704- 741- 48-C-80
FM7CD 240,408-1431- 56-C-40

HH2CQ (K4JPD,opr.)
4,447,440-5112-290-C-AB
HH2VP 11,628- 102- 38-C

HI3AMF 216,300- 721-100-B-AB
HI8GB 134,037- 843- 53-C-40

HP3JRP 31,878- 253- 42-B-10

W9NXD/HR7 19,440- 180- 36-B-80

KG4GU (KB4CD,opr.)
1,247,328-1952-213-B-AB

KL7LF 550,368-1274-144-C-AB
AL7EN 432,246-1181-122-C
KL7IWF 155,760- 590- 88-C
WB4WXE/KL7
70,640- 172- 40-C-15

NP4P 1,142,784-1984-192-B-AB
NP4EM 214,032- 686-104-B

KP4FIX 78,000- 520- 50-B-20
NP4FR 208,760-1335- 52-A-QRP

TG9GI 936,144-2167-144-A-QRP

TI2KI 29,295- 217- 45-B-15

VP2KBE (KL1JU,opr.)
477,855-1295-123-B-AB

VP2MBA (W7FP,opr.)
4,081,230-4965-274-C-AB
VP2MKO (K9MK,opr.)
545,661-3191- 57-B-15

V3GU (K0GU,opr)
6,376,471-7381-297-C-AB
V3TV 202,113-1321- 51-B-10

XE1LCB 111,540- 676- 55-B-40
XE1LLS 252,054-1474- 57-B-10

ZF2FL (N6RJ,opr.)
6,578,928-6984-314-C-AB

8P6J (N6IJ,opr.)
6,079,200-6800-298-C-AB
KI8G/8P6
613,791-1143-179-B
8P6QI 141,168- 692- 68-B

Oceania

KH6ND 3,041,595-3855-263-C-AB

KH6RS (AI6V,opr.)
2,699,250-3599-250-C
KH6BZF (K8HQR,opr.)
1,934,748-2982-223-C
W7PSO/KH6 5865- 85- 23-B-15
KH6LW 67,104- 466- 48-B-10
AH6EK 1344- 28- 16-A-QRP

KH7AA 115,056- 799- 48-C-20

T32AF (KH6UR,opr.)
1749- 53- 11-B-160

VK4VU 2,161,494-3174-227-C-AB
VK5BW 738,728- 686-116-B
VK4UR 4617- 57- 27-B
VK1LF 726- 22- 11-C
VK5ARO 172,536-1027- 56-C-10
VK6NSD 12,741- 137- 31-B
VK4VMW 2337- 41- 19-B
VK6NCW 1716- 44- 13-B

V85YY (K5YY,opr)
187,200- 600-104-C-AB

ZL4LZ 574,494-1058-181-B-AB
ZL2BED 162,036- 643- 84-B
ZL1IM 22,356- 138- 54-B

South America

CE2BNT 878,754-1754-167-C-AB
EA4LH/CE3
54,945- 407- 45-C-40
CE7BIY 122,400- 816- 50-B-10

CE0AE 351- 13- 9-B-10

CP6EL 574,880-2272- 55-C-10

HC1HC 94,954- 617- 54-C-80

HK8BVN 49,128- 356- 46-B-15

LU1BR 2,386,438-4086-211-C-AB
LU4ECL 137,826- 589- 78-B
LU8DQ (LU6KTB,opr.)
74,088- 504- 49-C-40
LU8ESU 8265- 95- 29-C
LU2MM (K1MM,opr.)
350,112-2084- 56-C-15
LU5FGL 118,455- 745- 53-C
LU1VK 151,368- 901- 56-B-10

OA3AK (WB9MRX,opr.)
77,625- 375- 69-B-AB
OA4BOV 133,326- 823- 54-B-10

P4[illegible]J ([illegible],opr.)
3,485,133-4451-261-C-AB
K3ZOD/PJ4
23,100- 220- 35-B-20

PY5EG 1,484,436-2402-206-C-AB
ZY1NRZ 722,160-1770-136-B
PP8ZAT 533,352-1252-142-C
PY2BCQ 188,416- 957-136-B
PT2IR 339,552- 864-131-C
PS7KM 48,930- 233- 70-B
ZY5OC 144,372- 908- 53-C-20
PY1VT 45,648- 317- 48-B-15
PP1ZCP 10,506- 103- 34-C
PT7CST 128,949- 811- 53-B-10
PY8ZBJ 81,270- 602- 45-C
PY7FFW 47,517- 337- 47-C

PZ5JR 624,666-1498-139-B-AB

K3UOC/YV4
2,170,674-3462-209-C-AB
KB0FQ/YV3 638,496-1478-144-C
YV2DPJ (YV4BUU,opr.)
1200- 25- 16-B
YV2IF 405- 15- 9-C-160
YV7OP 82,350- 549- 50-B-20

DX — Phone
Multioperator
Single Transmitter

Africa

ED9EA (EA9s GJ, HE, IE, IJ, IU, KF, LZ,MO,oprs.)
3,000,330-3927-255-B

FR0FLO (+FR7CG)
1,662,570-2730-203-B

5Z4CL (+5Z4CM)
674,388-1572-143-C

Asia

JG1ZUY (JG1s ILF, IMM, JI1s, AGI,QQI,JL1RLW,oprs.)
1,160,640-2015-192-C
JA1YXP (JH4OWG, JE6IGU, JR6NJD,oprs.)
561,879-1257-149-C
JH1YLM (JA3s BAG,XGF, JE3CYV,JH3QKU,oprs.)
361,560- 920-131-B
JA7YFB (JH7XMQ,JJ1GXY,JR7s 3VO,LCI,OEF,oprs.)
301,824- 786-128-C
JA1YCL (JG1CQB,JH8MHZ, JH0,BUG,oprs.)
139,932- 507- 92-C
JA2YGK (JK7GIB,JR7s QLO,UJU,oprs.)
43,896- 268- 59-B
JA6YDH (JE6s PSL,VEJ, JG1TAW,JR6QHK,oprs.)
34,344- 216- 53-C
JA6YBR (JE2HCQ,JE6QFE,JF6s DLA,QZE,oprs.)
31,122- 247- 42-B
JA1YQB (JA7ARW, JK1NEC, JD1FMF,oprs.)
20,592- 176- 39-B

JA0YCR (JH0s NLB,NOS,oprs.)
11,016- 136- 27-B
JA1YWO (JN1CRV,JO1WIZ,oprs)
2394- 57- 14-B
JA3YCT (JK3s,FXF,FXN,oprs)
27- 3- 3-B

UK7LAA (UL7s LAA,LEG,LEN, LER,oprs.)
175,424- 536- 78-B

9K2QL (W6s KG,QL,oprs.)
41,416- 201- 72-C

Europe

DJ5IW (DF6CY,DK9CW, DL9CT,OE1ETA,OE2VEL, oprs.)
737,544-1556-158-C
DL5BAN (+DF7BZ,DK4BW,DL2BAQ)
368,277- 923-133-C
DK0TA (multiop)
42,714- 226- 63-C

EA3CRR (EA3s, DQN,HA,oprs.)
149,868- 543- 92-B
EG3SCB (EA3s,BOW,BOX,CVA, CWQ,DDU,oprs.)
131,955- 465- 95-B
EA1RCJ (EA1s BGT,BLY,CEJ, ECI AYW,oprs.)
93,744- 414- 72-B

F6CTT (+F1DDA,F6s BDN,EMT)
1,657,308-2574-214-C

G3XEP (G3s KWT,PSM,VKW, VTY,ZCA,G4s ATZ,DZI,EZI, EZX, FKS,IUF,LVQ,oprs.)
333,945- 905-123-B
G4BP (G3s CAA,ISL, G4s EDR, IZZ,IKI,MGQ,MVA,NSE,OBR, G6s BWO,NTH, G8s YWF,ZFS, oprs.)
78,183- 357- 73-B

GJ5DSO (GJ3YHU,WA3NGL,oprs)
694,868-1017-163-C

GU3HFN (GU3s KFT,MBS,GU4EOH GU6s JSG,RIS,TDE,oprs.)
645,174-1473-146-C

GW4JBQ (+GW3s KYA,NWS,GW6s NTB,OSM)
498,732-1196-139-C

HG5A (HA5s FM,FN,GF,ML,MK, OM,UA,WE,HA7SU oprs.)
1,031,688-2047-168-C
HA6KNB (HA6s ND,NF,NN,NO, NY,ON,OQ,oprs.)
939,360-2060-152-C
HG6V (6 oprs.)
604,098-1743-167-C
HA5KKC (HA5s KP,LV,MA,MD, MO,VM,oprs.)
602,148-1444-139-B
HG1Z (6oprs.)
366,000-1000-121-C
HA7KPL (6oprs.)
36,423- 213- 57-B
HA3KNA (2oprs.)
22,578- 147- 53-B
HA1KSA (5oprs)
2968- 81- 37-B

HB9AUS (+HB9s BLQ,CFU,CIP, MWD,HE9s,ASD,EEX oprs.)
654,300-1454-150-C

I5MPN (+I5s,MPK,MXX,NPH, SDG,IK5BAF oprs.)
1,769,904-2892-204-C
I0LJ (I0s JX, MGM,I6FLD, IBs,RPO,ULL)
1,765,329-2957-199-C
I7RA (+I2s CZ,QMU,RVW,SLA, WDB,YCF,IK2s AGN,AVH)
117,598- 646- 71-C
I4ZQS (+I4s WKL,YHB oprs)
28,980- 210- 46-C

OK1VSZ (OK1ZAF + 1 opr.)
9396- 87- 36-B

ON6BR (ON4s,AAJ,AQD,ASF,AYL, ON6s JA,JN,OU,ON7s PY,QU,XN, oprs.)
141,522- 458-103-B

PA0TUK (+PA0s AAS,BOE,PB0ABE oprs.)
47,744- 256- 62-B
PA0GN (PA0s ERA,GIN,oprs.)
10,720- 160- 64-B

SM0DJZ (+SM0AJU)
90,636- 336- 91-C
SM7KIL (+SM7FJE)
67,776- 353- 64-C

UK3ABO (3oprs.)
770,220- 990- 91-B

UK2BBK (UP2s BKW,PX + 3 oprs)
334,152-1071-104-B

UK2GAB (Multiop)
29,274- 238- 41-B
UK2GAZ (UQ2GLW + 1 opr.)
11,520- 128- 30-B

YT3M (YU3s TFY,TOR,TPZ, oprs.)
797,030-1553-170-C

North America

KP4BZ (+NP4CC)
5,163,631-6549-273-C

V2AXA (K4LTA,KR4C,N4FKO, KØDSN,oprs.)
3,486,276-5142-226-C

XE1MDX (XE1s FAO,CBM,OX, VIC,oprs.)
4,114,893-5099-269-C

XE2EBE (AA6DP,W6TSE,oprs.)
2,700,378-3798-237-B

ZF2CW (W2HPF,AE4H,oprs.)
2,876,385-4115-233-B

Oceania

H44SH (+H44s DX,SA)
1,506,744-2462-204-C

ZL1UC (ZL1s BHQ,BTZ,BXA, BXJ,DP,SC,oprs.)
1,277,568-2218-192-B

South America

HK3NBB (K3ZO,LU8AGT,oprs.)
376,674- 937-134-B

LU1EQ (LU2DHY,LU4ETL,LU6s DLU,ESF,LU7DUE,LU8s,ECD, ERB,oprs.)
457,470-1173-130-B

OA8CW (+OA8V)
2,854,080-3964-240-C

DX — Phone
Multioperator
Two Transmitter

Africa

CN8CX (AA4SC,K4RF,KC4CD, KU4V,WB4YFD,oprs.)
4,194,405-5615-249-C

Asia

JH7YJF (JA7UWU,JH7s DNO,GGI, LRS,NBE, JR7s AUT,FEK,QKR, oprs.)
1,127,976-2186-172-C

JA7YCQ (JH7s UGG,XUZ,JR7MZC, oprs.)
27,528- 248- 37-C

Europe

OH3AA (OH3s IQ,RF,TQ,OH6UD,oprs)
309,504- 806-128-C

OH8AN (OH1LJ,OH2's BH,BTZ, OH3ZE,SM2EKM,SM5CNG,oprs.)
222,138- 602-123-C

4N9YU (YU6s RS,VQT,WDN,WSF,oprs)
820,134-1698-161-C

4U1ITU (K1ZZ,KA1ZD,W2GD,oprs)
431,145-1005-143-B

North America

KL7RA (+AL7CQ)
1,729,887-3019-191-C

VP5KMY (K4UEE, W8UVZ, WB8LDH, WB9TIY, oprs.)
9,954,537-10,273-323-C

South America

YV3BRF (+YY3s ADR,ACT,AZC, BQG)
6,779,985-7661-295-C

DX — Phone
Multioperator
Unlimited

Africa

ZS6WB (+ZS6s BRZ,BTY,XD, oprs.)
809,044-1807-164-C

Asia

JA2YKA (JA6UDP, JA9s NFO, SSY,XXS,JE2s RQT, VYH, JE6GTX,JF2BQJ,JC1GIF,JH2QXG, JH4VBQ,JH6RPZ,JI2JXR,JJ1s BTA, BTC,JR2GMC, oprs.)
1,931,997-2837-227-C

JA9YBA (JA9s BZS,LJI,LNJ, OTX,VBW,JHØs CAZ,BHU,oprs.)
1,695,267-2653-213-C

JA7YAA (JE7IQE,JH7s CUD,GFO, LIS,ULN,WTC,JR7s OHD,SEI, UVL,oprs.)
1,615,464-2493-216-C

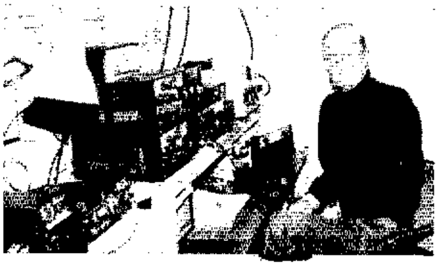
JF1ZRQ (JF1CYV,JG1GCU, JH1s CNT,VPP,JK1RNC,oprs.)
1,155,099-2059-187-C

Europe

I3EVK (I1DFS,I3s FIY,MAU, ON,IN3DYG,oprs.)
1,572,651-2661-197-C

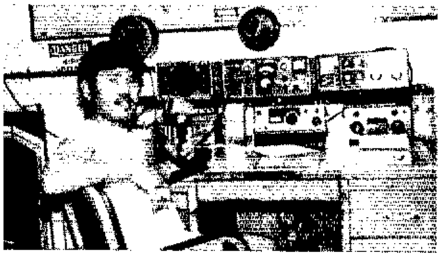
Oceania

VK2WU (+VK2s ADK,CR,NYA, XDS)
3,261,996-4769-228-C



SMØAJU teamed up with SMØDJZ for a multi-single phone effort.

Jack, VK4UR, at age 70, has been licensed since 1935 and likes to give the 'test a go on both cw and phone.



KH7AA was a surprise but welcomed multiplier in 800 20-meter phone logs.

W/VE — CW
Single Operator

1

Connecticut

W1ZM (K1ZM,opr.)	1,377,513-1467-313-C-AB
K1JX	1,289,700-1433-300-C
K1TO	1,286,637-1397-307-C
W1RM	947,340-1108-285-C
K1XA	754,380- 990-254-C
K1KI (AA2Z,opr.)	489,888- 756-216-C
KA1FCH	376,695- 761-165-C
K1WJL	353,535- 637-185-C
W1CNR	269,616- 548-164-C
WA1FCN	205,587- 431-159-B
W1KKF	197,658- 474-139-C
K1VDF	163,968- 437-128-C
K1YRP	139,695- 335-139-B
K1DM	117,384- 292-134-C
K3FN	65,199- 211-103-C
W1CNU	64,260- 210-102-C
K1IG	54,432- 252- 72-B
K1RV	42,630- 203- 70-C
K1WA	30,096- 132- 76-C
W1VH	29,748- 134- 74-C
K1CC	27,552- 112- 82-C
N1BCL	18,300- 100- 61-C
K1EM	15,996- 86- 62-C
AA2Z (K1KI,opr.)	12,540- 76- 55-C
AB1U	5406- 53- 34-B
W1AB	5244- 46- 38-C
W1WEF	1638- 26- 21-C
KB1N	768- 16- 16-B
KE1F	4959- 57- 29-C-80
KJ1N	3450- 46- 25-C
KB8VT/1	7344- 72- 34-B-20
K1RM	75,240- 330- 76-C-15
KA1CZF	5985- 57- 35-A-QRP

Eastern Massachusetts

W1KM	1,491,543-1609-309-C-AB
K1DG	946,944-1152-274-C
W1FJ	494,910- 705-234-C
K1XM	250,560- 464-180-C
W1DA	170,970- 410-139-C
W1CWU	105,705- 261-135-C
W1HX	69,498- 198-117-C
KA1CLV	62,685- 199-105-B
KC1X	41,385- 155- 89-C
KA1GHR	29,520- 123- 80-B
W1OPJ	5304- 52- 34-B
K1MEM	2700- 36- 25-C
N1BET	1200- 25- 16-B
W1PLJ	231- 11- 7-C
K1PT	83,877- 383- 73-C-80
K1VUT	2592- 39- 27-C
W1YN	110,946- 451- 82-C-20
WAØAXH/1	24,180- 155- 52-B
W1WAJ	61,776- 312- 66-C-15
WB1GNM	45,315- 265- 57-C

Maine

K1SA	210,105- 435-161-C-AB
K1JB	114,048- 264-144-C
WB1GLB	36,636- 142- 86-B
W1RRV	35,088- 136- 86-B
K1IIO	126,084- 553- 76-C-40
KN1M	7448- 54- 24-B
KB1U	1881- 33- 19-C-15
N1AFC	6549- 59- 37-A-QRP

New Hampshire

W1RR	1,047,696-1196-292-C-AB
AK1A	471,591- 859-183-C
KM1C	401,477- 611-219-C
AK1L	114,633- 271-141-C
K1NH	51,255- 201- 85-B
W1VY	19,053- 87- 73-C
AG1C	3880- 49- 40-C
KM1H	43,740- 243- 60-C-80
W1END	6455- 55- 27-B-40
K1GW	61,932- 397- 52-C-20
KA1O	59,772- 293- 68-C-15

Rhode Island

K1MXD	47,376- 168- 94-B-AB
K1VSJ	4320- 45- 32-C

Vermont

K2LE/1	740,860- 980-269-C-AB
W1KQ	4896- 51- 32-C
K1IK	72,864- 352- 69-C-15

Western Massachusetts

K1BW	1,109,016-1266-292-C-AB
W1GG	314,469- 613-171-C
AI1S	295,869- 511-193-C
KB1W	169,320- 415-136-C
W1MM	22,356- 108- 69-C
AI3E	8160- 80- 34-C-80

2

Eastern New York

W2AZO	619,200- 860-240-C-AB
K2RD	354,645- 555-213-C
K2QF	272,403- 531-171-C
AG2X	268,380- 639-140-C
W2XL	217,464- 442-164-C
N2CAP	155,901- 331-157-B
W2NC	97,125- 259-125-C
W2AWF	79,920- 240-111-C
W2DW	55,752- 184-101-C
W2GUP	46,248- 164- 94-C
W2KHQ	20,088- 108- 62-B
KB2CR	4800- 50- 32-C
KB2HP	360- 12- 10-C
WA2SPL	4350- 50- 29-C-160
KB2MG	12- 2- 2-C-80
KP2O	17,331- 109- 53-C-40

N.Y.C. & Long Island

K2SX	297,345- 461-215-C-AB
W2GGE	225,345- 415-181-C
W2CKZ	131,553- 311-141-C
KA2AEV	104,877- 271-129-B
W2AYJ	91,800- 255-120-C
W2AFM	15,312- 88- 58-B
K2KTT	1512- 24- 21-B
WA2ECT	168- 8- 7-B
N2KA	2997- 37- 27-C-80
N2UN	42,670- 165- 66-C-40
KM2X	2304- 32- 24-C
KK2E	22,032- 144- 51-C-20
WB2AMU	462- 14- 11-B-10
WB2DLA	45- 5- 3-B
WB2ENW	21,780- 121- 60-A-QRP

Northern New Jersey

N2LT	1,521,330-1570-323-C-AB
AG2A	676,632- 932-242-C
W2VJN	675,384- 856-263-C
K2NJ	458,325- 679-225-C
KC2FV	244,296- 522-156-B
W1GD	227,136- 416-182-C
W2BQ (K2WR,opr.)	220,980- 508-145-C
WA4PFN/2	46,134- 233- 66-B
K3DX	11,025- 75- 49-B
KT2O	7128- 54- 44-B
K2RF	5904- 48- 41-B
WB2WIK	5088- 53- 32-C
KJ2N	5580- 62- 30-B-40
WA2ASQ	7371- 63- 39-B-20
W2LPV	1914- 29- 22-B-15

Southern New Jersey

WA2OOS	294,492- 506-194-C-AB
N2MR	220,056- 424-173-C
K2QIL	186,309- 381-163-B
W2PAU	145,954 273-166-C
W2EA	80,682- 226-119-B
N2SS	75,375- 201-125-C
N2BK	46,746- 159- 98-B
K2MK	39,564- 157- 84-B
W2BLV	31,048- 136- 81-B
WA2VYA	25,308- 111- 76-B
K2ZSY	9600- 64- 50-C
KA2BEW	22,176- 176- 42-B-20
W2FGY	270- 10- 9-C

Western New York

W2TZ	335,775- 605-185-B-AB
W2FTY	97,605- 241-135-B
W2IPQ	65,508- 206-106-B
W2FUL	44,820- 180- 83-B
N2EAW	21,300- 100- 71-B
KK2B	4800- 50- 32-B
WA2LEZ	1440- 24- 20-B
K2UAN	1392- 29- 16-B-20
N2PP	140,220- 570- 82-C-15
WA2LOG	19,080- 120- 53-C
WB2SZY	10,944- 96- 38-C
WA2ABN	1728- 32- 18-B-10

3

Delaware

W3XU	810,006-1063-254-C-AB
W3GL	282,870- 449-210-C
AD3V	79,344- 228-116 C

Eastern Pennsylvania

N3BB	1,123,620-1220-307-C-AB
N3AD	1,014,156-1182-286-C
N3RS	1,007,172-1212-277-C
K3OO	768,104-1022-244-C
W3AP	723,900- 950-254-C
K3NZ	595,665- 915-217-C
N3ED	594,364- 783-236-C
K3II	364,527- 587-207-C
W3DV	224,595- 465-161-C
N3HW	223,155- 513-145-C
N3NA	219,561- 449-163-C
W3ARK	165,585- 415-133-B
W3EVW	79,860- 220-121-C
AJ3H	69,006- 217-106-B
WA3SXV	61,518- 242- 93-C
W3EAN	41,748- 173- 92-C
K3FMF	26,265- 101- 85-C
W3CRS	25,584- 104- 82-C
WB3IZE	2 ,645- 111- 65-B
WA3SPJ	20,703- 103- 67-C
KC3Q	12,000- 80- 50-B
K3NL	8901- 69- 43-C
W3KEQ	8160- 68- 40-B
K3YD	6804- 54- 42-C
N3CBZ	2016- 28- 24-B
WB3KIL	1827- 29- 21-B
W3KV	1020- 20- 17-C
K4JLD/3	6720- 70- 32-C-80
N3CZB	1056- 22- 16-B-20
KC3CB	468- 13- 12-B-15
KH6CP/3	1 ,515- 85- 53-A-QRP

Maryland D.C.

K3SA	699,111- 959-243-C-AB
K3ZZ	510,048- 759-224-C
W3UT	428,856- 668-214-C
N3AM	367,080- 665-184-C
N3RL	234,738- 414-189-C
W3AZ	201,405- 419-165-C
K3NCO	152,057- 313-163-B
K3AV	134,808- 328-137-C
K3TM	115,187- 323-123-C
W3GNQ	96,136- 282-116-C
WB3BRF	58,479- 193-101-B
W3HVM	51,000- 170-100-C
K2LTC	42,042- 143- 98-C
K3SO	30,672- 142- 72-B
W3EE	20,790- 99- 70-B
W3FQE	12,393- 81- 51-C
K13L	17,712- 123- 48-C-80
W3HVQ	17,207- 122- 47-C-40
K3TW	13,734- 109- 42-C-20
K3EW	108,339- 469- 77-C-15
W3CN	39,159- 229- 57-C

Western Pennsylvania

K3LR	557,443-1091-291-C-AB
AD8J/3	269,808- 511-176-C
W9KTP	58,092- 206- 94-C
K3WGA	61,040- 152- 90-B
N2MA/3	22,407- 97- 77-C
N3BJ	83,250- 375- 74-C-40
K3UA	8880- 74- 40-C
K3QHR	59,094- 294- 67-C-20

4

Georgia

W8ZF/4	706,680- 906-260-C-AB
NQ4I	595,428- 841-236-C
N4PZ	584,448- 761-256-C
KX4R	281,313- 453-207-C
K4BAI	230,736- 418-184-C
K4JPD	20,079- 97- 69-C
WA6OKX/4	12,012- 91- 44-C
K4BAH	4176- 48- 29-C-40
W4JF	10,146- 89- 38-B-15

Kentucky

N4AR	1,335,756-1418-314-C-AB
W4JBQ	18,270- 105- 58-C
K4FU	31,104- 162- 64-C-40
NA4D	6912- 64- 36-C
N4BS	2964- 38- 26-C
KA4JMZ	19,008- 132- 48-B-15
WB4FOT	9918- 87- 38-B

North Carolina

N4AA	217,728- 448-162-C-AB
N6AV/4	184,464- 336-183-C
K4PB	114,648- 281-136-C
W1FTX/4	59,796- 151-132-B
N4SU	1932- 28- 23-C-160
NN4Q	43,884- 159- 92-A-QRP

Northern Florida

WC4E	112,893- 311-121-B-AB
W4WKQ	42,720- 160- 89-C
N4FY	24,960- 130- 64-B
W4VQ	44,712- 216- 69-C-40

South Carolina

W3VT/4	820,638-1002-273-C-AB
N4AH	380,874- 514-247-C
AA4V	6903- 59- 39-C-80

Southern Florida

AA4CM	287,166- 458-209-C-AB
W4BV	255,816- 408-209-C
WD4AHZ	108,537- 299-121-B

K8UNP/4 103,274- 253-136-C
K4CEF 90,906- 218-139-C
W4YN 56,964- 202- 94-C
WB4HAI 51,744- 154-112-C
W5OG/4 11,388- 73- 52-C
WA4KXQ 5106- 46- 37-B
N4IN 2112- 32- 22-C-160
W4OD 17,787- 121- 49-C-80
W2FY 16,992- 118- 48-C
W4BAA 4536- 56- 27-C
N4AW 11,088- 84- 44-C-40
K5KUZ 10,881- 93- 39-B
WA4LLQ 27- 3- 3-B-20
W2SDB/4 5957- 67- 32-C-15
WB4TDH 34,608- 206- 56-C-10
WB4BBH 84,582- 222-127-A-QRP
KA4YAE 21,825- 97- 75-A

Tennessee

W4XJ 653,430- 947-230-C-AB
N4RG 470,004- 739-212-C
WB4SFX 55,968- 176-106-C
KO4PP 34,500- 175- 92-B
AB4H 26,412- 124- 71-C
W5RUH 6678- 53- 42-B
WA4ZZU 126- 7- 6-B
N4ZZ 133,518- 578- 77-C-15
K4XO 48,168- 223- 72-C
W4JD 22,308- 143- 52-C
AA4AK 90,420- 274-110-A-QRP

Virginia

K4CRD 427,800- 713-200-C-AB
K2NA 299,820- 526-190-C
W4YE 253,236- 649-188-C
K4OD 198,996- 412-161-C
K4RZ 148,800- 400-124-C
W4NH 133,545- 307-145-C
K2BA 112,404- 323-116-C
WB4NFS 93,366- 273-114-C
W4VBH (N4DW,opr.)
83,895- 235-119-C
K4FPF 75,555- 219-115-B
W4RW 69,336- 216-107-C
WC4B 49,749- 161-103-B
WB4LNT 36,573- 167- 73-C
N4RA 35,604- 129- 92-B
W4NM 28,440- 120- 79-B
K4TH 27,264- 128- 71-B
KA4RLJ 15,660- 87- 60-C
N3OS 7638- 67- 38-B
W4GF 4773- 43- 37-C
KF4PP 1200- 20- 20-C
N4UA 12,276- 93- 44-C-80
AA4FF 29,241- 171- 57-C-20
W4KFC 14,850- 90- 55-C
W4IQ 330- 11- 10-C
WA4EMU 180- 10- 6-B
KV4P 32,832- 228- 48-C-15
N4HM 29,913- 169- 59-C
W4KMS 765- 17- 15-A-QRP

5

Arkansas

W5ELJ 4560- 38- 40-C-AB
NC5K 588- 14- 14-C

Louisiana

W5XZ 622,512- 786-264-C-AB
WA5POK 118,755- 273-145-C
N5JR 90,000- 250-120-C
W5OB 89,088- 232-128-C
WB5TEQ 72,216- 108- 84-B
K5BLV 6042- 53- 38-B
WB5UTH 1080- 20- 18-C
K5KLA 112,320- 520- 72-C-15

Mississippi

WA5OYU 58,800- 175-112-C-AB

New Mexico

W5JW 84,822- 422- 67-C-40
KT5X 12,690- 141- 30-C
W5TVX 9975- 95- 35-B-15

Northern Texas

N5TP 325,725- 505-215-C-AB
N5JB 299,700- 555-180-C
KY5N 259,248- 491-176-C
K5LP 222,642- 434-171-C
WB5VZL 164,439- 363-151-C
W9PL/5 138,180- 329-140-C
KA5W 123,552- 396-104-C
KC5DX 120,048- 328-122-C
AF5K 64,749- 191-113-C
K9LA/5 41,814- 138-101-C
N5UA 41,496- 152- 91-C
K5BDX 35,802- 153- 78-B
W5LKP 21,312- 96- 74-B
KC5EA 11,076- 71- 52-C
W5FO 58,164- 262- 74-C-20
WB5UDK 31,104- 216- 48-C-15
W5AH 1188- 22- 18-C-10
W5VCX 27,948- 137- 68-A-QRP

Oklahoma

KM5H 85,608- 232-123-C-AB
KA5IDQ 6630- 65- 34-B
K7CW/5 1425- 25- 19-C-80
K5WE 450- 15- 10-C-20

Southern Texas

KZ5M 730,281-1063-229-C-AB
N5AW 445,680- 619-240-B
KH6SU/5 70,263- 211-111-B
K5MA 66,612- 182-122-B
W5PWG 61,560- 180-114-B
K3ZMI/5 36,156- 131- 92-B
W5ASP 31,374- 126- 83-B
N5HB 16,287- 89- 61-B
W5NR 15,753- 89- 59-C
K5SF 7866- 69- 38-C-80
NA5R (N5EA,opr.)
135,900- 604- 75-C-40
W5VX 165,438- 707- 78-C-15
WA3ABQ/5 3465- 55- 21-B

K5TSQ 24,336- 169- 48-C-10
N5DDO 7020- 90- 26-C

6

East Bay

K6ATV 132,561- 429-103-C-AB
KS6H 125,190- 390-107-C
AD6D 23,052- 113- 68-C
K6CSL 8670- 85- 34-B
KS6Q 108- 18- 2-B-15

Los Angeles

N6AR 295,200- 492-200-C-AB
NE6I 149,160- 440-113-C
WB9HRO/6 35,520- 185- 64-C
AD7G 11,526- 113- 34-C
N6IC 10,458- 83- 42-C
N6AA 4515- 43- 35-C
NQ6H 9576- 114- 28-B-15

Orange

K6LEB 33,216- 173- 64-C-AB
N6UH 28,860- 148- 65-C
NG6W 26,076- 106- 82-C
K6GLF 8400- 70- 40-B
W6TMD 5694- 73- 26-C-80

Sacramento Valley

K6DR 151,776- 408-124-C-AB
K6SG 134,322- 367-122-C
W6NKR 40,704- 128-106-B
AF6D 10,512- 73- 48-B
N6JM 4800- 40- 40-B

San Diego

K6MC 97,890- 251-130-C-AB
AA6EE 17,877- 101- 59-C
N6KW 6396- 52- 41-C
W6OVO 3654- 42- 29-C
N6ND 76,224- 397- 64-C-40
W6ZT 11,808- 123- 32-C-15
KD6WH 20,520- 152- 45-A-QRP
W6ABT 5616- 52- 36-A

San Francisco

K6ANP 312,840- 632-165-C-AB
K6ZUR 24,336- 156- 52-B
KD6GC 10,200- 136- 25-B
K6LRN 864- 24- 12-B-15

San Joaquin Valley

N6CC 513,282- 847-202-C-AB
N6EA 211,479- 449-157-C
W6BYB 68,850- 225-102-C
W6SX 51,330- 290- 59-C
KA6BIM 9204- 58- 52-B

Santa Barbara

W6OUL 146,766- 401-122-C-AB
N6HK 16,815- 95- 59-C
KD6JY 1275- 25- 17-B
W7CB 20,160- 160- 42-C-40
N6MA 3432- 104- 11-C

Santa Clara Valley

N6AN 158,364- 498-106-C-AB
N6HR 129,921- 341-127-C
N6UW 44,916- 197- 76-C
W6ATO 7722- 78- 33-C-20

7

Arizona

W7IR 603,716- 944-213-C-AB
N0DH 162,936- 438-124-B
W2CGL/7 56,916- 204- 93-C
KC7V 34,608- 206- 56-C
WA7NXL 7344- 51- 48-B
WB7FDQ 19,560- 163- 40-C-40
K6LL/7 151,731- 733- 69-C-15
W7AYY 10,179- 117- 29-C
KO7V 3078- 54- 19-A-QRP

Idaho

KD7Y 51,840- 216- 80-B-AB
WB7FAR (KS7V,opr.)
53,280- 296- 60-C-20
KN7W 13,545- 105- 43-A-QRP

Montana

KE7X 86,700- 289-100-B-AB

Nevada

WA7UEC 163,944- 552- 99-C-AB
WA7CWM 123,975- 551- 75-C
WA7UTM 51,912- 206- 84-B
N7NV 432- 18- 8-A-QRP

Oregon

W7XN 230,400- 640-120-B-AB
KA7V 123,003- 519- 79-C
AD7T 17,400- 100- 58-B
KA7FEF 5460- 70- 26-B
KS7P 4536- 56- 27-B
WA7OEM 1764- 28- 21-B
K7DBV 2808- 52- 18-B-20

Utah

N7CJO 34,542- 202- 57-C-AB
WB5TJP 16,470- 183- 30-B

Washington

W6RR 664,670-1131-190-C-AB
N7TT 491,106-1063-154-C
W7IIT 74,613- 323- 77-C
K7LAY 54,384- 176-103-C
W7EEJ 50,616- 222- 76-C
W7IEU 27,342- 147- 62-B
N7ALW 16,254- 126- 43-B

K7NF 14,532- 173- 28-C
K7UU 7920- 66- 40-C
K7RS 363- 11- 11-C
N7EA 5103- 63- 27-C-80
N7AM 1326- 34- 13-C
K7UR 28,680- 239- 40-C-40
K7ZA 100,800- 480- 70-C-20
W6QJI 6225- 83- 25-B
N7RO 74,511- 487- 51-B-15
KB7NV 3009- 59- 17-A-QRP
KR7L 1950- 65- 10-A

Wyoming

N7NC 170,555- 285-141-C-AB
KC7KC 714- 17- 14-B

8

Michigan

WA8TBQ 844,164-1074-262-C-AB
W8UA 655,662- 938-233-C
K8SS 221,094- 476-173-C
K8DU 92,625- 247-125-C
KS8Q 41,325- 145- 95-C
KQ8J 40,194- 174- 77-C
KA8HJC 16,575- 85- 65-C
N8CXX 11,322- 74- 51-B
W8TW 9792- 68- 48-B
N8CJX 5301- 57- 31-B
W8SCW 1980- 30- 22-C
K8DD 1170- 26- 15-C
KT8X 897- 23- 13-C
W8UU 44,946- 227- 66-C-40
K8NA 119,520- 498- 80-C-20
W8TWA 47,436- 236- 67-C
K8JLB 54,336- 283- 64-C-15
W8WVU 7770- 74- 35-B
K8QWG 576- 16- 12-B
W8VSK 41,736- 148- 94-A-QRP
N8CQA 37,880- 137- 80-A

Ohio

W8JIN 330,120- 524-210-C-AB
W8LNO 320,778- 507-213-C
W8ELE 190,008- 364-174-C
WD8IXE 189,600- 400-158-C
W8RSW 182,400- 400-152-C
N8BC 159,396- 359-148-C
W8QID 141,723- 381-124-C
N8BJQ 134,976- 296-152-C
K8SW 127,373- 329-129-C
KR8Y 119,700- 300-133-B
KD8Y 90,624- 236-128-C
W8II 70,560- 210-112-B
W8ZCQ 68,808- 188-122-C
KC8JH 66,600- 200-111-C
KZ8Y 66,216- 178-124-C
KW8M 51,084- 198- 86-C
W8MPY 48,594- 182- 81-C
K8EF 44,082- 158- 93-C
W8GDC 42,720- 160- 89-B
W8KUX 42,312- 164- 86-B
K8QNY 41,448- 157- 88-B
AI8S 31,347- 129- 81-C
W8EE 28,674- 124- 77-C
N8YGR 27,918- 99- 76-B
N8SEX 25,623- 117- 73-C
K8US 21,840- 140- 52-C
N8OWP 21,624- 106- 68-C
W8KK 16,830- 83- 66-B
W8NJH 12,300- 82- 50-C
KY8K 12,126- 86- 47-B
W8FDN 9384- 68- 46-C
K8PYD 6042- 53- 38-B
KB8IZ 4896- 48- 34-C
N8DPO 4590- 45- 34-B
W8UPH 4590- 51- 30-C
WB8ULZ 3999- 43- 31-C
W8CY 3420- 38- 30-C
W8CLZ 3120- 40- 26-B
W8TO (K8EM,opr.)
2046- 31- 22-B
AA8Z 1778- 24- 24-C
W8VZE 1008- 21- 16-C
KI8B 972- 18- 18-B
AA8S 4002- 46- 29-C-80
AD8C (AD8P,opr.)
92,430- 395- 78-C-40
KV8Q 6786- 58- 39-B
K8EM 2016- 28- 24-C
W8WPC (N9AC,opr.)
29,574- 186- 53-C-10
W8EAO 1620- 27- 20-A-QRP

West Virginia

N8II 1,028,160-1224-280-C-AB
K8OQL 99,225- 245-135-C
WA8YTM 28,314- 121- 78-C
KB8FJ 10,080- 70- 48-C
W8LRL 6300- 60- 35-C-160

9

Illinois

K9BGL 423,477- 669-211-C-AB
K9ZO 354,480- 560-211-C
WB9JKI 235,494- 441-178-C
N9TT 127,455- 293-145-C
KM9L 75,516- 217-116-C
K9MFI 67,914- 231- 98-C
K9IW 21,528- 104- 69-C
W9QWM 15,624- 93- 56-B
KQ9D 15,372- 84- 61-B
K9BQL 12,834- 93- 46-C
W9TNZ 9306- 66- 47-B
W9REC 5616- 48- 39-B
KE9A 25,272- 156- 54-C-40
W9NUF 8280- 69- 40-C
WA9ZPR 104,400- 435- 80-C-20
K9AB 87,822- 357- 82-C
K9BC 19,890- 130- 51-C
KG9C 1020- 20- 17-B
K9QVB 91,542- 418- 73-C-15
KM9P 10,767- 97- 37-C-10
KC9N 3807- 47- 27-C
W9OA 54,126- 186- 97-A-QRP
W9PNE 47,025- 165- 95-A

Indiana

W9RE 900,804-1084-277-C-AB

W9XD 60,420- 190-106-B
K9VQK 11,400- 76- 50-C
KK9W 6552- 56- 39-B
WB9ZGY 6264- 58- 36-B
W9YDP 468- 13- 12-B

Wisconsin

KE9A 262,440- 540-162-C-AB
W9RN 182,250- 405-150-C
W9OP 171,072- 396-144-C
KO9Q 88,044- 253-116-C
KB9S 77,112- 204-126-C
AK9Z 67,536- 201-112-B
KS9K 35,532- 141- 84-C
W9GXR 34,866- 149- 78-C
W9KRT 31,290- 149- 70-C
W9CBE 6903- 59- 39-C
W9WAQ 46,230- 230- 67-B-15

0

Colorado

KJ0G 92,928- 352- 88-C-AB
KI0J 66,483- 249- 89-B
K0ZFL 34,646- 123- 96-B
W0JF 15,960- 95- 56-B
N0CNV 12,549- 89- 47-B
KA0FXB 2268- 36- 21-B
K0RF 26,700- 178- 50-C-80
K0GU 2244- 34- 22-C-40
AC0S 25,368- 151- 56-C-20
W0ZV 184,500- 750- 82-C-15
N0RCN 20,868- 148- 47-C
K0UK 26,082- 207- 42-C
W7KC 5016- 76- 22-B
K0OST 4650- 62- 25-B

Iowa

W0WP 537,654- 793-226-C-AB
KD0Q 335,871- 557-201-C
N0CA 201,150- 450-149-C
WA7CNF/0 81,420- 236-115-B
W0YBV 39,456- 137- 96-C
K0CF 39,411- 151- 87-C
KK0R 27,144- 116- 78-B
KC0XK 21,000- 125- 56-C
W0HJN 8547- 77- 37-C
AK0P 3132- 36- 29-C-80
K0LUZ 2772- 33- 28-C
KC0Q 1584- 24- 22-C
W0SHL 192- 8- 8-C-40
KJ0D 1188- 22- 18-C
N0JR 9477- 81- 39-C-10

Kansas

WA0TKJ 594,624- 528-186-C-AB
KB0C 224,844- 457-164-C
N0IYR 19,278- 102- 63-C
N0CY 16,368- 88- 62-C
N0WPL 13,275- 75- 59-B
WB0DUN (KA0KAN,opr.)
12,636- 81- 52-B
AC0E 5412- 44- 41-B
N7DF 18,762- 118- 53-C-80
KS0U 15,480- 120- 43-B-15
KB0U 7104- 74- 32-C-10

Minnesota

W0LP 19,800- 110- 60-C-AB
N0BSH 6579- 51- 43-C
W0UO 39,192- 184- 71-C-40
W0HW 36,504- 169- 72-C-20
W0RXL 3384- 47- 24-C

Missouri

K4VX/0 692,307- 999-231-C-AB
W0JLC 184,605- 397-155-B
WD0AUT 61,776- 198-104-B
WA0RBZ 27,051- 127- 71-B
KA0P 7830- 58- 45-B
AB0T (KM0L)
77,004- 414- 62-C-40
K9BF 1377- 27- 17-B
N0TT 44,826- 261- 62-C-20
K0RWL 129,078- 606- 71-C-15

Nebraska

KB0YK 108- 6- 6-B-AB

North Dakota

K0QQ 25,704- 119- 72-B-AB
KI0E 8280- 69- 40-C

VE

Maritime — Newfoundland

VO1MP 179,601- 457-131-B-AB
VE1CEC 29,640- 190- 52-C-40

Quebec

VE2AYU 292,824- 498-196-C-AB
VE2OPO 11,448- 72- 53-B

Ontario

VE3DZV 243,390- 427-190-C-AB
VE2WA/3 127,602- 306-139-C
VE3IRF 98,829- 237-139-B
VE3NBE 11,988- 74- 54-C
VE3TNQ 360- 12- 10-B-160
VE3CUI 4836- 52- 31-C-40
VE3JTQ 264- 11- 8-C-20
VE3KZ 135,351- 557- 81-C-15
VE2AEJ/3 1050- 25- 14-C-10

Manitoba

VE4MF 30,450- 145- 70-B-AB

Saskatchewan

VE5RA 170,330- 382-105-C-AB

Alberta

VE6OU 84,564- 324- 87-C-AB
VE6CNV 28,260- 157- 60-C

British Columbia

VE7AAQ 191,746- 507-126-C-AB
VE7IN 80,640- 384- 70-C
VE7BSH 2565- 45- 19-C-20

N.W.T. — Yukon

VY1DD 792- 22- 17-B-20

W/VE — CW
Multioperator
Single Transmitter

1

K1RU (+K1YR)
986,148-1191-276-C-CT
KE1C (+K1NYK,KA1VC,KG1D)
298,350- 650-153-C-CT
N1AU (+AJ1T,Net)
196,581- 407-161-C-EMA
KF1C (+K1ZZJ,KA1AOT,KA1UK,
KG1K,N1BPJ)
174,886- 397- [illegible]-C-RI
AJ1I (+Net)
1008- 21- 16-B-EMA

2

N2RM (+KB3TN)
892,857-1037-287-C-SNJ
KQ2O (+K2BK)
696,600- 860-270-C-NNJ
K2GHV (+KW2U,WA2FSP,WB2EGI)
461,559- 709-217-C-NNJ
K2FL (+W3SOH)
420,354- 579-242-C-SNJ
K2TO (Multiop)
313,769- 491-213-C-SNJ
W2UI (+N1KR)
299,637- 507-197-C-SNJ
WA2LQO (AA2J,K2DOD,K2UAT,
N2DYE,W2DKM,W2ZZB,WB2FMP,oprs.)
270,648- 504-179-C-NLI
W2BHK (+W2NM)
112,500- 300-125-C-SNJ
N2AIF (Multiop)
72,186- 227-106-C-ENY
W2RMW (N2RB,W2YDO,WA2PMW,oprs.)
11,880- 72- 55-B-NLI

3

W3BCN (+K2BM1,WA2ZKY)
1,460,916-1503-324-C-EPA
W3GRF (+K3AO,K4PJ)
993,240-1240-267-C-MDC
W3MA (+K3ZA)
744,642-1009-246-C-EPA
WB3CAC (+K3WGR,W3UM)
344,565- 589-195-C-EPA
K3HEI (+Net)
263,133- 507-173-C-EPA
N3GB (+N2AW,Net)
215,670- 455-158-C-MDC
W3YFV (+K3PPI)
35,088- 136- 86-C-EPA

4

N4UH (+N4BP)
1,137,063-1409-269-C-SFL
N4KG (+KC4ZV,N4YG,NW4Y,WA4QHI)
641,600- 765-280-C-AL

5

K5LZO (+K2TNO,K5IY,KD5SP,KY5A,
N5UU,WA5RUS,WD5GXI,WB0NFY)
1,026,207-1253-273-C-STX
K5KG (KU5I,W5ASP,W5SG,oprs.)
626,448- 847-248-C-STX
AA5Y (+KG5U,W5JQ)
603,432- 986-204-C-STX
K5RX (+KM5R)
409,404- 626-218-C-NTX

6

N6CW (+K1LL)
712,080-1104-215-C-SDG
W6OWQ (+N6BV)
402,480- 780-172-C-SCV
W6BIP (+WA6DJI)
300,762- 539-186-C-SF
KE6PQ (+Net)
66,990- 290- 77-C-SCV
AA6DP (+W6JI,W6TSE)
66,045- 259- 85-C-ORG

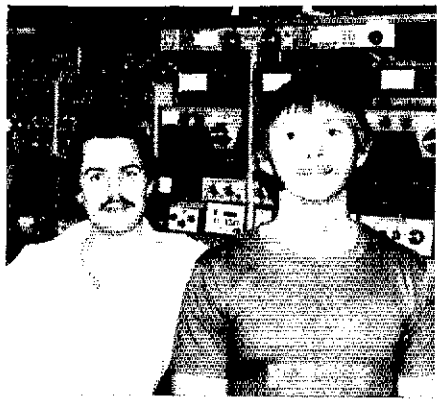
7

K7LXC (K7HBN,K7WA,KB7G,KC7RN,
oprs.)
448,800- 935-160-C-WA
AG7M (+KR7G,KW7Q)
392,460- 844-155-C-WA
KS7T (+KA7GVI)
99,360- 368- 90-C-MT
W7DG (KA7CRS,KA7HWE,KA7JVW,
WA7ILC,WB7PEE,oprs.)
36,774- 227- 54-C-WA

8

K8ND (+AD8I,KA8IFC,KU8E)
1,031,424-1264-272-C-OH
N8AA (+KB8AZ,KE8NZ,KA8MLA,W8CAR,
WB8ISK)
936,768-1088-287-C-OH
WA8RRR (+K8CC)
632,730- 913-230-C-MI
W8FN (+WB4AIN)
437,760- 640-228-C-OH
WB8KKI (+KA8NUV,WD8LLD)
265,299- 463-191-C-OH
KA8ITC (+K8EM,KA8FLW,KA8PTT)
151,998- 329-154-C-OH
KW8Q (+KX8K)
67,392- 216-104-C-WVA
KQ8X (+W3TCM)
48,594- 178- 91-C-OH

Jim, N6RJ, used the call ZF2FL to make nearly 7000 QSOs and the top single-operator phone score from North America.



K3LR (left) and K8CX each operated K3LR on a single band on phone. 'LR went to 15 meters, while 'CX braved the QRN on 40.

PY5EG made over 2400 QSOs and nearly 1.5-million points on phone on his way to the top single-operator position in Brazil.

B

AD#O (+KY#S,N#s 68M,ST)
452,979- 883-171-C-CO
KN#V (+KI8Z,W#EZV)
325,845- 557-195-C-MN
K#SR (+KF#P,W#OA)
234,977- 428-183-C-MN
K#DI (+K#SCM)
133,380- 390-114-C-NE
KM#P (+W#MBH)
64,602- 194-111-C-MO
K#TNR (+KB#FP)
324- 12- 9-C-IA

VE

VE7QV (+VE6WQ)
641,376- 816-262-C-PQ
VE2CCA (+VE2FWE)
8385- 65- 43-B-PQ

W/VE — CW

Multioperator

Two Transmitter

K5RC (+K5s GA, GN,KN5H,N5JJ, NA5R,W5VAB,WB5WBR)
7,600,169-2299-377-C-STX
K4CG (K3s TW,WUN,K4POL,K7SV,oprs)
2,107,314-1914-367-C-VA
K3VW (+KJ0U,K3WW,KC3EE,W3RJ)
1,644,780-1580-347-C-EPA
K7VV (+K2XA,N7JJ)
1,483,629-1643-401-C-WNY
W88JBM (K8US,KC8XX,KQ8N,KW8N, W8s ATR,DNM,EOB,WD8s AUB,LJP, oprs)
1,266,143-1362-310-C-OH
N6TR (+AA6RK,KB6I,N6AA,WA6OTU)
1,057,665-1439-245-C-SB
N16W (+W6KUT,WA6DBC)
975,849-1499-217-C-SDG
K8AQN (+W5ONL,AC8W,K8s KIC,XQZ, KA8IZJ,KC8s A,KQ,KJ8A,KM8Y,KZ8K, W8s WVH,YZ,WA8s BSF,MEC,YVR, WB8s ATA,MEZ)
838,500-1075-260-C-MI
W#AIH (multiop)
738,704- 908-271-C-WI
K3HPC (+KA3R,N3ST,WB1LRU)
734,328- 868-282-C-MDC
KK9V (+KJ9D,W#NO)
596,820- 980-203-C-IN
K5EE (+KV5Y,N5WS)
560,601- 769-243-C-NTX
KR1MM (+K3LE,N3ARK)
549,810- 745-246-C-EPA
K6ZM (+AK6I,K4UVT,NB6L)
491,238- 827-198-C-EB
KC3Z (+K3FD,WB3KKX)
475,875- 705-225-C-WPA
K1RX (multiop)
345,762- 674-171-C-CT
VE1CR (VE1s GEM,HK,oprs)
43,281- 294- 63-B-MAR

W/VE — CW

Multioperator

Unlimited

N2AA (+K2s BQ,GL,GM,NG,SS,TT,TW, KA2KVZ,KC2X,KR2J,KR2Q,KR2W, W2RQ,K3EST,KA4YDR,K5NA)
4,294,695-3217-445-C-ENY
K1OX (K1s KA,GQ,KA1R,KC1F,W1s FV,IHN,WB8BTH,oprs)
3,687,648-2872-428-C-NH
K2UA (+NZs BA,MM,K3JLT,N3s RD,RG)
3,245,436-2758-414-C-SNJ
W3LPL (+KA1CD,AI3M,K3DI,W3FG, WD4AKM,KC8C)
3,151,548-2556-411-C-MDC
N5AU (+K5s FOV,GO,MM,MR,ED,N5CR, W5SJ)
2,749,680-2412-380-C-NTX
N9MM (+K9s GL,UWA,KA9A,KM9D,KR9D, N9s NB,NC,NS,W9s LF,ZRX,WB9s LTY,POB)
N6RO (+N6s IC,NE,TV,XI,N16D, WA6DIC)
2,020,011-2237-301-C-EB
EX4S (+KJ2R,KA3DTE,K4WHN,N4HB, W4MYA,WA4BKD,WB4BVY,WK4Y)
1,874,988-1929-324-C-VA
W1CW (+K3s FV,GM,ND,OA,K83YY, N3VV)
1,798,608-1616-371-C-EPA
N4ND (+K4JM,KC4W,N4EHJ,W4s BJ,XR)
1,396,860-1502-310-C-VA
N5RM (+N5AM,AA5C,K5HM,KM5K, KM5X,N5BQQ)
1,019,160-1192-285-C-NTX
W3GD (+W3KV)
982,464- 756-248-C-EPA
N3LR (N3s CSC,DAY,oprs)
936,733- 927-193-C-EPA
K3ZUF (+KB1UD,W3HM)
833,008- 582-268-C-EPA
W1AR (+WI1HA,K4VBC,KA4KMB,KE4XY, N4EBZ,WB4CWA)
270,375- 515-175-C-CA

DX — CW

Single Operator

Africa

CN8CO (W3EMH,opr)
965,248-1024-184-B-AB

SM#GMG/CT3
7,689,638-1767-236-C-AB

EA5YU/EA8 55,620- 417- 45-B-15
EA8KY 2205- 35- 21-A-QRP

ZS6RPJ/ZS3
164,520- 457-120-B-AB

Z86ME 40,200- 335- 40-B-20

5N66KD 3- 1- 1-B-40

5Z4CQ 180,177- 551-109-B-AB

/PBCG (KB3K, opr)
17,088- 134-144-B-AB
7P8CL 189,684- 479-132-C

Asia

HZ1HZ 90,300- 350- 86-C-AB

JA7FWR 562,440-1090-172-C-AB
JI1QPU 551,786-1107-166-C
JA7RHJ/1 487,542- 979-166-B
JH7DNO 447,678- 969-154-C
JA#CUV 388,517- 912-142-B
JA7YAI (JK1CYV,opr)
210,672- 627-112-C
JA9DAI 174,696- 502-116-C
JE3SEN 133,308- 483- 92-C
JA6LDD 98,400- 328-100-C
JA1NLX 79,772- 309- 86-B
JK3WXA 55,500- 250- 74-C
JA1OFQ 48,945- 251- 65-B
JA7JWE 43,452- 204- 71-B
JR1BOT 40,362- 217- 62-B
JF3CCN 40,128- 209- 64-B
JA1ELY 39,900- 190- 70-C
JA8BSW 26,568- 164- 54-C
JA1SIM 23,850- 150- 53-B
JA#CGJ 21,801- 169- 43-B
JH1WTX 18,900- 140- 45-B
JA8AQ 17,325- 105- 55-B
JA1OHP 13,800- 115- 40-B
JH2XTV 13,689- 117- 39-B
JR6ACW 10,767- 97- 37-B
JA1VZM 9579- 103- 31-B
JA7EC 8019- 81- 33-B
JR7DPO 6966- 86- 27-B
JA7EDZ 6474- 83- 26-B
JK1VXR 5676- 86- 22-B
JF1EEK 4320- 60- 24-B
JJ1CZR 4320- 60- 24-B
JA1NTK 4260- 71- 20-B
JA1QZC 3519- 51- 23-B
JR4ISK 2754- 51- 18-B
JA7BJE 2052- 36- 19-C
JP1BJR 2016- 42- 16-B
JJ1VTE 1944- 36- 18-B
JL1EJO 1833- 47- 13-B
JN1CSB 1332- 37- 12-B
JA1KPA 693- 21- 11-B
JA2SAP/1 357- 17- 7-B
JA2YEF 84- 7- 4-C-160
JA1GTF 63- 7- 3-C
JR1SPY 18- 3- 2-C
JA2NDQ 13,143- 141- 31-C-80
JA9YBA (JA9LNJ,opr.)
13,020- 155- 28-C
JH7LVK 12,330- 137- 30-C
JA4CDU 7976- 62- 18-B
JA7NX 1710- 38- 15-C
JH8KPE 630- 30- 7-B
JA6BCF 665- 11- 5-C
JI1QQI 45,276- 343- 44-B-40
JA1SGX 40,700- 268- 50-B
JE1AYD 16,533- 167- 33-B
JA7VHP 13,500- 150- 30-B
JR7BTI 4374- 81- 18-B
JA1BCT 3540- 59- 20-B
JH3WKR 2987- 71- 14-B
JR8QJZ 1386- 47- 11-B
JG7IGM 918- 34- 9-B
JA7YBO (JH7MHK,opr.)
888- 37- 8-B
JA1OZT 792- 33- 8-B
JA8EJO 756- 28- 9-B
JR1FNS 360- 20- 6-B
JA1BOK 240- 10- 8-B
JA7ARW/1 168- 14- 4-B
JH1LZT 144- 12- 4-B
JE7HXC 120- 10- 4-B
JA1QXY 53,280- 370- 48-B-20
JA8GOJ 43,200- 360- 40-C
JA5JCG 27,852- 211- 44-C
JA1JXU 12,810- 122- 35-B
JG1QCQ 7440- 80- 31-B
JI3UMO 6750- 90- 25-B
JF1MZI 4650- 62- 25-B
JA2DHG 4092- 67- 22-B
JA7RXU 3519- 51- 23-B
JA1HPO 1728- 36- 16-B
JA1BDI 1628- 34- 16-B
JA1AAT 12- 2- 2-B
JH7RZR 3- 1- 1-B
JA1YQP (JF3PLF,opr.)
82,950- 553- 30-B-15
JA1HCY 49,572- 324- 51-B
JJ1HKY 48,972- 371- 44-C
JA7XBG 40,524- 307- 44-B
JL1DBJ 38,400- 256- 50-B
JA1CSR 27,552- 224- 41-C
JH8JYV 12,670- 155- 38-B
JA3GSM 16,182- 124- 31-B
JH1KTR 14,870- 130- 33-B
JA8CJY 12,192- 127- 32-B
JE6PWV 11,220- 110- 34-B
JO1GHV 10,848- 113- 32-B
JF2XPL 8910- 110- 27-B
JI1QLS 7575- 101- 25-B
JA8VUJ 2300- 100- 24-B
JM1SOL 6624- 96- 23-B
JA1ENW/2 5412- 82- 22-B
JA1BZB 5256- 73- 24-B
JA2KPV 4623- 67- 23-B
JE2MEE 4386- 77- 19-B
JN1WFF 2640- 44- 20-B
JH5EVO 2193- 43- 17-B
JA6LYV 2112- 44- 16-B
JA2DEL 2067- 53- 13-B
JA6BJP 1950- 50- 13-B
JN1ENK 1287- 39- 11-B
JA1FKC 1014- 26- 13-B
JA1AIA 660- 22- 10-B
JR6GHN 306- 17- 6-B
JR6PCB 108- 9- 4-B
JA7JT/7 72- 6- 4-B
JJ1NBB 20,160- 210- 32-B-10
JA7DMZ 9504- 132- 24-B
JA1ZLO (JA6-9330,opr.)
2691- 69- 13-B
JA1OP 1110- 37- 10-B
JA1MCD 100,605- 353- 95-A-QRP
JR2BNF 74,046- 287- 86-A
JM1NKT 16,080- 134- 40-A
JA1KEF 12,420- 115- 36-A
JJ1LCU/1 11,124- 103- 36-A
JR6KRT 10,098- 99- 34-A
JH9ABB 5346- 81- 22-A
JH1EBU 4992- 64- 26-A
JH7XGN 1920- 40- 16-A
JA2DN 1134- 27- 14-A
JO1FYC 96- 6- 8-A

JT1AN 12,075- 115- 35-B-20

HD6NKW 3705- 65- 19-B-20

DF6FFF 1140- 38- 10-B-20

UL7TAY 4374- 54- 27-B-20

UA#ZBP 281,232- 356-124-B-AB
UA#JAD 3465- 55- 21-B
UA#SAU 106,029- 693- 51-B-20
UA9XSQ 79,560- 560- 52-B
EK9C/@ 63,960- 410- 52-B
UA#BBT 44,274- 314- 47-B
UA9YE 29,643- 241- 41-B
UV9DO 7308- 87- 28-B
UA9OCF 4644- 86- 18-B
HB9WT 60- 5- 4-B
UA#ZCR 513- 19- 9-B-15

VU2JXO 15,750- 125- 42-B-AB

4J4AB 220,875- 589-125-B-AB

Europe

CT1CFT 81,855- 321- 85-B-AB
CT1AOZ 108,900- 825- 44-C-40

LY2AK 66,285- 491- 45-B-80

DL6RAI (85,765- 537-115-C-AB
DJ4OL 88,704- 352- 84-B
DL8MBS 83,670- 340- 82-B
DJ2AT 46,656- 216- 72-B
OK5KC 28,743- 143- 67-B
DK3LM 12,054- 98- 41-B
DL2KEE 6912- 72- 32-B
DL1NE 5133- 59- 29-B
DL1KR 35,409- 319- 37-C-80
DJ0YT 84,656- 617- 48-C-20
DK5LY 2916- 54- 18-B
DK#CN (DK3QN,opr.)
33,264- 264- 42-B-15
DL9YC 11,865- 113- 35-C
DL1BRO 3698- 54- 22-B
DL1TH 2451- 43- 19-B
DJ8SG 1800- 30- 20-B
OF2RG 198- 11- 6-B
DF4ZL 21,624- 136- 53-A-QRP
DL9CE 13,753- 133- 47-A
DK3KD 48- 4- 4-A

EA5AMW 743,280-1478-175-C-AB
EA5GVU 294,754- 793-126-B
EA7CIX 24,550- 137- 50-B
EA/LM 1566- 29- 18-B
EO7AIN 43,440- 120- 29-B-80
EA2IA 41,302- 101- 34-C
EA/BUU 55,952- 452- 62-B-40
EA4RV 5975- 79- 25-B-15
EA1CIM 1620- 36- 15-B
EA1KT 576- 16- 12-B

EI9J 199,470- 545-122-B-AB
EI5DI 31,674- 182- 69-B

M5IN 524,664-1041-168-C-AB
F6FTB 60,501- 301- 67-B
F6ERZ 29,829- 163- 61-B
F6HB 26,928- 132- 68-B
F8VJ 3600- 60- 20-B-160
F6FYY 16,626- 163- 34-C-20
TO6EQV 70,480- 704- 40-B-15
F6CCI 2223- 39- 19-A-QRP

G5OPP (W4UUM,opr.)
18,600- 124- 50-B
GI4AIB 8190- 70- 39-B
G6N& 3705- 65- 19-B
G3SZA 3168- 48- 22-A-160
G4CNY 46,398- 407- 38-B-80
G3RXW 9750- 175- 26-B
G3KWZ/A 6750- 125- 18-B
G3RXB 151,844- 955- 53-B-20
G3PVA 94,032- 653- 48-B
G4GIR 11F,547- 733- 53-B-15
G4JKS 20,424- 184- 37-B
G3LKY 7128- 72- 33-B
G3WNT 15,372- 122- 42-A-QRP
G4BBD 8892- 76- 39-A
G4FDC 2652- 68- 13-A
GM3LYY 209,922- 593-118-B-AB
GM3RSQ 2952- 41- 24-B
GM3RAD 55,695- 395- 47-B-20
GM3OXC 32,130- 255- 41-B-15
GU3HEN (GU3NBS,opr.)
288,915- 935-103-B-AB

GW3LII 99,144- 324-102-B-AB

HA#MK 100,776- 494- 68-B-AB
HA1XO 92,340- 380- 81-B
HA1ZG 79,813- 299- 89-B
HA4XX 52,645- 305- 63-B
HA7RR 48,178- 248- 62-B
HA1ZW 40,905- 301- 45-B
HA3GA 8670- 85- 34-B
HA8IE 17,487- 201- 29-B-80
HA8DU 15,456- 161- 32-B-20
HA8DT 9888- 103- 32-B
HA4ZX 4680- 60- 26-C
HA4ZZ 81,585- 555- 49-B-15
HA8CU 8820- 105- 28-B
HA5KMR (HA5MB,opr.)
936- 24- 13-B
HA1NX 2460- 41- 20-B-10
HA5KD 30,240- 160- 63-A-QRP
HA5KF 8058- 79- 34-A
HA5GN 5751- 73- 27-A

HB9CSA 269,250- 718-125-B-AB
HB9KG 54,068- 167- 68-B
HB9QA 11,158- 86- 51-B
HB9AYZ 8910- 90- 33-B
HB9DX 41,844- 317- 44-C-15

I2HBI
1,222,416-1959-208-C-AB
I4EAT 51,520- 446- 40-C-80
I3LDS 21,408- 223- 32-C
I1XBV 18,216- 184- 33-B
I1XPQ 25,641- 259- 33-B-40
IC8POF 20,568- 392- 43-C-20
I0KXR 21,466- 554- 43-C-15
IK1BAE 12,670- 155- 38-B
I7QIE 13,392- 144- 31-B
I09VDQ 10,767- 97- 37-B

JW5NN 9346- 66- 27-B-AB

LA6ZV 36,672- 191- 64-B-AB
LA7SI 5130- 57- 30-B
LA1MG 3276- 42- 26-B
LA1EE 1998- 37- 18-C-40
LA7ZAA 4524- 58- 26-B-20
LA9DK 3450- 50- 23-B-15

OZ1IF 15,408- 107- 48-C-AB
OZ7KAD (OZ2BS,opr.)
11,526- 113- 34-C
OZ2PP 13,608- 162- 28-C-80
OZ1KSN 4620- 70- 22-C-40
OZ1FM 9324- 111- 28-B-20

OE3RE 57,474- 309- 67-B-AB
OE5SHI 27,540- 180- 51-B
OE5CWL 75- 5- 5-C-80

OH1PY 77,610- 398- 65-C-AB
OH6MM 50,007- 211- 79-C
OH1RZ 33,735- 173- 65-B
OH2BAH 15,180- 110- 46-C
OH3OS 14,628- 106- 46-B
OH1PS 12,426- 109- 38-C
OH9TD 5247- 53- 33-B
OH6CD 5088- 53- 32-B
OH2NW 540- 15- 12-C
OH8AV (OH8PF,opr.)
204,003-1193- 57-C-20
OH3RF 23,283- 194- 19-C
OH6AM (OH6LR,opr.)
100,650- 610- 55-C-15
OH2BJC 1632- 34- 16-B
OH1RV 264- 11- 8-B
OH6RC 1740- 29- 20-A-QRP

OH0PA 2967- 43- 23-B-15

OK1ALW 926,965-1705-191-C-AB
OK2BGT 148,770- 435-114-C
OK2BWH 98,355- 395- 83-B
OK1PQ 97,263- 321-101-B
OK1ZP 83,740- 340- 81-B
OK1KZ 53,808- 236- 76-B
OK3IF 47,088- 218- 72-B
OK1KYS (OK1FRF,opr.)
41,268- 181- 76-C
OK1AXB 34,515- 177- 65-B
OK3TCF 31,680- 176- 60-B
OK1AWC 30,600- 170- 60-B
OK1PN 10,176- 102- 56-B
OK3EON 30,318- 163- 62-B
OK2PBC 28,392- 164- 26-B
OK2BCJ 26,700- 178- 50-B
OK3BA 13,287- 103- 43-B
OK2POF 8856- 82- 36-B
OK1MSB 5460- 70- 26-B
OK7FD 38,280- 319- 40-C-80
OK3CEL 1116- 31- 12-B
OK3CED 28,404- 263- 36-C-40
OK3CAQ 14,208- 148- 32-B
OK2POG 12,936- 156- 28-B
OK3CJO 3480- 58- 20-B
OK1KJ 2736- 48- 19-B
OK2ABU 960- 10- 8-C

OK1AVD 49,392- 343- 48-B-20
OK2BCR 18,954- 162- 39-C
OK1TD 17,604- 165- 36-B
OK2SGW 9000- 100- 30-B
OK3TAY 6942- 89- 26-B
OK1OPT 459- 17- 9-B
OK3CEM 50,904- 404- 42-B-15
OK1ABS 45,402- 329- 46-C
OK2BYW 17,427- 157- 37-B
OK3KEX (OK3-26928,opr.)
17,127- 171- 33-B
OK1AOV 16,872- 152- 37-B
OK2BLD 14,949- 151- 33-B
OK2BSG 14,880- 160- 31-B
OK1DMJ 13,608- 126- 36-B
OK1ACN 11,781- 119- 33-C
OK3IA 11,625- 125- 31-B
OK1DCN 9309- 107- 29-B
OK1JIM 6912- 72- 32-B
OK1DZD 4248- 59- 24-B
OK2PFP 3339- 53- 21-B
OK2BEW 6048- 84- 24-B-10
OK1TS 3306- 58- 19-B
OK1DMP 2928- 61- 16-A-QRP
OK2BMA 900- 25- 12-A
OK3BRK 48- 4- 4-A

ON7BX 29,829- 163- 61-B-AB
ON5WL 5742- 87- 22-B-80
ON7BV 3- 1- 1-B
ON4XG 29,484- 234- 42-B-15

OZ1LO 704,862-1374-171-C-AB
OZ5WQ 56,232- 213- 88-B
OZ1CAR 37,248- 194- 64-B
OZ1FGS 31,374- 166- 61-B
OZ7BW 30,672- 142- 72-B
OZ1CCB 17,628- 113- 52-B
OZ8AE 17,852- 102- 47-B
OZ1NF 12,519- 107- 39-B
OZ1W 11,454- 83- 66-B
OZ6KI 3120- 40- 26-B
OZ1DTF 7395- 85- 29-C-40
OZ1EXZ 1638- 39- 14-B
OZ7YL 20,916- 166- 42-C-20
OZ5KU 18,144- 168- 36-B
OZ1DKG 5016- 88- 19-B
OZ6XR 1344- 32- 14-B-15
OZ6KS 744- 8- 6-B
OZ1FAO 480- 16- 10-B-10
OZ1FFG 390- 13- 10-A-QRP

PAØVDV 142,380- 452-105-B-AB
PAØLOU 89,856- 288-104-B
PA2JDB 61,712- 176- 79-B
PA3BLU 28,545- 173- 35-B
PAØINA 27,999- 153- 61-B
PA3ADM 17,595- 115- 51-B
PA3AMA 11,454- 83- 46-B
PAØCF 9120- 76- 40-B
PA2DXY 4248- 51- 28-B
PAØPN 3720- 40- 31-B
PAØSOL 1968- 41- 16-B
PAØDIN 1080- 20- 18-B
PAØCLN 6399- 79- 27-B-40
PAØADT 9657- 87- 37-A-QRP

SKØLM (SMØDRD,opr.)
109,968- 464- 79-C-AB
SM5ALJ 70,686- 306- 77-C
SMØBDS 49,062- 221- 74-C
SM6BZE 32,319- 189- 57-B
SM5RE 23,940- 140- 57-B
SM5XX 14,190- 86- 55-C
SM7TV 13,158- 102- 43-B
SM5AFE 9159- 71- 43-B
SK7NK 6617- 57- 27-B
SM6CST 2664- 37- 24-B
SMØBTS 1800- 30- 20-C
SM6CZE 1131- 29- 13-B
SMØIFX 126- 7- 6-B
SLØDT 48,990- 335- 46-C-20
SM7LSU 6660- 74- 30-B
SM3KMB 5913- 73- 27-B
SMØKV/Ø 4997- 52- 32-B-15
SM7LAZ 1125- 25- 15-B
SM5DUT 864- 24- 12-C
SM7BNG 196- 17- 11-A-QRP

UA3DOF 168,405- 545-103-B-AB
UV3CM 9120- 80- 38-B
UA3EAL 6750- 90- 25-B-80
UA1ZCW 101,765- 665- 51-B-20
UA4PNX 38,340- 284- 45-B
UA6LAM 37,122- 269- 46-B
UA6AJF 930- 31- 10-B-15

UA7EC 4455- 55- 27-B-15

UC2WBJ 2376- 44- 18-B-20
UC2OBP 1116- 31- 12-B

UB5UBI 11,583- 117- 33-B-AB
UY5TE 9888- 103- 32-B
UY5OO 8897- 114- 26-B-80
UB5PBA 4560- 80- 19-B
UB5IFN 2688- 56- 16-B
UB5IKM 4950- 75- 22-B-40
UB5UCR 2655- 59- 15-B
UB5UKE 1755- 39- 15-A
UB5CBA 5837- 98- 74-B-20
UB5VX 3363- 59- 19-B
UB5UYR 1785- 35- 17-A-QRP

UO5OWC 48,990- 230- 71-B-AB

UP2BAO 110,400- 400- 97-B-AB
UP2BBF 459- 17- 9-B-20
UP2OU 3180- 53- 20-B-15

UR2OT 26,235- 159- 55-B-AB
UR2RSA 9282- 91- 34-B
UR2RBR 22,765- 495- 49-B-40

YO8BSE 10,764- 92- 39-B-AB
YO6VZ 1728- 36- 16-B-80
YO9YB 3894- 59- 22-B-40
YO2BEO 1710- 30- 19-B
YO3KWJ 27- 3- 3-B-20
YO9HT 2226- 86- 28-B-15
YO4KBF (YO4ATW,opr.)
420- 14- 10-B

YO6AVB 690- 23- 10-A-QRP

YU7AF 39,471- 223- 59-C-AB
YU7ORQ 15,300- 102- 50-C
YU7QDT 1560- 40- 13-B-80
YU7SF 1443- 37- 13-B
YU3EY 179,300- 862- 50-C-40
YU2SD 85,407- 581- 49-C
YU3EIJ 38,406- 346- 37-C
YU3CAB (YU3TVE,opr.)
5040- 80- 21-B
YU1OVY 2016- 42- 16-C
YT3A (YU3TVI,opr.)
145,800- 900- 54-C-20
YU2SDX 13,362- 131- 34-B
YU2RRI 8507- 109- 26-B
YU4YA 57,450- 383- 50-B-15
YU7AOA 42,120- 360- 39-B
YU3NP 13,908- 127- 38-B
YU3TOI 8190- 91- 30-B
YU3C (YU3RM/X,opr.)
15,744- 164- 32-C-10
YU7AV 10,080- 120- 28-C
YT3T (YU3TUX,opr.)
5082- 77- 22-C
YU3TMJ 13,920- 160- 29-A-QRP

Y54WL 217,329- 551-131-C-AB
Y41VI 116,523- 363-107-C
Y51KE 116,280- 380-102-B
Y47YN 64,800- 270- 80-B
Y22YO 41,193- 199- 69-C
Y38YE 21,756- 148- 49-B
Y79WN 17,700- 118- 50-B
Y38OF 13,764- 124- 37-B
Y3ØOFJ 12,096- 96- 47-B
Y87VL 11,466- 98- 39-B
Y3ØCCM 7236- 67- 36-B
Y1ØYJ 7110- 79- 30-B
Y58ZA 5538- 71- 26-B
Y68WG 4131- 51- 27-B
Y47ZL 3000- 40- 25-B
Y49RF 1596- 28- 19-B
Y3ØAJB 405- 15- 9-B
Y30ATL 45- 5- 3-B
Y25RK 8448- 128- 22-B-80
Y57WJ 6552- 104- 21-C
Y43ZK 840- 28- 10-B
Y32KE 792- 22- 12-C-40
Y24LE 390- 13- 10-B
Y3ØBUB 24,260- 202- 40-B-20
Y51QL 13,563- 137- 33-B
Y31PA 9999- 101- 33-C
Y21OL 7998- 86- 31-B
Y24MI 5874- 89- 22-B
Y59ZA 3960- 66- 20-B
Y54KA 2322- 43- 18-B
Y23RJ 1920- 40- 16-B
Y22TD 16,614- 142- 39-C-15
Y37ZB 5538- 71- 26-B
Y3ØUE 4860- 60- 27-B
Y64ZG 4860- 60- 27-B
Y22HF 3588- 52- 23-B
Y62XG 1653- 29- 19-B
Y21XC 1710- 30- 19-A-QRP
Y27KL 12- 2- 2-A

9U3BV (W7BUN,opr.)
107,646- 466- 77-B-AB

North America

KØCVB/C6A 2394- 38- 21-B-160

HH2VP
3,437,769-3911-293-C-AB

HP3JBP 209,898- 598-117-B-AB
HP1AC 112,200- 340-110-B
DL1IW/HP1 65,274- 473- 46-B-80

W9NXD/HR7 40,764- 316- 43-B-80

VE3DFD/J7 (VE3OOS,opr.)
1,125,525-1745-215-B-AB

KG4CD (KB4CD,opr.)
139,482- 574- 81-B-AB

KP4FV 126,360- 780- 54-B-20

W2BBK/PJ7 60,750- 250- 81-B-AB
W7KN/PJ7 2940- 49- 20-B-10

K8WW/VP9
2,234,793-3091-241-B-AB
KA1GDN/VP9
302,436- 813-124-B

VP2EU (K8MR,opr.)
3,620,535-4091-295-C-AB
VP2ES (K8CV,opr.)
56,889- 461- 43-B-40

K4FW/VP2K 683,640-1266-180-B-AB

VP7MM 112,812- 476- 79-B-AB

8P6J (N6TJ,opr.)
4,050,144-4704-287-C-AB
8P6GG (N8BCJ,opr.)
2,376,360-3220-246-C

Oceania

N7ET/DU6 26,019- 177- 49-B-AB

KH6ND 1,928,850-2338-275-C-AB
KH6IJ 3240- 60- 18-C-160
KH6WT 62,918- 311- 46-B-15
AH6EK 858- 22- 13-A-QRP

VK3DXI 344,625- 919-175-B-AB
VK2GW 201,135- 583-115-B
VK2AYD 146,160- 435-112-B
VK4UR 41,106- 271- 62-B
VK3AEW 39,621- 281- 47-B-40
VK6IT 17,670- 155- 38-B
VK4XA 66,440- 360- 63-B-10
VK4SF 8640- 77- 40-A-QRP

ZL2RY 264,384- 576-153-B-AB
ZL2TX 3198- 41- 26-B-80
ZL1AIZ 19,152- 152- 42-B-40
ZL3AGI 21,726- 213- 34-B-20

South America

HK1AMW 998,310-1555-214-C-AB
HK1BAU 813,288-1316-206-B
HK3NBB 258,084- 642-134-B

LU1EWL 291,096- 933-104-B-AB
LU1CLA 205,542- 601-114-B
LU7CW 14,553- 99- 49-B
LU9EIE 179,355-1087- 55-C-20
LU5FGG 48,048- 364- 44-C-15
LU5DVD 132,888- 904- 49-B-10

P42J (W1BIH,opr.)
1,420,576-3852-296-C-AB

PR7CM 578,886-1078-179-B-AB
PY2DBP 262,710- 695-126-B
PP2JT 45,678- 331- 46-B
PY2ERA 36,000- 160- 75-B
PT8AVV 31,746- 143- 74-B
PP2YI 10,914- 107- 34-B
PY2FRW 10,560- 110- 32-B
PY6ABZ 1140- 60- 19-B
PY2CMS 108- 6- 6-B
PY1BOA 2967- 43- 23-B-80
PY1VT 100,776- 646- 52-B-20
ZY5XFR 124,578- 769- 54-B-15
PY2SDI 25,764- 226- 38-B-10
PY2CAR 17,082- 146- 39-B
PY2TU 11,760- 80- 49-A-QRP

K3UOC/YV4
1,654,029-2743-201-C-AB
YV2OPJ (YV4BDU,opr)
385,416- 808-159-B

9Y4VU 200,070-1170- 57-C-40

DX — CW
Multioperator
Single Transmitter

Africa

5Z4CH (+5Z4CL)
766,061- 677-131-C

Asia

JA7YFB (JH7MXO,JR7s,JVO,LCI oprs.)
150,588- 534- 94-C
JA1YKP (JE6IGU,JB4OWG, JHØNPR,JJ1OHJ,JM1MJW,JR6NJD, oprs.)
147,294- 501- 98-C
JR2ZIA (JA5UDP,JA9s NED, XXS,JE2RQT,JF2OQJ,oprs.)
137,088- 448-102-B
JA2YAF (JK7HLZ,JH7VNK,JR7s, HHS,SZJ,TRW,oprs.)
117,810- 462- 85-B
JA1YCL (JG1GOB,JH8MHZ, JHØDUG,oprs.)
91,455- 335- 91-C
JA2YKA (JF2003,JR2GMC,oprs)
35,040- 292- 40-C
JA2YGX (JH7s,QLG,DJU,oprs.)
17,036- 138- 34-B
JA6YBK (JE6UXS,JF6DEA,oprs.)
6240- 80- 26-B
JA6YDH (JG6TAW,JR6s BZG, GHN,oprs.)
5681- 63- 29-B
JA4YIK (JA9WMQ,JR4WGH,oprs)
132- 11- 4-B
JA1YWO (JN1ERV,JO1WIZ,oprs.)
105- 7- 5-B

UKØCAA (UAØs GAR,CBW,CCD, CDM,CDT,DAA,oprs.)
167,904- 578-106-B
UK9FER (UA9s,FAC,FAR,FDW, oprs.)
162,540- 630- 86-B
UK9HAD (2oprs.)
81,090- 510- 53-B
UKØQAH (UAØs QDL,QWN,RP, oprs.)
67,824- 471- 48-B

UK7CAC (UL7s CAZ,CBP,oprs.)
27,307- 177- 62-B

UK8MIR (3oprs.)
1087- 49- 21-B

Europe

DLØTE (DL7s,AHT,AHV,WK, oprs.)
27,225- 165- 55-B

EA3CRR (EA3s,LL,NA,oprs.)
678,456-1396-162-C

F3TV (F6s ARC,BEE,oprs.)
1,597,296-2688-214-C

HG5A (HA5s FM,FN,GF,HO,JI, LZ,ML,OM,UA,WE,HA7s RY,SU oprs.)
1,158,885-1981-195-C
HA6KNB (HA6s ND,NF,NN,NQ, NY,ON,OQ,oprs.)
1,010,295-1727-195-C
HG1Z (6oprs.)
926,295-1669-185-C
HG6V (6oprs.)
875,892-1553-188-C
HA5KKC (HA5s,KP,LV,MA,MU, MO,OC,oprs.)
560,616-1316-142-B
HA1KSA (6oprs.)
166,788- 492-113-B
HA3KNA (4oprs.)
153,276- 482-106-B
HA2KRZ (6oprs.)
152,337- 493-103-B
HG19HB (6oprs.)
106,845- 419- 85-C
HA6KNX (HA6s ND,NW,OD,oprs)
93,906- 333- 94-B
HA6KNI/P (6oprs.)
74,844- 308- 81-B
HA8KVK (3oprs.)
48,837- 223- 73-B
HA5KHI (2oprs.)
31,122- 182- 57-B
HA5KFV (HA5RY + 2 oprs.)
29,640- 152- 65-B
HA1KVL (2 oprs.)
6693- 97- 23-C

IØMGM (+I8ULG,IØJX oprs.)
1,741,707-2651-219-C

LA4O (LA8UU,LA9HW,oprs.)
47,460- 225- 70-B

4U1VIC (OE3OLW,W1HUE, WA4EWN,oprs.)
18,375- 175- 64-B

OH2TI (OH2s BSI,BSQ,OH5s RA,IS,OH6DD,oprs.)
304,425- 825-123-C

OK3KEE (Multiop)
179,520- 544-110-B
OK3VSZ (7oprs.)
141,300- 471-100-C
OK1KPA (OK1s AFC,MHT,oprs.)
44,456- 206- 72-C
OK3KYR (Multiop)
34,020- 189- 60-B
OK3KEV (Multiop)
23,760- 176- 45-B
OK1KWV (Multiop)
12,654- 114- 37-B
OK3BTB (Multiop)
2574- 29- 22-B
OK3KFO (Multiop)
1980- 33- 20-B

ON6BR (ON4s AAJ,ADO,ON5IA, ON6JN,ON7s PY,QU,XN,oprs)
264,384- 648-136-B

OZ5EDR (OZ1HET,OZ3QN,oprs.)
127,008- 441- 96-B

PAØCN (PA3s,ABA,BFM,PAØs ERA,GIN,oprs.)
522,123-1081-161-B

SK1PW (SM1s ALB,BUO,IGO, NAQ,oprs.)
376,494- 958-131-C
SM7KIL (+SM7FJE)
193,908- 572-113-C
SMØCCM (+SMØMLL)
39,936- 208- 64-C

UK1AFA (3oprs.)
119,274- 386-103-B
UK4SAM (3 oprs.)
19,188- 156- 41-B
UK6APR (UA6s,ABS,AKJ,oprs.)
16,704- 116- 48-B
UK4ACE (3oprs.)
5760- 60- 32-B
UK3DBV (UA3DFO + 1 opr.)
5544- 66- 28-B

UK2WAE (UC2WBL + 2 oprs.)
3036- 132- 23-B

UK2BBK (UA2BAV,UP2s BAV, BKW,oprs.)
333,732- 812-137-B

UK2GAB (Multiop)
64,818- 377- 78-B

YO5KAU (YO5s BBO,BRC,oprs)
148,350- 430-115-B
YO5KAD (YO5s AFJ,BJW,oprs)
35,838- 181- 66-B

YT3M (YU3s EW,TFY,TOR,TPZ, oprs.)
1,282,402-2117-202-C
YU2CCO (Multiop)
30,240- 168- 60-C
YO4DIJ (Multiop)
8160- 85- 32-B

Y36ZM (+Y36s,VM,WM)
93,492- 318- 98-B

North America

NP4EJ (+WP4BVD)
584,256-1432-136-B

TI2BEV (K4IA,W4s,KET,OMW, ZD,oprs.)
7,663,100-3300-269-C

Oceania

AH6BK (+WB6B)
2,811,748-3526-266-C

ZL2AU (Multiop)
37,928- 196- 56-B

South America

4K1D (UA1s, AFH,PAM,oprs.)
17,673- 117- 43-B

DX — CW
Multioperator
Two Transmitter

Asia

H2IAB (N6OL,W6s,KG,QL,W7s, KJJ,SE,RØJI,oprs.)
143,616- 544- 88-C

JA3YKC (JE3MAS,JF3RAL, JH4RHF,oprs.)
172,143- 617- 93-C
JA6YAT (JE6s,MOW,UWI, JH6VLF,JR6EZE,oprs.)
57,650- 270- 65-B
JA7YCQ (JH7UGG,JR7HZC,oprs)
25,506- 220- 39-C

Europe

OH3AA (OH3s,WS,XS,OH6DO, oprs.)
591,888-1298-152-C
OH6AC (OH6s,CS,WZ,oprs.)
369,024- 997-124-C

SMØAJU (+SMØDJZ)
644,412-1294-166-C

North America

KL7RA (+AL7CQ)
855,162-1851-154-C

VP5FOX (KF1V,K9VV,KC9J, oprs.)
6,048,456-6676-302-C

Multioperator
Unlimited

Asia

JA7YAA (JE7s IQE,IVP,JH7s, GHO,GFO,LIS,UJN,WTC,JJ1MVV, JR7s OMD,SEI,oprs.)
940,188-1667-188-C
JF1ZRQ (JG1GGU,JH1s CNT,QXP, JJ1AKD,JR1BNC,oprs)
688,050-1390-165-C

Europe

EA3HM (EA3s,AIR,AVV,EEE, EER,KU,oprs.)
1,275,750-2025-210-C

LZ1KAB (LZ1s,AP,VP,oprs.)
676,776-1304-173-C

YU1EXY (YU1s,EA,EW,NW,PKC, UU,YU3TCA,oprs.)
1,815,516-2726-222-C
YU7BCD (YU7s,AD,AU,BB,KW, MGR,PFR)
1,405,332-2774-206-C

CHECKLOGS

Special thanks to the following amateurs who submitted logs to assist in cross-checking entries:

9Y4VU, AH6BK, BV2A, CE2CNC, CE3TZ, CT1AED, EA1BAD, EA3CUV, EA4KR, EA5CIX, EA6KP, EA7ATE, EA7BHO, ER9D/Ø, G3CRF, HA1YG, HA5UA, HA8IF, HA8KAZ, HA8KUC, HB9CBQ, HK3NAW, JH7PWS, K3TK, K4FHO, K6KWN, K7BBM, K9NA, KAØJPH, KAØNNF, KA2BXB, KA4LBD, KA6ZSV, KE6NW, KW23, LA2EG, LA6IAA, LA4XX, LA5BS, LA6IX, LA7TO, LA7XB, LA9XG, LZ2CC, LZ2KKZ, LZ2KTS, LZ2SO, NØBCN, N2BXV, N2RS, N5CCB, N9CTS, OD5LX, OH1BV, OH1XX, OH2BAI, OK1APS, OK1AOS, OK1DZD, OK1TN, OK2KLN, OK5CSR, OK3ZM, OY7ML, OZ5MJ, OZ7IZ, OZ9RL, PAØCF, PAØPHK, PAØTV, PAØUV, PA3BSV, PA3CRY, PA3CPG, PT1CDE, PT1TRC, PP2WV, PT7ZMG, PY1DFF, PY7ORF, PY4KB, SKØLM, SMØCMH, SM2NTU, SM5BDV, SM5GA, SM6CPO, SM7KNW, SP-Ø7I3-GD, UAØICP, UAØQCA, UAØQWO, UAØZDD, UA1AWO, UA1COA, UA1QBV, UA1ZCZ, UA3ACJ, UA3DFV, UA4NBD, UA6LAM, UA6LDF, UA6PCH, UA6YCK, UA9MQ, UA9YDY, UA9YFC, UB5ICK, UB5JNW, UB5MDP, UB5PS, UB5SBM, UB5UCE, UB5UKO, UB5ZBG, UB5ZFR, UD6CM, UF6EFJ, UK1TBB, UK2ROX, UK3ABO, UK4WAB, UK5EDV, UK5HAB, UK9CEY, UK9UDD, UL7TAK, UL7TBM, UP2BBF, UQ2GLW, UR2TRG, UV1DN, UY5GG, UZ3TC, V3HE, VE1RH, VE1YX, VE3AWE, VE4AEX, VE8JG, VO1AW, W2BAZ, W2KXB, W4JD, W4OO, W5GWD, W6ISQ, W6OES, W7JKA, W8ILH, WA4YLD, WA6TLL, WB2VFT, WB4RUA, XO7AJ, Y27ED, Y22HF, Y23YK, Y24GF, Y24VF, Y24VK, Y24WL, Y24YH, Y26MH, Y26ML, Y26WM, Y27HL, Y27VH, Y33TA, Y33ZB, Y39ZG, Y42YG, Y44ZK, Y51WO, Y51YJ, Y54VA, Y58SA, Y62RN, Y67XL, Y68SG, Y85ABS, YO7APA, YO9HP, YU2CB, ZL3PE

Disqualifications

Phone — CT2CM (duplicates); I#WDX (+I#s HCJ,HRI,JBL,WX, ZXB,I6NOA) (duplicates, call sign/exchange errors, unconfirmed QSOs).

CW — AI7B (duplicates, call sign/exchange errors); EA8ZS (duplicates); I#HCJ (duplicates, call sign/exchange errors, unconfirmed QSOs); VE3BMV (call sign/exchange errors).

Public Service

Conducted By Robert J. Halprin,* K1XA

What a Day for a Parade

While many hams across the country were participating in Field Day on Sunday, June 26, 1983, members of the Milwaukee ARRL Amateur Radio Emergency Services (ARES) were getting ready to provide communications for an unforgettable event. Here is one amateur's account.

This is the first day of the year for temperatures to soar over 90°; in fact, it is a sunny, hot and muggy 96°. What a day for a parade. At 10 A.M., the parking lot at the Milwaukee Red Cross Building fills with cars sporting various ham call plates. Hams emerge carrying clip boards, papers, pens and two-meter hand-held transceivers. They're five hours early, but won't have a moment to spare. Special orange jackets are issued to each operator for official access past police lines, and are tied around waists because of the sweltering heat. These operators will provide communications for the staging area near the starting line of the first Milwaukee City of Festivals Parade.

Two-meters comes alive. One ARES member radios to report he has an injury in the family and cannot participate. Another has his car water pump fail, and he'll be late. Standby operators immediately fill the vacant positions. The ARES repeater is activated to give timely announcements about the coming day's operation and answers to questions. Two dozen other operators, forming a second group, listen at home. They will report to parade route positions later. Staging duties are checked, and group one communicators return to their cars to drive to their specific assignments.

Once the hams are on location, communications start with requests to locate parade officials, who are wearing bright-orange sport coats, and to exchange information between them. A brick is discovered missing in a decorative crosswalk on the route, a potential hazard to floats, so a Public Works inspector makes a call for repairs. A procedure is set up for lost children, monitored by a police liaison, in which parent inquiry or lost-child descriptions can be announced on the net for matching. The basic order of the day is for hams to provide communications for disoriented persons or those needing assistance, but to leave parade decisions to parade officials and medical or first-aid care to Red Cross volunteers.

At the starting line is Milwaukee County Emergency Coordinator WB9SMM, assisted by WD9IKS, working with a parade marshall. In four hours, they will be faced from the south by 30 marching bands, from the west by 19 floats and from the north by 21 groups of folk dancers, clowns, ethnic paraders and color guards. The bands will be made up of 50 to 150 marchers each. Dozens of busloads of marchers with musical instruments, banners or flags, some from as far away as Georgia, are already arriving on the scene. Communicators W9ZAG and WD9GRI pair up with parade band officials. Floats, costing $10,000 to $25,000 each and taking many months to build, loom motionless in a line several blocks long. Many floats are so huge they could easily carry a 40-meter dipole at 30 feet. Parade float officials team up with WB9NNJ and WB9YSG. Meanwhile, the 440-MHz administrative channel is checked. Parade headquarters is set up in a recreational vehicle, where two parade officials plus K9GDF and his wife, N9DIJ, handle special telephone inquiries using a temporary phone installation and 2-meter equipment.

It is two hours to starting time. The second group of operators arrive and take their positions at one-block intervals along the parade route. Girl Scouts, handing out programs along the parade route, do not know they are to be in the parade. Net Controls WA1REL and WB9BZC, on request by Scout leaders, announce that all Scouts along the route will be picked up in a brown Scout van and then will be taken to the staging area to march in the parade. With 2-meter rigs and their operators spaced at one-block intervals, this assignment is carried out immediately along the entire parade route. This same coverage could also allow answering of individual Scout questions.

It is now one hour before the parade. People are coming from every direction. Parade watchers line the route four deep on both sides of the street, while crowds bulge seven deep elsewhere. Some estimates put the crowd at 300,000. Many people watch from offices and apartments above. Helicopters, providing part of live coverage on two local TV stations, circle overhead. Clowns tell jokes, marching bands tune up and practice, and float builders place fresh, potted plants on floats. The ARES repeater handles an uninterrupted flow of messages, requests, last-minute parade changes and information between parade officials.

The Mayor and his wife arrive to ride the lead float. Charlotte Rae, TV star of "The Facts of Life," takes her position as Grand Parade Marshall in a sleek antique convertible.

Five minutes to starting time, messages taper to a silence filled with anticipation. No transmissions are made for nearly two minutes. Forty ham radio operators are in their positions and ready to provide communications for the Milwaukee City of Festivals Parade. At precisely 3 P.M., parade officials give the starting signal and net control relays it to all operators — the parade has officially begun. The click of drum sticks resounds between downtown buildings as the Milwaukee Police Band moves out; the parade is on schedule. The band crosses the starting line playing "On Wisconsin" as crowds cheer and applaud. Suddenly, the full brass section, combined with loud bass drums, joins to further overwhelm and delight listeners. Operators nearby press earphones tight in order to hear communications.

A title banner is spotted out of sequence; a radio call is all that is needed to pull it out and hold it for the right spot. Merging bands, floats, and paraders continue to make up the parade.

The float drivers are cramped and have restricted vision, and the heat they now endure is fouling up their engines. The Polish Fest Float's engine groans lower and lower in pitch. Its wheels squeal, and it jerks toward the starting line and quits. An unexpected delay, but it is minimized by a radio call for a tow vehicle and a change of plans to reroute floats around the stopped float. Next, the Fourth of July Celebration Float has engine trouble, and the Rainbow Summer Festival Float is out of gas. Finally, the Afro Fest Float and the Indian Float break down at a turn and need to be towed.

Ham communicators are kept busy, not only to report towing needs and parade delays or gaps to officials, but also to relay medical requests to the Red Cross. Eleven Red Cross areas, some with message runners, are spaced along the route. Hams provide vital linking communications to Red Cross officials, who in turn coordinate ambulance and paramedic help for victims of the heat. Some marchers wear uncomfortable, hot football-season wool uniforms and large caps in dark colors, while clowns wear makeup, wigs and elaborate costumes. Everyone is exposed to the relentless sun. Although the parade takes 1½ hours to pass any point, it takes over three hours to complete the long route. Thus, it is inevitable that people in the hot sun and in need of water are affected by heat exhaustion or heatstroke. During the parade, 143 people are overcome by the sweltering heat, with around 350 treated. At least 23 people are taken to area hospitals; fortunately, all are released after additional treatment. For hours, the heavy 2-meter traffic frequently contains urgent reports of "spectator down" or "band member out, unconscious, but pulse okay."

Overall, hams responded immediately with reliable communications to resolve unanticipated problems. There were many situations from which to learn appropriate actions to be applied in next year's parade, or in a real emergency. The 10-hour volunteer effort was one of the biggest ARES training exercises for Milwaukee, and was

*Deputy Communications Manager, ARRL

Third-Party Traffic Agreements

Here is the latest list of countries (by prefix) with which U.S. amateurs may legally handle third-party-message traffic.

C5	The Gambia	TI	Costa Rica
CE	Chile	V2	Antigua and Barbuda
CO	Cuba		
CP	Bolivia	VE	Canada
CX	Uruguay	VK	Australia
EL	Liberia	VR6	Pitcairn Island†
HC	Ecuador		
HH	Haiti	XE	Mexico
HI	Dominican Republic	YN	Nicaragua
		YS	El Salvador
HK	Colombia	YV	Venezuela
HP	Panama	ZP	Paraguay
HR	Honduras	3D6	Swaziland
J6	St. Lucia	4U1ITU	ITU, Geneva
J8	St. Vincent	4X	Israel
JY	Jordan	6Y	Jamaica
LU	Argentina	8R	Guyana
OA	Peru	9G	Ghana
PY	Brazil	9Y	Trinidad and Tobago
TG	Guatemala		

†Informal agreement. See League Lines, Oct. 1981 *QST*, for details.

made possible by the careful planning of WB9SMM. The next evening, ARES stations monitored the regular net for WB9SMM to give the prognosis. "This is WB9SMM," he said, quickly changing to an elated voice: "Holy catfish — what an operation." — *Richard R. Regent, K9GDF, Milwaukee, Wisconsin*

COMMUNICATIONS SERVICE OF THE MONTH

A team of greater-Boston hams handled safety communications for the first Charles River Watershed Association (CRWA) canoe race on April 24, 1983. It was a large race, and it required a serious communication effort to assure the safety of the participants. Repeaters used were K1HRV (295/895) in Walpole and K1IJZ (22/82) in Weston.

The race course was from rural Hopkinton to Newton, well into the urban area. It covered 41 miles of river, with 15 checkpoints and nine portages around dams. About 150 boats began on a gloomy, overcast Sunday morning, and around 90 finished in conditions that varied from drizzle to downpour. The canoeists arrived drenched but happy — Lord knows why.

The fundamental purpose of the ham participation was to make sure help could be sent fast if anyone got into serious problems. As it turned out, the bulk of the communication traffic was reports of boats dropping out of the race along the way, and reports of boats overdue at checkpoints and showing up later. The hottest messages were some warnings of unexpected dangerous conditions at a couple of checkpoints and a request to establish an extra checkpoint at a bad spot. Fortunately, nobody needed rescuing during the race, though a couple of runaway canoes had to be retrieved by other racers.

There was a ham with the race officials at each of the checkpoints along the way. Start, finish and CRWA headquarters were among the checkpoints. There was also a station at the Red Cross chapter house in Newton, where the Red Cross dispatched its first-aid trucks with its own 7-meter fm net.

The ham operation had several unusual features. From what worked and what didn't, we learned some things about public service operating.

First, the distances involved, and the fact that stations opened and closed at different times during the day as the race moved down river, made it impractical to get everybody together in one place for a briefing. So, we put the briefing on paper and got the CRWA to mail it out to those who volunteered in advance, along with their own maps and pamphlets. This worked out pretty well. Everybody seemed to understand the unusual aspects of the procedures we used, and everybody, except one or two, found their posts without a talk-in. Unfortunately, CRWA mailed the stuff a couple of days later than they'd planned to, so a couple of people didn't get their packages and had to depend on picking up the procedures by ear. Next time, we'll try to have the final meeting with CRWA two weeks before the race, instead of one week.

One major benefit of a written briefing is that everybody got all of the information. They didn't have to depend on note taking and interpretation on the fly. So we'll probably make handouts standard practice in the future. Important: Written briefings should be well-organized, with topic headings, so half-remembered points can be looked up quickly when things are hot and heavy. Ours had the emergency reporting procedures on the back page, by themselves.

The written handouts, particularly the maps, helped a lot in making the individual operators as independent as possible. There's no way one coordinator with a map can navigate everybody into position, or tell them every detail of what they're supposed to do when they get there. Paper helps, but a willingness on everybody's part to look around when they arrive, decide what needs doing and to make sure it gets done helps even more. Every decision made on the spot frees air time to coordinate events happening at different places that really need communication. The briefing paper pointed this out, and it seemed to help.

We used tactical call signs, which were identical with the names the race officials used for the various locations. This made it unnecessary to try to remember where a particular station was, or to look up the proper call sign to reach a particular site. The tactical calls also took less time to say. To stay legal, each station announced its regular call at the end of the exchange. This served the double purpose of telling the other stations that the stations in contact were releasing the channel. (Sometimes they just stopped talking when it was obvious that the contact was over, but the rate of traffic was high enough to get the call signs in at least every 10 minutes as required by FCC rules anyway.)

Probably the most radical thing we did was throw out the controlled-net concept. Instead, we used a variation of air-traffic-control procedure. This was a *spectacular* success. Eliminating the net control overhead, by itself, cut out about 40% of the usual chatter. We could never have kept up with the situation if we'd operated like a conventional traffic net. The abbreviated language and calling technique helped some more. Here's how it worked:

A station that wanted contact with another station gave the tactical call of the station called, then its own call. The reply was just the tactical call of the station answering. Then down to business — no more calls, even tactical calls, during the useful communication. When the calling station had no more to say, it would give its regular call. The called station would give its regular call if it had no questions and nothing more to say — the "Roger" and the "Clear" were implied and didn't need to be said.

Since ham headquarters in the Red Cross building had considerably more traffic than any other station, a special rule allowed it to be addressed by default without taking air time. Any station could call headquarters by giving only its own tactical call. The lack of "station called" automatically implied that headquarters was called. Similarly, headquarters called other stations by giving only the "station called"; it identified itself only when breaking contact, and only to stay legal.

The economy of procedure words, by itself, was a help in keeping up with the flood of checkpoint reports during the middle of the race. What helped even more was that the abbreviated procedures got everybody into the habit of saying only what needed to be said, in an economical way. They tended to get on and off the air fast. Not that we got down to the minimum possible number of syllables; we still sounded like hams, but there were no interminable exchanges of call signs or folksy socializing to get in the way of useful reporting. It worked.

A side benefit of letting stations call each other without requesting permission from net control was that the headquarters operators didn't have to be glued to the speaker every second. We could talk with people in the room, stop to think about the best way to deal with unexpected problems as they came up, and just plain catch our breath.

Another thing we did was put the up-river half of the race on one repeater, and the down-river half on a different repeater. That was because we couldn't find a single machine that gave hand-held coverage of the whole course. Well, splitting channels had an unexpected benefit. It gave us twice the information capacity during the middle of the day when both halves of the river were busy and there was a lot of information being exchanged between nearby checkpoints. It was an accidental application of the old rule — if you can identify a group of stations who need to talk mainly with each other, give them a channel of their own and get them out of everybody else's way.

There were backups for just about everything, and it was a good thing. To begin with, each ham was advised to bring both a hand-held radio for convenience and a synthesized mobile rig for dead spots and failures. At Red Cross headquarters, where we were both handling traffic and managing the ham operation, we had two operators, three rigs, three power supplies, two mag mounts on filing cabinets, an Austin vertical in the stairwell, a big car battery, a headset and some earplugs, lots of cables and adapters, and some hand-held rigs. For each repeater we planned to use, we had permission to use another one with roughly the same coverage. For emergencies, there was even a backup to the headquarters site itself — three autopatches and the standard checklist for using them. With no particular hassles, we coped with a primary repeater that went down for maintenance, dead hand-held radio batteries at CRWA headquarters, and moving the station at Red Cross from one room to another in the middle of the job when the Red Cross transmitter's remote control failed.

Actually, there were some other good reasons for having more than one ham at the headquarters of the ham operation itself. For one thing, the ham who is dispatching other hams needs to be able to get away from the rig and think, at times. Examples: We had to cope with a request to set up another checkpoint in the middle of the race, and find someone to cover it. A couple of inbound hams needed help in finding their sites, and the calling channel was far too busy to handle that. When you're dealing with that, you can't even listen in on the routine communication. On the other hand, headquarters has to be available pretty much all the time. That means a second operator to handle communication. Also, there were times when the sheer volume of communication with headquarters required two of us on two channels to keep up. And when a station has to be instantly available when called, the only way to let an operator get away from the rig for a pit stop is to have at least two operators. And of course, one can set up and fix equipment while the other operates; if the site is important enough, that's a consideration. So my advice to anyone in charge of a ham communication team is to work at a site where there is another ham and where there's room to spread out maps and notes, and don't try to be the principal communication operator there.

One idea that didn't work out was the use of extra channels. The plan called for any station that needed more than 30 seconds of contact time to take the other station off. We'd picked some simplex channels and an extra repeater with good wide-area mobile coverage for that. The rain forced a lot of hand-held radios into plastic bags, and made it hard to work the switches. (Lesson: if it's a rain-or-shine event, take a plastic bag big enough for your hand-held rig, not to mention foul-weather gear that will fit over a warm coat.) Sometimes, in the heat of the moment, operators just plain forgot to move off when the contact stretched out to a minute or so. On the other hand, the abbreviated procedure worked so well that there wasn't much of a bottleneck, anyway, so there wasn't too much pressure to chase stations off the calling frequency. A couple of talk-ins were handled off-channel, and an operator at a checkpoint was assigned to go headhunting on the local repeaters when we needed to find somebody for that unplanned checkpoint. Outside of that, we handled everything on two repeater channels. I've got some different theories about multi-channel operation to try out next year.

Another idea that wasn't so good was putting the overall headquarters at the Red Cross building, on the theory that a call for a first-aid truck would be very high priority. In practice, almost all the communication had to do with checkpoint reports that accounted for boats — dropouts, boats late, boats missed but seen by a later checkpoint, requests for trailers to go collect a dropped-out boat, and so on. The three or four contacts with the Red Cross the whole day could have been handled by telephone. Headquarters should be where people are keeping track of the overall picture, and the ham coordinator should be with the people who are running the show. Race headquarters moved just before the end, too, from CRWA headquarters to the finish line. I guess the results proved that if you have good communication you can cope with just about anything. It took a lot of extra communication to bring the new headquarters up to date, though.

The bottom line is that race officials got all the communication they needed. They were highly impressed with the effectiveness and efficiency of ham communications, except for one rough spot where a relief operator got lost within the checkpoint. From the CRWA thank you letter to the hams: ". . . All who participated in our inaugural run have been generous in praise for the organization and gratitude for the concern for their safety in which you played a part. Under the most difficult weather conditions imaginable there was a spirit of cooperation and excitement that augurs well for the years ahead . . . Without your network we could not have kept critical track of swamped canoes, dumped racers — those scary instances when canoe and canoeist parted company . . ."

A point that came out at the critique was that communication made it possible to act promptly when problems that weren't planned for showed up — that extra place that needed a checkpoint, a clipboard that wasn't where it was supposed to be, boats that couldn't finish in a reasonable time, and so on. Remember, this was the first time they'd done this race. Nobody thinks of everything the first time. — *John A. Carroll, AB1Z, Bedford, Massachusetts*

NATIONAL TRAFFIC SYSTEM

Beginning October 1, DTEN will institute the 1945 UTC (cycle 2) net session. CAN/c4 certificates went out to KJ9J, AIØO, K5PE and KSØU. Certificates for 1RN/c2 participation were awarded to N1ALM, K1AQE, N1BHH, KA1BJ, N1BJW, K1BQB, KA1CDC, WB1CFP, W1CUE, AK1E, W1EOF, KA1GBS, WB1GXZ, WB1HIH, KL7IJG, W1JTH, W1KK, K1IM, KA1T, WA1TBY, AK1W, WA1YYW and WA1YZN. 2RN/c4 certificates: N2BLX and WA2FIJ, first annual; WB2IQJ, fourth annual. WB6VPY received an RN6/c4 certificate, and K8TPF picked one up from 8RN/c4.

July Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	991	32.0	.681	96.8	
CAN	31	842	27.2	.498	100.0	
PAN*	61	837	10.4	.424	97.4	

Region Nets						
1RN	59	269	4.6	.230	68.3	100.0
2RN	62	301	4.9	.269	83.5	100.0
3RN	31	209	6.7	.407	96.8	100.0
4RN	62	595	9.6	.368	73.9	100.0
RN5	62	675	10.9	.382	95.8	100.0
RN6	62	444	7.2	.379	98.4	98.4
RN7	93	594	6.4	.499	93.1	98.4
8RN	61	308	5.0	.291	92.9	100.0
9RN						100.0
TEN	31	436	14.1	.390	86.4	100.0
ECN						80.6
TWN	55	182	3.3	.287	64.9	96.8
TCC						
TCC Eastern	113[1]	680				
TCC Central	85[1]	342				
TCC Pacific	104[1]	341				
Cycle Four						
Area Nets						
EAN	31	1367	44.1	1.164	94.1	
CAN	31	933	30.1	.905	99.5	
PAN	31	1013	32.7	1.009	98.9	
Region Nets						
1RN	56	650	11.6	.510	94.9	93.5
2RN	90	623	6.9	.542	94.1	94.1
3RN	62	227	3.7	.420	96.8	100.0
4RN						100.0
RN5	62	522	8.4	.537	94.0	100.0
RN6	62	672	10.8	.611	100.0	100.0
RN7	62	505	8.1	.653	92.5	100.0
8RN	58	334	5.8	.389	90.0	90.3
9RN	62	483	7.8	.436	98.0	98.4
TEN	62	447	7.2	.388	74.4	100.0
ECN	62	265	4.3	.482	82.2	90.3
TWN	59	331	5.6	.300	90.7	96.8
TCC						
TCC Eastern	112[1]	607				
TCC Central	58[1]	385				
TCC Pacific	114[1]	672				
Sections[2]	7014	27,281	3.9			
Summary	8505	45,165	5.3			
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 (240): APSN ATN (AB), ACN ATEN HARC (AZ), BCEN (BC), NCN NCTN SCN/1 SCN/V SVTN WCCARES (CA), DEPN DTN SEN (DE), MDD (DE/MD), BEN DEN ENMC FAST FMSN FMTN FPON FPTN GN LCEN NFPN PEN PRVAN QFN QFNS SEFTN SPARC SVTN SWFTN TPTN (FL), PTN (HI), CIARESN IA75EN IA75NN ITEN PCARESN TLCN (IA), ILN ITN (IL), ICN ITN QIN (IN), CSTN KMWN KPN KSBN KWN QKS QKS-SS (KS), 3ARES 4ARES 5ARES 7ARES 11ARES BARES CARN KEN KNTN KRN KSN KTN KYN KYPON MKPN MWRTTY NKARC PAEWTN SEKEN TSTMN WTEN (KY), CITN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MTN (MA/RI), MEPN MMN MTN WRIN (MB), AEN CMEN MPSN PTN SGN (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN MSSN (MN), CMEN HBN IFN JCCN KARN MEOW MON MOSSB NARN PHD RRARN SARN (MO), APN (MR/NF), CAEN GCSBN MMN MRA MTN (MS), CEN CFARS CMN CNCTN JFK PCTN PETN RARS THEN (NC), CN CSN (NC/SC), BVARES MNARES NCHN PVTN WNN (NE), GSFM GSPN NHN RCARES (NH), HCATEN JSARS MCN NJM NJN NJPN NJSN OBTTN TCETN (NJ), NSN (NV), BAVTN CNYTN NCVHFTN NLI NLIPN NYPON NYS NYS/M OCTEN SCVHFTN STAR WDN (NY), BN BRTN BSSN COARES HCARES LCTN MCTN O6MN OSN OSSN RARA (OH), NON NWOSN OLZ ONON OTN OTWN QCWA STN (OK), KTN OLN OPN OSN2 OSND TIN (ON), BSN ORARES PDXARES PTTN WCN (OR), NWPA2MTN WPA WPA2MTN WPAPTN (PA), QSN (PQ), A2MN GPD2MN LC2MN SCNTN SCSSBN (SC), NJQ SDEEN SDEN SDEPN SDMN SDN SDTIN (SD), TNCW TNPN TNVN TSRN (TN), DFW NET TEX TSN TTN (TX), BUN UCN (UT), STARES SVEN VLN VN VSBN VSN VTN (VA), VTN (VT), EWTN NTN NWSSBN PSTS SCARES WARTS WSN (WA), CCTMN (WY).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

De WØHXB: "KT6A deserves a medal for his management of TCC-P/c2 during WØHXB's convalescence from a broken leg." A TCC-E/c2 certificate was awarded to AA4AT.

1	2	3	4	5
Cycle Two				
TCC Eastern	124	91.1	1366	680
TCC Central	93	91.4	719	342
TCC Pacific	124	83.9	682	341
Summary	341	88.8	2767	1363
Cycle Four				
TCC Eastern	148	75.7	1217	607
TCC Central	62	93.5	752	385
TCC Pacific	124	91.9	1326	672
Summary	334	87.0	3295	1664

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (July) *Cycle Two* — Eastern Area (AF8V, Director) — AA4AT N1BHH WA4CCK N2CER K1EIC VE3GOL WB3GZU KO2H WB1HIH KB2HM VE3HTL K8KQJ WA4LJI WD8LRT AH2M K8OZ W8PMJ W1QYY W1TN KB3UD AF8V AK1W N2XJ W1XX WB8YDZ. Central Area (W9JUJ, Director) — N5AMH N5AMK N5BT N5CRU W5CTZ N5EFG WØFRC W4JL W9JUJ K5KJN W5KLV KD5KQ WB9NVN W9NXG WB5OXE WB9WGD WF4X WB5YDD. Pacific Area (WØHXB, Director) — KT6A NØACW N7CSP NØCXI KU6D W7DZX WØEJD KB7FE N7FKA W7GHT N6GIW K6HAD KM6I W5JOV KBØMB WBØMTA K7OVK K6OWA WA7OYI ND5T K6UYK W7VSE WB7WOW W6YVY KM7Z. *Cycle Four* — Eastern Area (W2CS, Director) — W3ATQ W3BBN KI3C WA4CCK W2CS W1EFW W2FR W2GKZ WB3GZU KN1K AH2M W8PMJ WB4PNY W3PQ WA2SPL W4UQ VE1WF W2XD N8XX K4ZK. Central Area (W5GHP, Director) — WØAM W9CXY KØEX K5GM WØHI W5LQ K5OAF W5RB N5TC W5TFB K5TL WB9UYU 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 July 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.

245 K7VW
196 W7GHT
163 WB7OGA
155 WB7WOW
154 W1PUO
143 KB5EK
131 W2AHV
124 WB2MCO
121 KA3DLY
118 KU4W
115 K2ZM
114 KA5KRI K8KQJ
113 WF4X KF8W WØOYH
112 KA1GBS W9YCV
111 WB1GXZ
110 WD8RHU
109 WB1HIH K8TI
108 WB2IQJ WA4QXT N5EFG
107 WB3GZU WA4PFK K4ZK AL7W AF8V
106 KCØOO
105 W2MTA
VE3GT
104 WA4JDH WF4Y KC5NN KV5X W9JUJ
103 N8EES KBØMB
102 N5AMK KD7ME W7VSE WD9FRI WA4CCK
101 KK1E AK1W W4CKS KA4GFU NG4J WA4YPQ KZ8Q WØKJZ WAØTFC
100 KI1M WA2FJJ W4ANK KA8NCR
99 N1ARI KAØEPY
98 WA3WIY N8DSU K4JST
97 N1BGW KD5FR W6NTN WD4ALY
96 N2AKZ KA2GSX VE3BDM KA3GJT K4EV KA5HDT W6VOM WA7LGN KT9I
95 KC2TF VE3GOL KA5CXW
KAØARP
94 WB1ABQ KA4BCM WA4LXP N6AWH W6INH W9DM WBØTED
93 N3COY N4PL KA5AZK KT6A KA8IAF AA4AT
92 WA4EIC AG9G
91 WA1TBY N2XJ WB4AID WD4CNQ WA8GMT
90 KB4OZ W5CTZ WD8MIO
89 W1RWG WB2QMP K2VX VE3DPO W3VA KA4MTX
88 KA1EPO WA2CUW KL7IJG
87 W1TN WA1YNZ KA3EJG WB2RBA
86 KA1T NI6A- KB4WT
85 N1BJW K4VWK W2AET WB2KLF KY2P
84 W2BIW KB5W NØBLB
83 KA1AVU K3ZJJ KY4U WB5YDD WB8MTD
82 N1AJJ KA1TJ KA2BHR WB2GHN KR4V KC2SW KB3UD N5DKW KT5Z KTØU
81 W2XD W3YVQ
80 N4FQD NN4I N4GDT KAØBWM KBØZ
79 WA4EYU AG2R NP4D K4IWW K4ZN
78 N2EBA KC2QQ WB2VUK K2ZVI KA4GUS W5KLV KS5V KT6D K7LCA KA9IKR NØCXI
77 AE1T N2DPN WB2IDS K3JL
76 K1JHC WB2OWO W5KMF
WD0AIT
75 KA4AUR KD4TY
74 WB6QBZ K8JDI KØSI
73 KA1GWE WA3UNX WD4HBP KB4LB WB4TZR K4WJR N7BGW
72 KF4U WB6DOB W6JTA
71 KA1GCW W7LG WD9HII
70 KB3FW WB4WII W4ZJY K6APW KA8GJV
69 WA2KOJ K9CMO W9TLU
68 KB2KW KB4OG W3DKX WB5LBR NI5V KAØBCB
67 K3NNI WD4BSC KA4FZI WB6RTE K6UYK
66 AC3N N5BFV N5FUS N5TC KT5Y KB7FE WB8TDA WBØHOX WØKK
65 N5BT KA7ELI WB7WVD
WA8DHB WB9IHH KD9K
64 WB2IDP N3CKQ WA4JTE WA6QCA AD7G WA7GQO W7LNE W8EK KAØLNI
63 KS2G WD4OCW KU2N KA8CPS NØCFS
62 KC3DW VE3KK KP4DJ W4FMZ W4GUJ W4HON WD8KBW
61 K3CR KA4BBA
W6RNL KA8MEB
60 N2CER W2KB W2ZOJ KJ3E WB3FKP KA9HPQ KA9NOT WØOUD WAØSCP
55 KA2MBP/T
53 WA1DXT/T
52 N5EZM/T
49 N5FDL/T
48 KA8GGZ/T WB8NHV/T
42 K1LCQ/T

Brass Pounders League July 1983

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: WB8WKQ WØFRC.

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
K3NSN	1596	891	881	100	3468
W3CUL	781	996	1501	86	3364
KA9CPA	62	1387	238	984	2671
NØBQP	28	1120	148	677	1973
WAØHJZ	0	1146	31	765	1942
W9JUJ	1	518	435	3	957
WB7OGA	87	366	418	49	940
W1EOF	1	321	499	17	838
W3VR	280	210	295	21	806
K8NCV	31	345	372	4	752
WA4JDH	4	348	292	3	647
KT9I	0	257	370	0	627
W7VSE	5	315	285	5	610
N3ADU	0	313	291	0	604
W7DZX	19	277	268	2	566
KBØMB	143	136	252	25	556
KA1GBS	8	267	251	6	532
K8OZ	7	236	274	12	529
WB5YDD	7	281	212	24	524
WB7WOW	10	208	280	24	522
WD8MIO	17	287	194	16	514
AF8V	1	275	219	6	501

BPL for 100 or more originations plus deliveries:

KAØCIR	179
KI1M	114
KH6B	114
WØFIR	103
N4PL	101
KB5EK	101
KA5CXW (May)	126
WF4Y (June)	117
K5CXP (June)	110

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (July 1983)

1	2	3	4
Amateur Radio Telegraph Society	31	547	289
Central Gulf Coast Hurricane	31	178	2097
Clearing House	31	72	242
Early Bird	31	931	351
Empire Slow Speed	29	45	313
Golden Bear	31	85	1675
IMRA	26	619	1306
Midwest RTTY	31	52	215
Mission Trail	31	258	1026
New England Novice	31	127	379
North American SSB	26	165	64
Vermont Sideband	30	124	551
West Coast Slow Speed	31	63	339
75-Meter ISSB	31	453	970
7290 Traffic	45	508	3051

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Simulated Emergency Test Announcement

Go for it on October 15-16!

By Robert Halprin,* K1XA

No activity has attracted more favorable or consistent public attention than the instances when amateurs have kept communications open during and after floods, forest fires, hurricanes, ice storms, and the like. And no activity gives the amateur a stronger sense of fulfillment, of pride in a job well done, than to aid his neighbors in time of crisis.

The Amateur Radio Service is unique in its combination of substantial numbers of widespread geographical distribution, its long-distance capability, its variety of equipment and bands, its freedom to serve all relief agencies voluntarily and on equal footing. Other services can do a little something when the chips are down, but a trained group with pretested equipment and well-laid-out plans can do much more.

A League objective for many years has been to improve our emergency communications training and capabilities, through the sponsorship of the Amateur Radio Emergency Service (ARES) and the National Traffic System (NTS). ARES and NTS get their workout in the ARRL Simulated Emergency Test. At the national level, Hq. provides a framework within which local groups can practice and prove the procedures they'll follow when a real test of their ability arises. But SET is a grassroots show; League officials in the ARRL field organization are in the driver's seat within their areas of jurisdiction. The form the SET takes is up to these League officials.

If you are a member of ARES, hold the weekend of October 15-16 open, and check with your local Emergency Coordinator about his or her plans. If you're a participant in an NTS net, try to be on hand during the weekend (and the following week).

If you're neither an ARES member nor a net operator, isn't it time you were? Contact your local Emergency Coordinator to ask about details of participation. If neither you, other hams, nor the local radio club know the EC's name, contact your Section Emergency Coordinator (see list) or your Section Manager (see page 8) for the info. There's a place for you, whatever your frequency band and mode. Listen a few evenings to catch on to the procedures used on ARES/NTS nets, then wade in. Most control stations will be patient, courteous and genuinely glad to welcome a new recruit.

The preceding words were taken from a *QST* editorial published 20 years ago this month (October 1963 *QST*), and the message has stood the test of time. But how does one participate in SET, 1983-style? Here's how.

Most local activity, particularly of an ARES nature, will occur on 2 meters. If you have a 2-meter fm transceiver, you're golden. Contact your local or district EC, and volunteer to help (your SEC or SM can tell you who your EC is).

Many ARES groups work closely with RACES and civil-preparedness entities, Red Cross, Salvation Army, REACT and other agencies. Thus, there should be more than enough assignments for everybody. If it turns out that your locality does not have an EC, perhaps you or another qualified amateur could volunteer for that role. Let your SEC know.

With 2-meter fm capability, you can also enjoy the many NTS local nets that exist on that band. If you are unfamiliar with formal traffic-handling procedures, we suggest you read up on the information contained in the *Public Service Communications Manual, Operating An*

Table 1
NTS Schedule During SET, October 15-16

Cycle ONE	*Cycle TWO*	*Cycle THREE*	*Cycle FOUR*
10:00 A.M. Section	1:00 P.M. Section	4:00 P.M. Section	7:00 P.M. Section
10:45 A.M. Region	1:45 P.M. Region	4:45 P.M. Region	7:45 P.M. Region
11:30 A.M. Area	2:30 P.M. Area	5:30 P.M. Area	8:30 P.M. Area
12:30 P.M. Region	3:30 P.M. Region	6:30 P.M. Region	9:30 P.M. Region
			10:00 P.M. Section

THE AMERICAN RADIO RELAY LEAGUE
RADIOGRAM
VIA AMATEUR RADIO

NUMBER 17 | PRECEDENCE Test P | HX | STATION OF ORIGIN KA1KRQ | CHECK ARL 5 | PLACE OF ORIGIN Plainville CT | TIME FILED | DATE Oct 15

TO Larry Lunchbucket
General Hospital
Fredonia City, Fredonia

TELEPHONE NUMBER 555-8451

THIS RADIO MESSAGE WAS RECEIVED AT
AMATEUR STATION ____ PHONE ____
NAME ____
STREET ADDRESS ____
CITY AND STATE ____

Test message X ARL fifteen

Peter Adamson

REC'D FROM WB9IHH DATE 10/15 TIME 1700Z

THIS MESSAGE WAS HANDLED FREE OF CHARGE BY A LICENSED AMATEUR RADIO OPERATOR WHOSE ADDRESS IS SHOWN IN THE BOX AT RIGHT ABOVE. AS SUCH MESSAGES ARE HANDLED SOLELY FOR THE PLEASURE OF OPERATING, NO COMPENSATION CAN BE ACCEPTED BY A "HAM" OPERATOR. A RETURN MESSAGE MAY BE FILED WITH THE "HAM" DELIVERING THIS MESSAGE TO YOU. FURTHER INFORMATION ON AMATEUR RADIO MAY BE OBTAINED FROM A.R.R.L. HEADQUARTERS, 225 MAIN STREET, NEWINGTON, CONN. 06111

SENT TO ____ DATE ____ TIME ____

THE AMERICAN RADIO RELAY LEAGUE, INC., IS THE NATIONAL MEMBERSHIP SOCIETY OF LICENSED RADIO AMATEURS AND THE PUBLISHER OF QST MAGAZINE. ONE OF ITS FUNCTIONS IS PROMOTION OF PUBLIC SERVICE COMMUNICATIONS AMONG AMATEUR OPERATORS. TO THAT END, THE LEAGUE HAS ORGANIZED THE NATIONAL TRAFFIC SYSTEM FOR DAILY NATION-WIDE MESSAGE HANDLING.

PRINTED IN U.S.A.

Fig. 1 — An example of a properly filled-out SET radiogram.

*Deputy Communications Manager, ARRL

Linda Guillory, N5FAS, of Denham Springs, is very active in public service communications in Louisiana.

Amateur Radio Station and *Net Directory* pamphlets,[1] as well as the *ARRL Operating Manual*, which is available at your local radio book counter.

Those of you who are low-hand oriented can get in on the SET action by helping out on the section-level NTS nets. Most every ARRL section has a traffic net meeting on 75/80 meters. In an emergency, it is imperative that all stations go about handling communications in a standardized format. So, it is important to be aware of the procedures spelled out in the above publications, as well as to monitor and report into net sessions before the SET. The National Traffic System will expand into four cycles (see Table I) during SET weekend to deal with the expected traffic overload. There will be plenty of net control, liaison and delivery functions to go around, so your presence will be greatly appreciated.

For SET, all nonroutine Test messages should carry the word "Test" before the precedence, e.g., Test Priority on phone or TEST P on cw. As a further step to ensure that test messages will not be construed as the real thing, use the words TEST MESSAGE in the first two words of the text. See Fig. 1 for a SET message in correct form. Do not use TEST in the precedence or in the text of a routine message. A routine message is a routine message, regardless of whether it was drafted for the SET. And for improved efficiency — and fewer migraine headaches — avoid using long words, such as participating and communications, in texts whenever possible.

To prevent SET messages from dragging out beyond the SET period, the handling instruction HXB is used. Loosely interpreted, HXB means "cancel message if not delivered within the SET period; send a service message to originating station." For SET messages sent during exercises held on a date other than the primary weekend, use HXB48, which means "cancel message if not delivered within 48 hours of filing time; send a service message to originating station." If a message is not a test message and you would like to have it delivered even after SET is over, don't use HXB at all.

Although October 15-16 is the official SET weekend, groups are free to hold their SETs on any two-day period between September 1 and October 31 to coincide when amateur activity, public service value and mass-media exposure can be the greatest. This year, however, special emphasis will be placed on having section-wide SETs on the official SET weekend (details on this will be included in the annual SET Bulletin, mailed to all League officials), but all SETs held within the two-month period will be included in the SET results in *QST*. The deadline for all reports is January 31, 1984.

While all League officials automatically receive the necessary reporting forms, those of you who are not ARRL field-organization leaders can request the SET Bulletin from ARRL Headquarters. These reports are necessary so that the actions of Amateur Radio operators in this nationwide public service exercise can be documented.

Effective public service communicating often requires emergency power. Would you be able to communicate if you suddenly lost commercial power? This is commonplace in many emergencies. Some exercises and net sessions will operate on the assumption that electrical service has been disrupted. Equip yourself with some sort of emergency-power source or battery-operated gear.

Quicker than you can say "Larry Lunchbucket," you'll be having fun with whatever aspect of SET you choose to participate in. But don't accept any third-party traffic, as it were, for it. Experience this activity firsthand. Or, to use the slogan of the 1980s, "Go for it!" QST

[1]To obtain these three pamphlets, send a 9- × 12-in. s.a.s.e. with $1.22 in postage to ARRL Hq.

Section Emergency Coordinators of the American Radio Relay League

Alabama: Carl Weaks, N4DMA, 1341 W. Navajo Dr., Alabaster, AL 35007
Alaska: David Epstein, KL7LO, 245 W. 22nd Ave., Anchorage, AK 99503
Arizona: Erich J. Holzer, N7EH, 3526 E. March Pl., Tucson, AZ 85713
Arkansas: John B. Barnett, N5BPU, 801 Hall Dr., Little Rock, AR 72205
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Illinois: Robert J. Hajek, W9QBH, P.O. Box H, Riverside, IL 60546
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Massachusetts
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Western Massachusetts: Richard I. Goodman, WB1HIH, P.O. Box 591, Williamstown, MA 01267
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New York City & Long Island: Philip M. Cemiglia, WA2KKJ, 51 Barthold Ave., East Patchogue, NY 11772
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Ohio: Ralph A. McDonough, K8AN, Box 240, RD 2, Adena, OH 43901
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South Dakota: Roland L. Corey, W0YMB, 1010 7th St. W., Mobridge SD 57601
Tennessee: Mel Chandler, K4TKQ, Rte. 4, Box 312, Rockwood, TN 37854
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Utah: James R. Brown, NA7G, 865 Manchester Rd., Kaysville, UT 84037
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Virginia: John Parker, WB4UHC, 177 Ira Dr., Yorktown, VA 23692
Washington: Stephen Hart, K7SH, 1566 E. S.R. 4, Cathlamet, WA 98612
West Indies: Wilfredo Alvarez, NP4CF, Calle 15 Blk 15 #11, Sierra Bayamon, Bayamon, PR 00611
West Virginia: George Puzzuole, K8QEW, 3616 Morgan Dr., Weirton, WV 26062
Wisconsin: Gary D. Maples, W9OAK, 1006 Marquardt Rd., Wausau, WI 54401
Wyoming: James S. Anderson, W7TVK, 1120 Forest Dr., Casper, WY 82601
Canada
Alberta: E. Roy Ellis, VE6XC, P.O. Box 2, RR1, Ft. Saskatchewan, AB T8L 2NJ
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Manitoba: Richard B. Maguire, VE4HK, 588 Tremblay Ave., Winnipeg, MB R2J ON8
Maritime/Newfoundland: Donald R. Welling,* VE1WF, 36 Sherwood Dr., St. John, NB E2J 3H6
Ontario: Jack W. Strangleman, VE3GV, 512 Pinetree Dr., London, ON N6H 3N1
Quebec: Adrien Michaud, VE2DEA, 1630 St. Croix Blvd., Montreal, PQ H4L 3Z8
Saskatchewan: Percy A. Crosthwaite, VE5RP, RR 3, Saskatoon, SK S7K 3J6

*No appointed Section Emergency Coordinator; Section Manager listed.

50th ARRL November Sweepstakes Announcement

This year marks the 50th running of that ever-popular domestic contest, the November Sweepstakes. For many hams, the November bash is the one event they never miss. This year's SS is no exception because we're offering a barrage of awards for all operating levels. Whether you just want to get on and pass out a few hundred casual QSOs, like to hunt down multipliers or are out for blood, there's something for you. Take a look at the accompanying table to see the awards ripe for the plucking.

The rules for this year's SS are basically the same as last year's. Per ARRL Board of Directors' policy, 10-MHz operation is still not allowed for contest credit. Also note that the low-power category is now defined as 150-W output, which should accommodate most of the transmitters and transceivers currently on the market.

Official log sheets, summary sheets and dupe sheets are available from ARRL Hq. Send an s.a.s.e. with one unit of First Class postage for each five sheets requested. You'll need at least one summary sheet and one dupe sheet for each mode. Log sheets hold 100 QSOs each, so order accordingly. Mail early to have your forms in hand by contest time.

Logs must be postmarked by December 21 for both modes. Try to get your logs in as soon as possible, as late logs will be classified as checklogs. If you're concerned about your log's safe arrival, include a self-addressed, stamped postcard, which we'll return upon receipt of your entry. Club officers: Remember to read the club competition rules in January *QST* (page 85) and to send us a copy of your club roster by the log deadline.

Get on, and help us make the 50th SS an event to remember!

Suggested Frequencies

CW	*Novice*	*Phone*
1800-1810		1855-1865
3540-3610	3710	3850-3950
7040-7090	7110	7200-7250
14,040-14,080		14,200-14,275
21,040-21,090	21,110	21,300-21,400
28,040-28,090	28,110	28,550-28,650

Contest Period

	Starts	*Ends*
CW	Saturday, Nov. 5 2100 UTC	Monday, Nov. 7 0300 UTC
Phone	Saturday, Nov. 19 2100 UTC	Monday, Nov. 21 0300 UTC

Rules

1) **Object:** For stations in the United States and Canada (including territories and possessions) to exchange QSO information, as detailed in Rule 4, with as many other U.S. and Canadian stations as possible on 1.8 through 30 MHz, excluding 10 MHz.

2) **Contest Period:**

(A) **CW** — First full weekend in November.

(B) **Phone** — Third full weekend in November.

(C) **Time** — Begins 2100 UTC Saturday and ends 0300 UTC Monday. Operate no more than 24 of the 30 hours. Off periods may not be less than 30 minutes in length. Times off and on must be clearly noted in your log, and listening time counts as operating time.

3) **Categories:**

(A) *Single operator.* One person performs all transmitting, receiving, spotting and logging functions.

(B) *Multioperator.* Single transmitter only. Those obtaining any form of assistance such as relief operators, loggers or use of spotting nets.

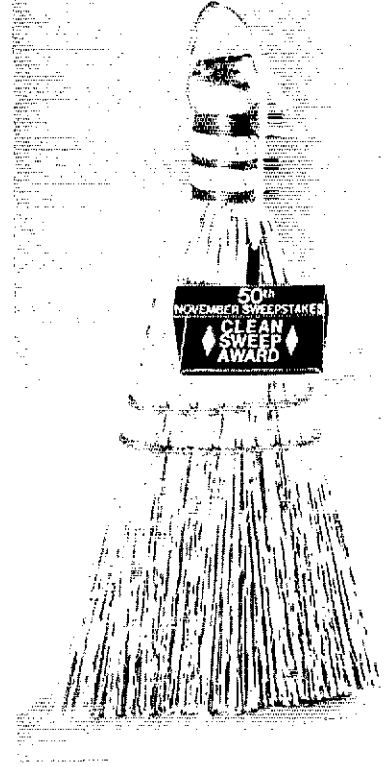
4) **Exchange:** A consecutive serial number, precedence ("A" if you run 150-W output or less, "B" if more than 150 W), your call sign, check (last two digits of the year you were first licensed), and your ARRL Section. For example, K4BAI answers W1AW's call by sending W1AW NR178 B K4BAI 54 GA for QSO number 178, more than 150 W, first licensed in 1954 and Georgia Section.

5) **Scoring:**

(A) *QSO points.* Count two points for each complete two-way QSO. No cross-mode contacts. Work each station only *once*, regardless of the frequency band.

Golden Anniversary Sweepstakes Awards

- Certificates for the top-scoring high-power single operator entrant in each ARRL Section.
- Certificates for the top-scoring low-power single operator entrant in each ARRL Section.
- Certificates for the top-scoring multioperator entrant in each ARRL Section.
- Endorsement stickers for the top-scoring high-power, low-power and multioperator station in each ARRL Division.
- Certificates for all entrants making at least 500 QSOs and 50 Sections, for at least 50,000 points.
- Certificates for all entrants making at least 200 QSOs, but not earning one of the other certificates.
- Endorsement stickers for any of the above certificates for entrants making a clean sweep.
- Clean-sweep whisk brooms for entrants working all 74 Sections on either mode. See photo caption for details.



For the 50th SS, we commissioned a not-so-famous artist to prepare a trinket that embodies the very essence of Sweepstakes. This limited-edition bauble, pictured here, will be available to a select few — those who make a clean sweep on either mode. These clean-sweep whisk brooms are sure to become collectors' items, and if you earn one, you'll be the envy of every ham on your block for years to come. To qualify for your very own, work all 74 Sections on either mode (limit one broom to a customer), and enclose $2 with your entry to help cover expenses.

(B) *Multiplier.* Each ARRL Section (listed on page 8 in this issue) plus VE8/VY1 — maximum of 74. KP4, KV4/KP2 and KG4 stations are in the West Indies Section, while KH6 and other U.S. possessions in the Pacific count as the Pacific Section.

(C) *Final score.* Multiply QSO points (two per QSO) by the number of ARRL Sections (plus VE8/VY1).

6) **Miscellaneous:**

(A) A transmitter used to contact one or more stations may not subsequently be used under any other call during the contest period (with the exception of family stations where more than one call is assigned by FCC/DOC).

(B) One operator may not use more than one call sign from any given location during the contest period.

(C) The use of two or more transmitters simultaneously is not allowed.

7) **Reporting:** Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL Hq. for an s.a.s.e. Official forms are recommended. Any entry claiming more than 200 QSOs must submit duplicate-checking sheets (check sheets). Incomplete or late entries will be classified as checklogs. Logs must include dates, QSO times, exchange sent/received, band and mode. Postmark your entry for either mode by December 21, 1983.

8) **Club Competition:** ARRL-affiliated clubs for club gavels and awards in the local, medium and unlimited categories as described in January 1982 *QST*, page 92.

9) **Awards:** Certificates to the top single operator cw and phone scorers in both the "A" and "B" categories in each ARRL Section, and the top multioperator entry in each ARRL Division.

10) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions as well as the intent of this announcement, the regulations of his licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications. See January 1983 *QST*, page 85.

Explanation of Exchange

	Number	*Precedence*	*Call*	*Check*	*Section*
Exchanges	Consecutive serial number	Power output more than 150 W	Send your station call	Last two digits of year first licensed	Your ARRL section
Sample	NR178	B	K4BAI	54	GA

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark J. Wilson,* AA2Z

OCTOBER

1-2

California QSO Party, Sept. *QST,* page 99.

Oregon QSO Party, Sept. *QST,* page 99.

VK/ZL/Oceania Contest, phone, Sept. *QST,* page 99.

Ohio QSO Party, sponsored by the FAROUT ARC, from 1700Z to 0500Z each day Oct. 1 and 2. Work stations once per band and mode. Work mobiles again as they change county. OH-to-OH QSOs okay. Exchange signal report and QTH (county for OH stations; state, province or country for others). Count two points per QSO. OH stations multiply by total states and OH counties worked. Others multiply OH QSO points by number of OH counties worked. All stations may claim 100 bonus points for working FAROUT club station WB8SMC. Mail entries within 30 days (include large s.a.s.e. for results) to Chuck Gelm, NC8Q, 2925 Wehrly Ave., Dayton, OH 45419.

4

West Coast Qualifying Run, 10-35 wpm, at 0400Z Oct. 5 (9 P.M. PDT Oct. 4). 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.

8-9

ARRL QSO Party, cw, Sept. *QST,* page 75.

VK/ZL/Oceania Contest, cw, Sept. *QST,* page 99.

World-Wide SSTV Contest, Sept. *QST,* page 99.

21/28 MHz Telephony Contest, Sept. *QST,* page 99.

11

W1AW Qualifying Run, 10-40 wpm, at 0200Z Oct. 12 (10 P.M. EDT Oct. 11). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Oct. 4 listing for more details.

15-16

ARRL Simulated Emergency Test, this issue, page 94.

Jamboree On The Air, Sept. *QST,* page 52.

Maryland-District of Columbia QSO Party, Sept. *QST,* page 100.

Worked All Y2 Contest, Sept. *QST,* page 100.

21 MHz CW Contest, Sept. *QST,* page 100.

Minnesota QSO Party, sponsored by the Paul Bunyan Wireless Assn., from 1800Z Oct. 15 until 2300Z Oct. 16. Work stations once per band and mode. No repeater QSOs. Exchange signal report and QTH (county for MN stations; state, province or country for others). Suggested frequencies: cw — 40 kHz up from low end; phone — 3.890 7.230 14.280 21.375 28.675; Novice — 25 kHz up from low end. Count one point for phone QSOs, two points for cw. MN stations multiply by number of states worked. Others multiply by total MN counties worked (max. 86). Add 100 bonus points for working 10 or more MN counties. Mail logs by Nov. 1 (include large s.a.s.e. for results) to Steve Scott, KCØUJ, 801 6th St., Staples, MN 56479.

RTTY DX Communications Sweepstakes, sponsored by the Canadian AR Teletype Group, from 0200Z Oct. 15 until 0200Z Oct. 17. Single ops operate 30 hours max. Multiops may use the entire period. 3.5, 7, 14, 21 and 28 MHz only. Single op, multiop-single transmitter and SWL categories. Exchange signal report, UTC and CARTG zone. Count two points for QSOs with your own zone. QSOs with other zones are awarded point values based on the CARTG zone chart (available from sponsor for s.a.s.e.). Multipliers are DXCC countries plus W/K, VE/VO and VK call districts. Stations may be worked on each band for QSO points, but only once for multiplier credit. Final score equals exchange points × multipliers × continents worked (max. 6). Add 200 bonus points to final score for each VE QSO. Mail logs by Jan. 1, 1984, to CARTG, 85 Fifeshire Rd., Willowdale, ON M2L 2G9, Canada.

22-23

ARRL QSO Party, phone, Sept. *QST,* page 75.

AC-DC Contest, sponsored by the Canadian Ladies' ARA, from 1800Z Oct. 22 until 1800Z Oct. 23. Each station may be worked twice (either on different modes or different bands). Non-CLARA members work CLARA members only. Exchange signal report, QTH and name. CLARA members indicate membership. Suggested frequencies: phone — 3.900 3.775 7.150 14.280 14.160 21.300 28.488 28.588; cw — 3.690 7.035 14.035 21.035 28.035. CLARA members count 1 point per non-CLARA-member QSO, 2 points for CLARA members and 3 points for bonus stations. Non-CLARA members count 2 points per CLARA-member QSO; 3 points for bonus stations. Cw QSOs count double. Multiply total QSO points by VE provinces/territories worked for final score. Mail logs by Dec. 15 to Muriel Foisy, VE3LQH, Box 122, Janetville, ON L0B 1K0, Canada.

Pennsylvania QSO Party, sponsored by the Nittany ARC, from 1600Z Oct. 22 until 0500Z Oct. 23 and 1300-2200Z Oct. 23. Work stations once per band and mode. Cw QSOs in the cw subbands only. No repeater QSOs. Work mobiles again as they change county. Entry categories: single op; mobile; multiop, single transmitter; multiop, multi-transmitter. Exchange signal report, serial number and QTH (county for PA stations; ARRL section for others). Stations on county lines count for multiple multipliers, but as one QSO. Suggested frequencies: phone — 3.890 7.280 14.280 21.380 28.580; cw — 40 kHz up from low end; Novice — 10 kHz up from low end; 160 — 1.810 cw and 1.835 phone at 0400Z. No WARC-band operation. Count 1 point per phone QSO, 1.5 points per cw QSO and 2 points per 160/80 cw QSO. PA stations multiply by number of ARRL sections, plus PA counties, plus DX (max. 1) worked (max. 142 multipliers). Others multiply by number of PA counties worked (max. 67). Mail logs by Nov. 25 (include large s.a.s.e. for results) to Douglas R. Maddox, W3HDH, 1187 S. Garner St., State College, PA 16801.

Fall QRP QSO Party, sponsored by QRP ARC International, from 1200Z Oct. 22 until 2400Z Oct. 23. Operate 24 hours maximum. Work stations once per band and mode. Exchange signal report and QTH (state, province or country). QRP ARCI members also

W1AW Schedule

October 30, 1983 — April 29, 1984 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000, 2100; Sn: 0300, 2100
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300: Sn: 0000
	Cw Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 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.
	Teleprinter Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CST	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 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.
	Teleprinter Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
PST	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 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.
	Teleprinter Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice and cw bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz.

Slow code practice is at 5, 7-1/2, 10, 13 and 15 wpm.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice texts are from *QST,* and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from July 1983 *QST,* pages 9 and 81" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 81.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2330 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America.

W1AW bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for cw on 145.840 MHz and ssb on 145.972 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII, and 100-baud AMTOR, FEC mode. Baudot, ASCII, and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

Cw bulletins are sent at 18 wpm.

W1AW is open for visitors Monday through Friday from 7:30 A.M. to 1 A.M. EST and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EST. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and cw on the half hour.

W1AW will be closed on November 24 and 25, December 25 and 26, January 1 and 2, February 20 and April 20.

*Assistant Communications Manager, ARRL

send membership number. Non-QRP ARCI members also send their power output. Suggested frequencies: cw — 1.810 3.560 7.040 14.060 21.060 28.060 50.360; phone — 3.985 7.285 14.285 21.385 28.885 50.385; Novice — 3.710 7.110 21.110 28.110. No WARC-band QSOs. Count 5 points per QRP ARCI-member QSO, 2 points per W/VE nonmember QSO and 4 points per DX nonmember QSO. Final score equals total QSO points × total states/provinces/countries worked per band × power output multiplier (4-5 W, X2; 3-4 W, X4; 2-3 W, X6; 1-2 W, X8; less than 1 W, X10) × bonus multiplier, if any (if 100%-natural power without storage, X2; if 100% battery power, X1.5). Logs must be received by Nov. 20. Mail to William Dickerson, WA2JOC, 230 Mill St., Danville, PA 17821.

YL Anniversary Party, cw, sponsored by the YLRL, from 1800Z Oct. 22 until 1800Z Oct. 23 (phone contest 1800Z Nov. 5 until 1800Z Nov. 6). YLs work YLs only. No crossband, net or repeater QSOs. Work stations once per contest. Exchange serial number, signal report and QTH (ARRL section or country). Count 1 point per QSO with stations located in an ARRL section, 2 points per QSO with stations not located in an ARRL section (i.e., "DX"). DX YLs count 2 points for all QSOs. Multiply QSO points by number of different ARRL sections and DX countries worked for final score. Entrants running less than 150 W on cw or 300 W on phone may multiply score by 1.25. Send separate entries for each contest by Nov. 16 (must be received by Dec. 17) to Rose Ellen Bills, N2RE, 17 Craig Pl., Pennsville, NJ 08070.

29-30

ARRL International EME Competition, Part 1, Sept. *QST*, page 100.

CQ World-Wide DX Contest, phone, sponsored by *CQ*, from 0000Z Oct. 29 until 2400Z Oct. 30 (cw contest 0000Z Nov. 26 until 0000Z Nov. 27). 1.8 through 30 MHz. Entry classes: single op, all band; single op, single band; single op, QRP; multiop, single transmitter; multiop, multi transmitter. QRP is defined as 5-W output or less. Multi-single: Only one transmitter and one band permitted during a 10-minute period. Exception: one — and only one — other band may be used during the same 10-minute period if — and only if — the station worked is a new multiplier. Stations found in violation of the 10-minute rule will be reclassified as multi-multi. Multi-multi stations are allowed one signal per band maximum. All transmitters must be located within a 500-meter-diameter circle, or within the limits of the licensee's address property, whichever is greater. All antennas must be physically connected to the transmitters by wires. Exchange signal report and *CQ* zone number. A station in a different zone or country than indicated by its call sign must sign portable. QSOs between stations on different continents count 3 points. QSOs between stations on the same continent but in different countries count 1 point. *Exception:* QSOs between North American stations in different countries count 2 points. QSOs with your own country count for multiplier credit, but not for QSO points. Multipliers: Count one multiplier for each different *CQ* zone worked per band (max. 40 per band). Count one multiplier for each different country worked per band (DXCC and WAE lists). Multiply QSO points from all bands operated by multipliers (zones plus countries) from all bands operated for final score. Single-band logs eligible for single-band awards only. Single ops must operate at least 12 hours (multiops, 24 hours) to be eligible for awards. Dupe sheets required for any band with more than 200 QSOs. Entry forms are available from the sponsor for an s.a.s.e., and all entrants are encouraged to send for a set. Each dupe removed by the *CQ* Contest Committee also carries a 3-QSO penalty. Phone logs must be postmarked by Dec. 1, 1983, and cw logs must be postmarked by Jan. 15, 1984. Mail phone logs to Larry Brockman, N6AR, 7164 Rock Ridge Terr., Canoga Park, CA 91307. Cw logs go to Bob Cox, K3EST, 6548 Spring Valley Dr., Alexandria, VA 22312. Logs may also go to *CQ*, 76 North Broadway, Hicksville, NY 11801.

30

W1AW Qualifying Run, 10-35 wpm, at 2400Z (7 P.M. EST) Oct. 30. See Oct. 11 listing for more details.

NOVEMBER

2

West Coast Qualifying Run, 10-35 wpm, at 0500Z Nov. 3 (9 P.M. PST Nov. 2). See Oct. 4 listing for more details.

5-6

ARRL November Sweepstakes, cw, this issue, page 96.

Corona 10-Meter RTTY Contest, May *QST*, page 82.

YL Anniversary Party, phone. See Oct. 22-23 listing.

International Police Association Contest, sponsored by the IPARC German Section, from 0600 to 1000 and 1400 to 1800Z each day, Nov. 5-6. Cw Nov. 5 and phone Nov. 6. Non-IPA stations work IPA members only. Exchange signal report and serial number. U.S. stations also send state. IPA members send IPA with exchange. Phone and cw contests are separate. Work stations once per band on each mode. Count 1 point per QSO with non-IPA members and 5 points per QSO with IPA members. Multiply by sum of IPA countries/states worked per band. Suggested frequencies: phone — 3.650 3.775 7.075 14.295 21.295 28.650; cw — 3.575 7.025 14.075 21.075 28.075. Mail entries by Dec. 31 to Anton Kohton, DK5JA, P.O. Box 40 01 63, D-4152 Kempen 1, West Germany.

9

W1AW Qualifying Run, 10-35 wpm, at 0300Z Nov. 10 (10 P.M. EST Nov. 9). See Oct. 11 listing for more details.

12-13

ARRL Midnight Special, from 0400-0600Z Nov. 13 (11 P.M. EST Nov. 12 until 1 A.M. EST Nov. 13). First hour, 160-m cw; second hour 160-m phone. Work stations once per mode. Suggested frequencies: cw — 1.805-1.820; phone — 1.855-1.875. Exchange power output and antenna type (G = ground plane; V = vertical; L = inverted L; D = dipole; I = inverted V; W = wire, long or otherwise; use your imagination for others). Score equals number of QSOs; no multiplier. Mail entries by Dec. 1 to ARRL Hq. Include s.a.s.e. for results; top scorers will be listed in *QST*.

European DX Contest, RTTY, July *QST*, page 86.

CQ WE Contest

Delaware QSO Party

Missouri QSO Party

North Carolina QSO Party

OMISS QSO Party

Rhode Island QSO Party

19

W1AW Qualifying Run

19-20

ARRL November Sweepstakes, phone, this issue, page 96.

26-27

ARRL International EME Competition, Part 2, Sept. *QST*, page 100.

CQ World-Wide DX Contest, cw. See Oct. 29-30 listing.

Rules, ARRL VHF/UHF Fall Sprints

We promised we wouldn't make you wait 'til next spring for another dose of Sprint Madness, and we weren't lyin'. Get ready; the next round of Sprints is almost here! The first annual Fall Sprints, this October and November, will provide an excellent opportunity to find those last few grid squares for VUCC, or to tune up for the January VHF Sweepstakes. Whatever your interests, get out a pencil and mark your calendar for a few evenings you don't want to miss.

The rules for the Fall Sprints are very much like those for the Spring Sprints. In response to comments received after the Spring events, we've shortened the time frame to 7 P.M. until 11 P.M. local time. Otherwise, the contest is still the popular one-band-per-evening format.

Remember: Each Sprint is separate, so you must use separate log and summary sheets for each band. Forms are available from ARRL Hq. for an s.a.s.e.

Rules

1) **Object:** To work as many amateur stations in as many different 2° × 1° grid squares as possible using authorized amateur frequencies on 50, 144, 220, 432 and 1296 MHz.

2) **Contest Period:** There is a separate contest for each band. Each runs from 7 P.M. until 11 P.M. *local time* as follows: Thursday, Nov. 10 - 1296 MHz; Wednesday, Nov. 16 - 432 MHz; Tuesday, Nov. 22 - 220 MHz; Monday, Nov. 28 - 144 MHz; Sunday, Dec. 11 - 50 MHz.

3) **Categories:** Single-operator only. One person performs all transmitting, receiving, spotting and logging functions.

4) **Exchange:** Grid-square locator (see Jan. 1983 *QST*, page 49). Example, W1AW in Newington, CT, would send FN31. Signal reports are optional.

5) **Scoring:** Count one point per valid QSO. Multiply QSO points by number of different grid squares worked for final score. Contests are separate; there is no accumulation of scores.

6) **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) For a valid QSO to occur, call signs and grid-square locators must be exchanged and acknowledged.

(B) A station may be worked for credit only once per band, regardless of mode.

(C) Crossband QSOs do not count.

(D) Stations are allowed only one transmitted signal at any given time.

(E) A transmitter used to contact one or more stations may not be used subsequently under any other call sign during the contest (except for family stations for which more than one call sign is assigned to one location by FCC/DOC — and then for family members only).

8) **Reporting:**

(A) Entries for each contest must be postmarked by Jan. 13, 1984.

(B) Contests are separate. Submit separate log and summary sheets for each contest entered.

(C) Logs *must* indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log each time worked. Dupe (cross-check) sheets must be included with entries of more than 100 QSOs.

(D) All entrants are strongly urged to use the official entry forms, available from ARRL Hq. for an s.a.s.e.

9) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions as well as the intent of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excessive duplicate QSOs and/or call sign/exchange errors. See January 1983 *QST*, page 85, for details.

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — SM/SEC: VE6XC. A/SM: VE6AMM. STM/DEC/NM (APSN & ATN): VE6ABC. The Int'l hamfest at Waterton went smoothly in spite of some wet and cool wx. World by scout jamboree held at Kananskis kept the CARA people busy with communications for about 17,000 Boy Scouts. Wx was also a factor at times. VE6ABC takes on another job, that of OBS. Still looking for volunteers for other leadership appts; give me a call. Traffic: VE6CHK 49, VE6ABC 26.

BRITISH COLUMBIA: SM, H. E. Savage, VE7FB — July saw us on the convention and hamfest trails. At Spokane, we met several from League Hq; from them and others we have gained much knowlege in our new role. Waterton, QCWA GAM, and Oliver we enjoyed meeting so many new and old friends. Sorry to write that our old friend VE7HW is very sick. He and VE7KC worked so hard on the QCWA GAM. Thanks to our net managers and their assistant managers for seeing that all net reports are waiting for us. BC Phone Net VE7QC NM, high 182, low 108, average 136, total 4249. BCEN, VE7BNI check-ins 298, QTC 407. VE7BNI wishes to make mention that we are not taking care to address many errors that were appearing during July causing extra work in delivery. Traffic: VE7BNI 192, VE7CDF 117, VE7EDM 109, VE7ZK 63, VE7CCJ 23. (June) VE7BNI 114, VE7CDF 113, VE7EDN 54, VE7FB 27, VE7ARR 26.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: AJE. STM: RO. SEC: HK. OO: FK. We regret the passing away of VE4TT. He was very active for many years. VE4JA is back home again after a stay in the hospital and is doing fine. The Duaphin Ukrainian Festival was again amply covered by VE4NUF. A lot of traffic was handled by local amateurs. MTN QNI 71, QTC 14, sess. 16. MMN QNI 529, QTC 38, sess. 31. WRIN QNI 245, QTC nil, sess 9. MEPN QNI 925, QTC 34, sess. 31. Traffic: VE4NUF 117, VE4ACX 60, VE4TE 34, VE4PG 27, VE4AAD 23, VE4JA 14, VE4CF 13, VE4NE 12, VE4BI 11, VE4ADS 9, VE4FK 7, VE4LN 6, VE4MG 6, VE4CR 4, VE4DT 4, VE4GB 2, VE4PA 2.

MARITIME/NEWFOUNDLAND: SM, D. R. Welling, VE1WF — ASM: VO1FG. There are several volunteer appointments open. If anyone is interested please contact me. Hospital: VE1GG and VE1BRD. Silent Keys: VE1BKA, VE1AKJ and VE1AGM. Repeater VE1DAR has changed freq to 147.75/147.15. New repeater VE1MAR in Halifax 147.87/147.27. Many visitors in area this year. Planning many trips this fall incl Nfld. If any of the clubs would like to have us come to a meeting, please let me know. VE1ASJ making many trips representing CRRL. APN: June 30 sessions, QTC 76, time 165 mins, QNI 136; July - 31 sessions, QTC 85,time 188 mins, QNI 153. Traffic: VE1WF 300, VE1BKM 32, VE1BXA 21, VE3BZB/1 17, VE1ALU 6, VE1BPM 3. (June) VE1WF 280, VE1BKM 69, VE1ALU 11, VE1BXA 11, VE1BPM 1.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3IBV. PGL: VE3AR. SEC: VE3GV. STM: VE3HTL. 146.46 being used as the local RTTY frequency in the Windsor area. VE3TOP (147.60/00), the Elliot Lake repeater, is back on the air after six months of repairs. CARTG's 23rd Annual RTTY DX "Communications" Sweepstakes is on this month. Dates are Oct. 15/0200Z to Oct. 17/0200Z. VE3WAW (146.34/94) in Wawa back on the air for a few months having only limited range. Improvements are planned over the next several months. New members of the Southern Ontario QCWA Chapter are VE3s NO APL EMJ SG AGC EFX and W4EEO. This chapter is gearing up for their 10th anniversary celebrations in May 1984. VE2TDH generating a heavy flow of traffic from Man and his World in Montreal, and VE3GOL and VE3HGJ have been keeping special tialson skeds to ease the flow. VE3YAK (147.75/15) in the Soo has a new decoder-control board for its autopatch. I had lots of fun operating XN3GT. Will have further details next month. VE3CYR enjoyed a summer vacation in the UK. Have you finalized your SET plans yet for later this month? Traffic: VE3GOL 338, VE3GT 242 VE3KK 151 VE3HGJ 103, VE3FGU 64, VE3BDM 61, VE3DPO 57, VE3KXB 49, VE3AJN 44, VE3GFN 43, VE3WG 40, VE3WV 34, VE3EWD 21, VE3MPF 21, VE3KCZ 18, VE3KLX 8, VE3BAJ 4. Late report — June 1983 VE3CYR 59.

QUEBEC: SM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2EDO. PIO: VE2YW. BM: VE2ALE. NMs: VE2EDO VE2FSA. Most of the code and theory classes have started, it looks like more candidates than ever have enlisted. VE2BLN is well on the road to recovery and reports on VE2TA. With regret I have to report VE2BAP and VE2FXV as Silent Keys. De la Mauricie un nouvel amateur handicape visuel, VE2GZB. Des communications professionelles fourni par des amateurs, les membres du club Sherham (Chers a moi), lors de la traversee a la nage du lac Memphremagog. Traffic: VE2EC 50, VE2BP 48, VE2EKC 23.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — STM: VE5HG. SEC: VE5RP. TC: VE5GF. NMs: VE5NJ VE5BAF VE5HG VE5OI VE5EX. Congrats to VE5CS and XYL on their 25th wedding anniversary and also to VE5AAD and bride on their recent wedding. The SARL ham-picnic at Manitou Beach was enjoyed by 123 hams and friends. Thanks to VE5IM VE5VJ VE5GG and everyone who contributed. VE5AAS was the winner of the major prize. VE5SZ and XYL along with VE5JS were prize winners at the Peace Garden hamfest. VE5BEX recently moved from Saskatoon to Regina. Net reports: SPN 28 sessions, 793 QNI, 21 QTC. PWXN 31 sessions, 436 QNI. RARA 2 31 sessions, 431 QNI. Traffic: VE5UX 31, VE5AAT 18, VE5BAF 17, VE5WM 6.

ATLANTIC DIVISION

DELAWARE: SCM, Harold K. Low, WA3WIY — STM: W3DKX. SEC: W3PQ. PSHR: WA3WIY K3JL W3DKX. Congrats to DARC, celebrating their 50th anniversary. Came to life in the basement of Jessie Lynch, meeting later in the Mullen Bld with W3DQ as pres. N3DIP is the PIO for Del. Please give him your help. DVARS has relocated the 146.955/355 repeater with an increase in power and coverage. They will have a SKYWARN net and be linked to NOAA. SARA new members W8QQH and Harry Becker. DTN: QNI 325 QTC 48 in 21 sessions. DEPN: June-QNI 52, QTC 12 in 4 sessions. DEPN: July-QNI 62, QTC 13 in 5 sessions. SEN: QNI 38, QTC 5 in 4 sessions. KARC: QNI 11 in 2 sessions. Traffic: W3QQ 94, WA3WIY 54, W3DKX 51, WB3DUG 41, K3JL 19, W2AGR 16, K3ZXP 13, WA3PWT 11, W3WD 8.

EASTERN PENNSYLVANIA: SM, Karl W. Pfeil, W3VA — ACC: KB3NE. SEC: WA3PZO. SGL: N3CJP. STM: KB3LF. DEC: AA3C K3QXC KB3LR KB3UD N3BFL N3CJP W3EEK.

Net	Freq.	Time	QNI	QTC	Sess.
EPAEPTN	3917	6 P.M. Dy	456	172	31
EPA	3610	7/10 P.M. Dy	437	168	62
PTTN	3610	6:30 P.M. Dy	157	52	29
PFN	3958	5 P.M. Dy	185	210	31

Local and VHF nets reporting (QNI/QTC/Sess.): D3ARESN 117/13/4; D5ESN 68/6/5; D6ARESN 36/4/4; Cumb. Co. ARSN 35/3/4; Luz Co. ARESN 60/8/8; PWA ARESN 78/1/5. OO reports: W3GTN W3KEK. OBS reports: K3EBZ KA3EJG W3AVJ W3CL W3VA. PSHR: KA3DLY KA3EJG KA3GJT KB3FW KB3UD N2BSK/3 N3COY W3VA WB3FKP. Congrats to K3NSN for making BPL. KA3GRS and N2BSK/3 upgraded to A. KA3KGT now KO3N. W3EEK passed FCC test for General Radiotelephone license; congrats. New appt.: WA3JRL now EC for Montour Co. Sorry to report KB3QW has resigned as DEC for D6. Many thanks for a job well done. KO3N now sporting a new triband beam. WB3KUZ now on RTTY. Nice to hear AG3R back on both CW nets. KA3EJG reports *Pocono Record* published interesting article on ham radio in a recent issue. WB3FYT has array F9FT yagi for 1296 MHz. W3AXA had a FB trip to UA1-2- and PY-land. W3HK reports a bout with Murphy. KA3IME will supervise a 10-week novice course at Cabrini College for MARC. Is your club interested in becoming a Special Service Club? If so, contact ACC KB3NE or this office for more details. KC3BP has several nice articles on traffic handling in MARC newsletter. Murgas ARC held a recent meeting at station of channel 44 TV. Susquehanna Co. ARC new ARRL affiliated club in EPA section; welcome aboard. The DL-ARC is starting a cw training net primarily for Novices on 28.150 MHz at 2000 hrs. KA3JMO is NCS. Also DL-ARC will sponsor "Out-of-State Award" Plaque in conjunction with the PA QSO Party. The EPA section annual picnic which was held at Tuscorora State Park was a great success. It was nice to see so many ARRL appointees and net members in attendance. Traffic: K3NSN 3468, KA3DLY 129, KB3FW 114, W3IPX 114, KB3UD 99, N3COY 96, AA3B 95, KA3GJT 82, WA3WOP 74, WB3KUZ 61, N3CD 54, WA3EHD 54, W3VA 49, W3DP 43, W3TWV 42, N3AIW 37, W3AQN 28, W3FAF 28, KA3EJG 27, KA3IME 25, WB3FKP 17, W3CL 16, WA3CKA 13, WB3CAI 12, N3AKQ 9, W3AVJ 8, W3AXA 7, N3BFL 7, K3QXC 6, N3CMC 3, K3EBZ 3. (June) KA3IME 8, N3BFL 6.

MARYLAND-DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — The new Washington DC EC is N3AQG. KA3DBN assumes the PIO job for MDC. See him for publicity help. KJ3E has decided to complete the 240 miles he has left on the Appalachian Trail. CU in October. W3CDQ is on the summer sked with a little DX thrown in! W3EOV is back from skindiving in the Fla Keys, and is recovering from major surgery thank you. N3BDW reports that AARC spawned 15 new Novices, congrats and standby for those new callsigns. Did I say KA3EWV snuck away for a mini vacation? WB3KJT did, and had a great signal back home. KA3R, our OO, is listening! W3IK wonders where he got all the time for work before he retired. K3NNI makes it big on the MSN, and on the other nets too. W3YVQ is trying to get counties not already covered to start a 2-meter or HF RACES net for statewide coverage. Contact W3YVQ or SEC WA3TAI if you can help. W3LDD has his code speed right up there. KC3Y is sometimes CW mobile at 55 MPH. Congrats to N3IT 1st class radio telegraph operator. This one you get only by demonstrated experience! KC3DW has more skeds than Carter has little liver pills! WB3BFK keeps fighting low frequency band conditions and is winning! KB3NL is busy on the farm. KC3AV with AARC support is interesting many in traffic handling — a FB job. WA4HVC is ex-WA3RDU and wants you guys to know that he is back to win contests! W3DQI combined his reports into one biggie! KC3D awaits the PVRC fowlfest! WB3GZU's summer months are his busy ones. Bulletins from FAR, GARC, SMARC, AARC, CARA and CARC. Thank you. Goddard says despite the fact I am a charter member, mention us! Yup, they do a darn good job without any help from me too. With the nets: Net/manager. Sessions/traffic/QNI average. WC 2-mtr/KC3DW 4/0/17; WR PON/WB3BFK 22/34/9; MDC PON/W3OYY 4/11/12.3; MSN/KC3AV 31/56/5.7. Traffic: WB3GZU 414, KC3DW 162, W3FA 115, K3NNI 111, KJ3E 96, KC3Y 77, W3YVQ 72, KC3AV 69, WB3KJT 48, W3DQI 38, KA3EWV 38, N3IT 24, WB3BFK 23, W3EOV 12, KC3D 4, W3LDD 4. (June) N3IT 13.

SOUTHERN NEW JERSEY: SM, Edward E. Wood, N2CER — STM: WA2HEB. SEC: K2NE. SGL: W2XQ. BM: WB2UVB. October marks that time of year for the annual Simulated Emergency Test (SET). This is the event in which local and state emergency management and American Red Cross organizations participate and will need and expect communications assistance from the Amateur Radio community through RACES, ARES and the NTS. Those of us who are traffic handlers are used to the workload generated by this type of exercise, but we can still gain additional experience and take the opportunity to operate under simulated emergency conditions. Those of us who have emergency power should use our generators and batteries, or if equipped for mobile operation, try to operate for a part of the time in that mode. Those of us who are not traffic handlers need not hesitate to sign in to a traffic net, even if you have never handled a formal message, your help will be greatly appreciated by your local and section net managers. Special net sessions will be held throughout the SET. For information about a net in your area, contact Section Traffic Manager WA2HEB. Traffic: WB2IQJ 133, WA2CUW 79, KC2PB 57, WA2HEB 52, N2CER 41, KY2T 22, WA4JRP 13.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH. STM: W2ZOJ. ACC: N2EH. BM: W2GLH. OO/RFI: W2AET. PIO: WA2PUU. SGL: KO2X. TC: K2QR. DEC: WA2AIV KA2BHR WB3CUF W2GJ/a WB2NAO. HAMFESTS: Elmira Sept. 24; Syracuse Oct. 1. PSHR: W2AET KA2BHR WA2FJJ WB2IDS WA2KOJ KB2KW W2MTA KU2N WB2OWO KC2QQ KC2SW W2ZOJ. Standby — HERE COMES SET promoting interface with both the world and the local area. OH, BY THE WAY — Orange Co. really isn't in this section, even though the ARRL Rules and Regs continue to say it is: BEWARE — all the issues from NORTHERN TEXAS "Section News" column should be chewed with caution! (Geraldine says, "Money isn't everything, Honey!") Anybody out there for "banana boat" swing MBA-RO indeed (see pg. 45 August *QST*).

Net	Freq.	Time/Dy	QNI	QSP	QND
NARASEN	75/15	0930/Sn	(ARES)		
NYS/1*	3677	1000/Dy	202	78	31
Mike Farad	3925	1300/M-S	123	15	26
NYPON*	3913	1700/Dy	453	262	31
NYSPTEN	3925	1800/Dy	560	65	31
ESS	3590	1800/Dy	314	45	29
OCTEN*	34/94	1830/Dy	412	58	30
Q Net	31/91	1830/Dy	---	---	---
STAR/E*	99/39	1830/Dy	24	6	12
WON/E*	04/64	1830/Dy	516	89	31
Blue Line	93/33	1900/Dy	647	23	30
NYS/4*	3677	1900/Dy	414	229	31
JCARCN	10/70	2000/Dy	552	22	28
OARC Net	25/85	2000/W	73	1	5
VHF THIN	04/64	2000/T	33	—	4
WNYECN	3955	2000/3Sn	(ARES)		
BRVRN	055/655	2100/Dy	297	24	29
CNYTN*	90/30	2115/Dy	395	58	31
STAR/L*	325/925	2130/Dy	43	16	17
WDN/L*	04/64	2130/Dy	620	110	31
NYS/5*	3677	2200/Dy	322	278	31

NTS. June NYS/1 163-80-30. WA2OEP reports PS Booth at Lewis Co. Fair again big hit with folks; signed up eight for Fall Novice class! K2IUT has tall Rohn w/CL-33 on top. K2UNY has old Rohn w/New Quad. W2MTA has lil pipe w/KLMs and is listening to OSCAR 10; Congrats AMSAT! Comms: K2QR and gang at Owego Y-athalon. New officers: ARATS' KA2HBO K2LRL WB2KGQ; GRAM-WA2ODD WB3JSU NA2O WA2AIV. Traffic: WA2FJJ 331, W2MTA 287, W2AET 278, WB2IDS 226, WB2RBA 180, WA2HSB 167, W2FR 158, WB2QIX 130, WB2OWO 124, WA2OEP 121, KC2SW 112, VE2FMQ 91, KA2BHR 73, KG2D 70, KB2KW 64, W2ZOJ 62, KU2N 52, WA2KOJ 48, KC2QQ 43, WB2NAO 40, KA2QIK 31, WA2RXO 31, KC2XD 23, N2ABA 15, KA2DQA 15, AF2K 15, N2CSB 12, WB2PID 9, K2IUT 8, KA2DBD 7, KA2HRS 6, K2VR 5, WA2AIV 4, N2DZD 1. (June) KU2N 68, W2HYM 20, N2ARD 18, K2RN 3.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3MSB — SEC: AB3Q. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3CEW. SGL: W3OKN. TC: W3FE.

Net	QNI	QTC	Sess.	kHz	T/D	NM
WPACW	337	145	31	3585	7:00P/D	WA3UNX
WPAPTN	501	90	31	3983	6:15P/D	N3ADU
WPA2MTN	427	59	31	148.28/88	8:00P/D	W3MML
NWPA2MTN	540	5	30	146.04/64	9:00P/D	WB3JDI

With deep regret I have two Silent Keys this month, W3KWG & KA3KBY. New Novices KA3KKD KA3KVU KA3LLH KA3LED KA3LBK KA3BLI KA3LIT. Upgrades General KA3DFK KA3JMU KA3JLQ KA3GGZ. Tech KA3IYR KA3KOF KA3IXX. Advanced WA3DBW KA3JOK KC3IU KC3IX. New calls KB3HO (was N3DBD), N3DLD (was KA3HSB). Breezeshooters new officers for 83/84: K3SDL, pres.; KA3ATQ, treas.; K3VSL, checker. Wind Gaugers W3OVM K3TOQ K3FIW WB3EHR W3UHM K3SJD. Congrats to KA3EGE and helpers who received a plaque from the Special Olympics Committee for their locality. If you can help the handicapped attain a license or aid in any way, you will feel a great deal of accomplishment and satisfaction with yourself. If you can give some time a couple of evenings a week to join one of the traffic nets, we can use you. The section is quite large in area and some areas have few operators, so if you are in one of them try to check in on either the CW or phone net. You would be welcome. We need OBS and OOs it doesn't take too much time and we need your help! Traffic: N3ADU 604, K3CR 177, AC3N 105, N3CKQ 99, WA3UNX 61, W3OKN 59, N3FM 58, K3NPW 57, K3SMB 53, WA3QNT 43, W3IQD 29, W3MML 28, W3RUL 21, WN3VAW 21, KI3C 20, K3HCT 20, KN3B 16, KB3NV 16, W3KUN 14, W3KMZ 13, WB3GUK 13, KA3COX 11, KA3HSV 9, W3NGO 9, K3TUA 9, KB3UO 9, W3TTN 8, K3NPX 7, N3KB 5, K3LTV 3, W3LOD 1. (June) WB3GUK 12. (May) WB3GUK 6.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT. ACC: WB9SFT. ASM: K9ORP.

Net	Freq.	Time (Z win)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	548	200	62
TN	3705	0100 Dy	214	71	30
LPN	3915	2230 Dy (x Sn)	607	94	31
NCPN	3915	1300 Dy (x Sn)	431	93	26
NCPN	7270	1815 Dy (x Sn)	141	28	26
EN	3940	1500 Sn	140	7	5
ARES	3915	2230 1&3 Sn	29	1	2

IL represented 97% to 9RN, stations: K9BVE CMO GMZ DEW SW MX W9INZ NXG KW9J N9TN WB9NVN. IL represented 100% to D9RN, stations: WB9NVN ODN BXB W9HOT NXG K9EHP AZS CMO KW9J KF4IW. D9RN represented 100% to CAND, IL stations: WB9WGD NVN W9NXG HOT. LAST CALL FOR THE 1983 IL ARES SEMINAR! As this writing goes to print in the October QST, it is the last column you read before the 2nd annual IL ARES SEMINAR in history. As has been said before, this event should be #1 priority for ECs and others interested in ARES and emergency communications. Please be sure to mark your calendar. If you are in need of a ride to Champaign, contact the nearest IL section cabinet member — calls are listed at the top of this column — for assistance in finding someone who is going from your area. Please note the following change in the address of the IL SM. Owing to USPS route restructuring it is now RR #1, Box 234, Makanda, 62958, even though I have not

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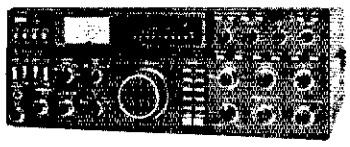

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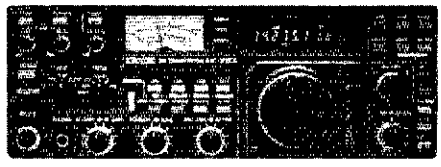

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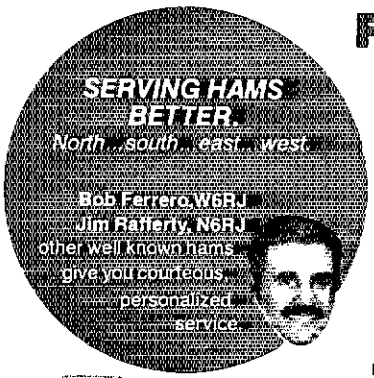

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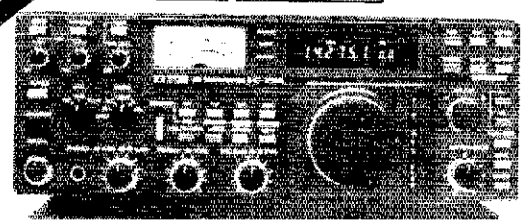

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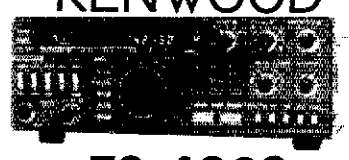

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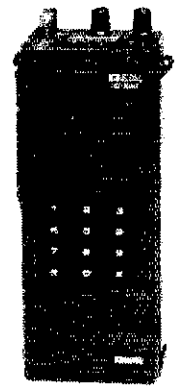

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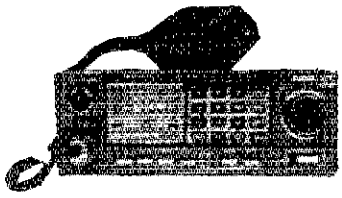

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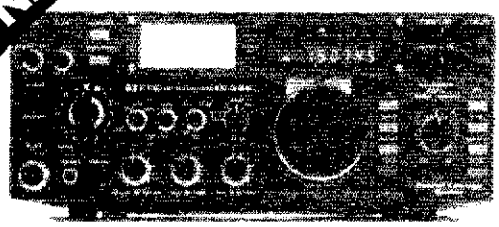

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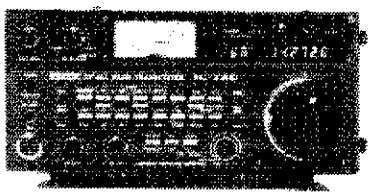

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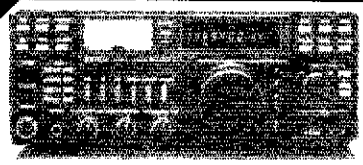

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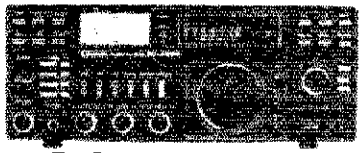

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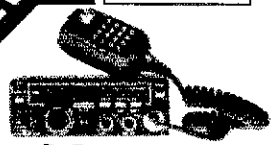

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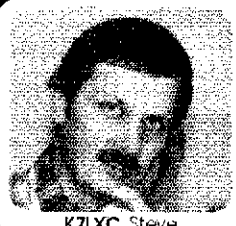

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moved. Please make a note of this so that you can send monthly reports and other correspondance to the right address and keep my mailman happy. As was reported last month, ITN NM KA9NWO has upgraded to Extra, the new call, KW9J, is now in hand. As can be seen from the growth in the heading of this column, we now have an ACC (Affiliated Club Coordinator) for ILI She is Sharon Harlan, WB9SFT of Rockford. WELCOME ABOARD! EC W9KPT (+SGL) reports that the Sangamon Co. ARES provided emergency communications for the City of Springfield for their "Lincolnfest" on July 2 & 3, and also for the Grand Prix street race sponsored by the Sangamon Co. Sports car club. W9HLX has sent word that the Taylorville repeater, formerly on 146.31/91, has been moved but is alive and well on 146.085/685. Owing to a change in job status K9CMO will no longer be able to be NM for ILN. While happy for the new job, we are sorry to lose such a fine manager. He will be replaced as ILN manager by KW9J, who whill in turn be replaced as ITN manager by K9QEW. Illinois will have an ARRL section phone net starting on October 1. Current plans are to meet at 6:30 A.M. daily on 3905 kHz. K9AZS will be the net manager. While there are a number of phone nets in Illinois, none are interested in being the ARRL section net. Also, none meet 7 days per week. The new net has been scheduled so as not to conflict with any of the existing independent nets, and it is hoped that all of our phone traffic ops will support the new net. 73 de WD9EBQ! Traffic: K9ZDN 517, W9NXG 222, WB9UEA 210, K9CMO 141, W9HOT 124, KW9J 122, W9OK 113, W9JIJ 86, W9KR 84, W9TLU 74, K9MX 48, W9HLX 38, K9EHP 32, K9QEW 31, KN9BAM 28, KD9K 26, WA9SHE 18, K9AZS 13, W9VEY/M 11, WA9RUM 10, K9SW 7, WD9CJB 7.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZOE. STM: W9JUJ, OO/RFI: KJ9G, SGL: WA9VQO. PIO: K9DIY. SDXC: N9MM. BM: KC9TA. SRC: N9WB. ACC: K9TUS. SCC: W9OBF. TC: WD9ADB. 8HC: WA9FUD. NMs: ITN-W9QYY; QIN-KJ9J; ICN-KA9CZD; VHF-W9PMT; IWN-N9BHT.

Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	1383	397	2101	93
QIN	3656	1430/0100/0400	797	385	2086	92
ICN	3708	2315	83	37	505	26
IWN	3910	1310	1866	—	465	31

IWN 2 mtr VHF Kokomo-Bloomington 2170 — 310+. Hoosier VHF nets: QNI 5373, QTC 305, QTR 7937, bulletins 64 for 27 nets. D9RN 100% QTC 401 in 1342 minutes. Stns W9JUJ W9URQ K9CGS KB9NR KJ9J. 9RN 100% QNI 394, QTC 483, QTR 1107 for 62 sessions. Stns N9AEI W9EI N9HZ KJ9J W9JUJ WA1QCF W9QLW WB9UYU K9WWJ W9XD. CAND 100% D9RN QTC 842 messages in 31 sessions. In stns W9URQ KB9NR W9JUJ. Appts: EC — WB9PXT WB9RLE WB9FNR WB9NCE. Public Information Assistant-N9CQS W9JKF KA9MQI. ORS — KW9C. OO — W9MM. Silent Keys: WD9HVS, Indianapolis; WA9TRT, Indianapolis; W9ZTZ Marion. I have now appointed Indiana's first three PIAs. Every club should have a PIA; let me know who it is. Congrats to W9JZV for being named Amateur of the Year by the Indiana Radio Club Council for his Novice training classes for Indianapolis Red Cross ARC and for his Official Bulletin Station duties for the Indianapolis Rptr Club. He is one of my favorite "old timers." When the LRPC first discussed the SM concept I thought it was a move to do away with the "Section News" and I oppose this. I was amazed to see the suggestion again come from an SM. I hope he doesn't run again; if so he should be defeated. If I were in his section I would gripe about the lack of information about his section. Congrats to all of the ARCs that have operated in the public interest at the festivals and county fairs this summer. I know bringing Amateur Radio to the public takes a lot of work. The Indianapolis Hamfest was a fantastic success this year. Thanks to all those who helped with and attended the Indiana Section State Convention, particularly WB9ZQE W9JUJ K9TUS K9DIY KC9TA N9WB W9OBF and WA9VQO. Traffic: W9JUJ 957, KJ9J 270, WB9UYU 184, W9QLW 155, W9URQ 146, W9EI 98, W9QYY 93, WD9DWD 82, W9UEM 81, N9HZ 81, WA9QCF 70, K9WWK 64, W9UMH 53, WD9HII 48, KB9HH 47, W9PMT 41, KO9F 37, KD9BE 33, KB9NR 29, WB9ZQE 27, W9IOH 26, W9JZV 25, AB9A 23, WB9AWI 23, KC9TA 23, KK9D 20, N9DHX 15, K9ET 15, KA9LAU 13, N9CQS 12, W9PRD 12, W9RTH 11, KW9C 10, KW9D 10, WB9MIK 10, WD9ART 8, WD9CIV 8, W9ZGC 8, WD9GET 7, WA9OKK 6, W9XD 6, KK9N 5, W9BDP 2, WA9JNC 2, WB9OZZ 2, K9SBW 2, W9UPI 2, KB9DE 1, KJ9G 1, WB9JUV 1, W9KMY 1, K9OUP 1, WB9TOW 1.

WISCONSIN: SM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1100Z QNI 1297, QTC 1489 W9YPY. BEN 3985 1700Z QNI 720, QTC 231 WB9ESM. WSBN 3985 2230Z QNI (873 June), QTC (277 June), QNI 830, QTC 348 K9ANV, WNN 3723 2300Z QNI 125, QTC 18 KA9HPQ. WIN-E 3662 0000Z QNI 304, QTC 131 W9YCV. WIN-L 3662 0300Z QNI 209, QTC 117 K9LGU. XPO 3925 1731Z QNI 249, QTC 14 WA9YVC. NWTN .34/.94 2330Z QNI 534, QTC 50 N9BDL. Gr. Bay .72/.12 (Thurs) 0145Z WB9NRK. WCWTN .31/.91 2330Z QNI 484, QTC 35 N9AUG. N9BDL. NM of NWTN. Last winter we were wishing it would warm up- now that we have had 90 degree wx now what are we saying??? Our condolences to K9ZZ, whose mom passed away in June. Sorry to report W9EWC & K9KNC as Silent Keys. KA9OIF has advanced, and son KA9OIE has General. KC9QT & N9CSF have Extras. KA9NVB is now KD9BF. XYL of W9SDH passed away; our condolences. KO9Q received endorsement sticker 250 mixed mode for DXCC. WA9OVU received endorsement sticker 136 phone for DXCC. Congrats to W9GU on being a licensed ham for 50 years. KM9W has DXCC certificate. New in Baraboo KA9QFM & KA9QFJ and in Lavalle KA9QFK. BPL to KA9CPA. Traffic: KA9CPA 2671, KC9KQ 266, W9CXY 225, WB9YPY 217, K9GDF 215, W9YCV 197, WA9WYS 149, W9IEM 144, W9CBE 143, W9UCL 133, W9DND 123, K9FHI 121, WD9FRI 119, K9SAO 102, K9AKG 94, W9LDO 87, N9BYK 81, KA9OBP 72, AG9G 68, WB9ICH 68, WB9ESM 62, N9AUG 60, W9SO 60, W9IHW 58, K9UTQ 53, KA9IKR 54, N9CRO 51, KA9HPQ 50, K9ANV 49, N9BCX 48, N9BDL 46, KA9BHL 45, K9BED 42, WB9JSW 36, KC9MX 34, W9FDY 32, K9JPS 32, KA9AFB 27, N9BGE 27, N9DCF 27, WA9YVC 27, WA9ZTY 25, WA9DXW 19, KA9NOT 19, W9UW 19, KV9U 13, KA9GYD 11, W9SFL 11, WD9BKT 9, KB9FM 8, KA9BHK 7, KA9NKQ 4. (June) K9GDF 81, KA9OBP 51, K9ANV 48, N9BYK 43, WD9IID 31, KG9B 20, N9DIJ 10, W9UW 6. (May) W9CXY 184.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — SEC: KAØARP. STM: KDØCI. Hello again! It was fun to see many of you at the Range Wide Hamfest on July 10th. As always, I missed visiting with a few. I hope to see more of you at the Park Rapids Hamfest on Oct 1st. On July 15th, WBØHOX announced the resignation of KNØJ as SEC. He

ICOM IC-745

A New Transceiver Worth Celebrating!

9 HAM BANDS!

GENERAL COVERAGE RECEIVER!

16 MEMORIES!

SCANNING!

PASSBAND TUNING!

VARIABLE NB & AGC!

What's the celebration about? The IC-745 . . . a new all ham band HF transceiver with SSB, AM, CW, RTTY and an FM option . . plus, a 100KHz — 30MHz general coverage receiver.

And . . . the IC-745 has a combination of features found on no other transceiver at such an incredibly low price.

Compare these exceptional features:

- 100KHz — 30mHz Receiver
- 16 Memories
- Full function Metering with a built in SWR Bridge
- IF Shift and Pass Band Tuning
- 10Hz / 100Hz / 1KHz Tuning Rates with 1MHz band steps
- Optional Internal AC Power Supply
- Adjustable Noise Blanker (width and level)
- Continuously Adjustable AGC with an OFF position
- Receiver Preamp
- 100% Transmit Duty Cycle

Other Standard Features:

- 100 Watt Output Transmitter with exceptionally low IMD
- VOX
- Speech Compressor
- Tunable Notch Filter
- RIT and XIT
- All Mode Squelch
- Scanning
- ICOM System Compatibility

Optional Accessories:

• IC-PS15	External Power Supply
• IC-PS35	Internal Power Supply for the ultimate in Portability
• IC-2KL	Linear Amplifier
• IC-SP3	External Speaker
• IC-MB12	Mobile Mounting Bracket
• IC-AT100	Antenna Tuner (100W)
• IC-AT500	Antenna Tuner (500W)
• IC-HP1	Headphones
• IC-EX241	Marker Module
• IC-EX242	FM Module
• IC-EX243	Electronic Keyer
• IC-FL52A	500Hz 455KHz CW Filter
• IC-FL45	500Hz 9MHz CW Filter
• IC-FL54	270Hz 9MHz CW Filter
• IC-FL53A	250Hz 455MHz CW Filter
• IC-FL44A	2.1KHz 455KHz SSB Filter
• IC-SM6	Desk Mic
• IC-HM12	Hand Mic

The IC-745 is the only transceiver today that has such features standard . . . the number of options and accessories available . . . and such a low price.

ICOM is ...*Simply the Best* in quality built ham equipment today. See the IC-745 at your local authorized ICOM dealer or contact ICOM for more information.

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The World System

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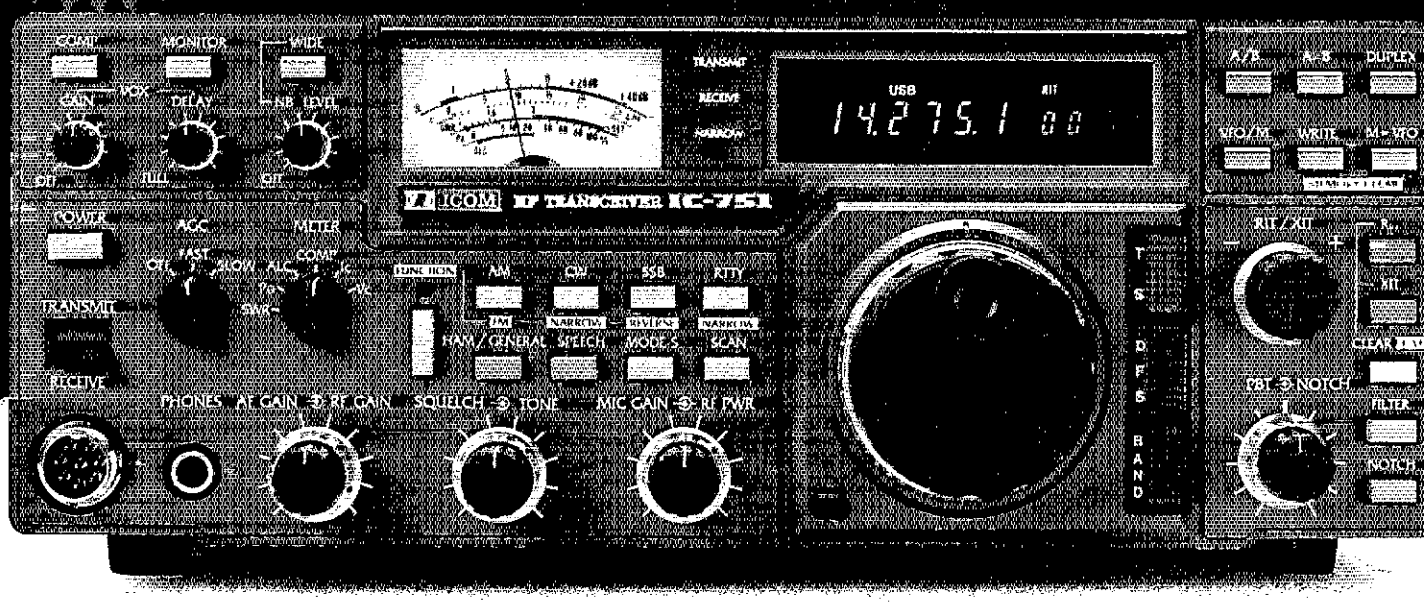
All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

ICOM 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

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The World System

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ICOM Handhelds

2 Meter, 220 or 440 MHz

attery ack	Nominal Transceiver Power (watts)
P2	1.0
P3	1.5
P5	2.3

C-DC1
DC Regulator
12 VDC in/9.6 out
(comes with DC
cord—will not get
power from BC30)

IC-BP2
Battery Pack
7.2 VDC 425 mAH
1.5 hr charge

IC-BP3†
Battery Pack
8.4VDC 250 mAH
15 hr. charge

IC-BP4*
Battery Case

Battery Pack
10.8 VDC, 425mAH
1.5 hr charge

IC-BC25U
AC Wall Charger
117 VAC in
(for charging
BP3 only)

IC-CP1
Cigarette Lighter
Cord w/Fuse
(charges BP3/powers DC1)

IC-ML1 12 VDC
144 MHz Booster
50W out/12 VDC
(comes with 5ft
coax,BNC to PL-259)

Requires BC 30 Charger
†Will charge from BC30, BC25U, CP1, or 12 VDC Direct (pack is internally regulated)
††Accept 6 AA size batteries - Alkaline or NiCd (Do not attempt to charge Alkaline batteries)

COM's reliable, field proven, andhelds have been the ost popular handheld on e market. Here's a few easons why:

he Transceivers. The IC-2AT eatures full coverage of the 2 eter ham band. The IC-3AT overs 220 to 224.99 MHz, and the IC-4AT has 440 to 449.995 MHz. Each radio is only 2.6in x 1.4in x 6.5in in size. Excellent audio quality is provided by a quality speaker and an electret condenser microphone. All have 1.5 watt output and battery saving 0.15 watt low power. Touch Tone™ pad is included (on "T" models).

Standard Equipment. Each transceiver comes complete — ready to use — with BP3 rechargeable battery, AC wall charger, flexible antenna, earphone, wrist strap, and belt clip...all standard.

The System. Accessories for the handheld series are interchangeable between transceivers. Slide in removable battery packs allow quick changing of batteries. Batteries may be charged when removed from the transceiver.

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"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

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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

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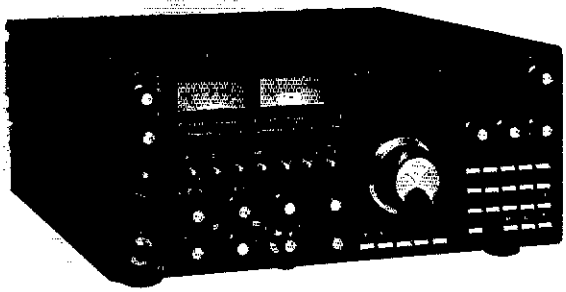
YAESU

HF FAMILIES



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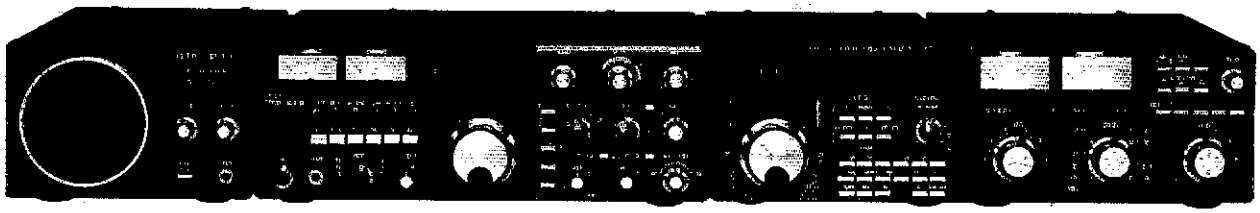
THE TOP OF THE LINE HF ALL MODE GENERAL COVERAGE TRANSCEIVER WITH COMMERCIAL-GRADE CONSTRUCTION, COMPETITION-GRADE DESIGN WITH UNEQUALLED RECEIVER FILTER PERFORMANCE.
TX: 100W 1.8–29.99 MHz
RX: 150 kHz–29.99 MHz

FT-980 CAT

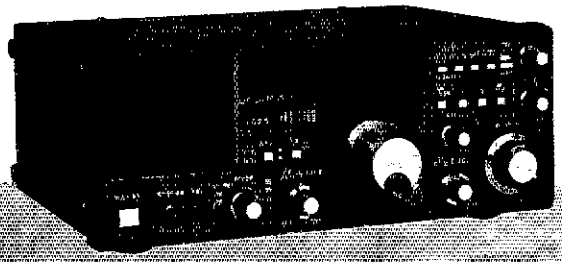
NEW HF ALL MODE TRANSCEIVER WITH GENERAL COVERAGE RECEIVER, 8-BIT MICROPROCESSOR CONTROL, AND INTRODUCING YAESU'S NEW COMPUTER-AIDED TRANSCEIVER SYSTEM FOR COMPLETE EXTERNAL COMPUTER CONTROL.
TX: 100W 9 bands
RX: 150 kHz–29.99 MHz



FT-102 LINE

Designed for wide dynamic range and clean transmitter output—to give you that extra competitive edge. Three 6146B's give power to spare, while the ultra-modern features give you total operating flexibility and control.

Simple, reliable and thrifty, the all solid-state rig that gives you everything you need for no-frills mobile HF, or base station with the optional FP-700 Power Supply.
100W: 9 bands, SSB and CW, w/FM optional



All mode synthesized general coverage receiver—perfect for serious shortwave listening. Options include 12-channel Memory Unit, VHF Converters, Antenna Tuner and an Active Antenna.

Specifications subject to change without notice or obligation.

V/UHF FAMILIES

FT-208R/708R

Feature-packed FM Handhelds that have proven their superior performance. Microprocessor control assures convenient operation while incorporating every worthwhile feature the serious operator needs.

FT-208R 2.5W/1W RF: 143.5–148.5 MHz

FT-708R 1W/200mW RF: 440–450 MHz

10 memories w/lithium backup
Full scanning features

FT-230R/730R

Compact FM mobiles engineered for reliability and convenience. The perfect balance of current drain and power output for all mobile needs. Built to withstand years of punishing mobile use.

FT-230R 25W RF: 143.5–148.5 MHz
FT-730R 10W RF: 440–450 MHz

FT-290R/690R/790R

All mode portables with full microprocessor control and all of the features needed for serious SSB, CW and FM field operation when powered by eight optional "C" cells. Options also available for mobile and base operation.

FT-690R 2.5/1W RF: 50–54 MHz
FT-290R 2.5W/1W RF: 143.5–148.5 MHz
FT-790R 1W/200 mW RF: 430–440 MHz

FT-480R/680R/780R

All mode base/mobiles with power and performance in all SSB, CW and FM applications. Optional matching FP-80A AC Power Supply makes the perfect base station.

FT-680R 10W RF: 50–54 MHz
FT-480R 10W RF: 143.5–148.5 MHz
FT-780R 10W RF: 430–440 MHz

YAESU

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YAESU Cincinnati Service Center, 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

Feel an *UltraPro*™

Introducing our new microprocessor-based HD-8999 *UltraPro* CW Keyboard... Better features and technology, for the build-it-yourself operator.

A major advance – the newest generation of "intelligent" CW Keyboards is now here! The *UltraPro* sends letter-perfect code, was 'human engineered' for maximum convenience, style and comfort – with specialized functions to improve your QSO productivity, typing skill and copy speed!

It's the most versatile concept in CW history! Assemble one yourself for real satisfaction – *and savings.*

EXCLUSIVE FEATURES

UltraPro combines the look of professional design with the sound and feel of a Morse computer. It's the only CW Keyboard with conveniences of the finest word/data processing terminals, like component-level diagnostics and 2-key rollover. A custom microprocessor makes setup fast, with all operations programmed by a few keystrokes. Send at 1-99 wpm, with ten weight and space settings, and enjoy automatic serial number generation, too! Up to ten variable-length message memories will hold a total of 495 characters, and can be selectively protected against erasure. CMOS RAM with battery backup and AC/DC power compatibility means you can use it anywhere.

MORE USER-FLEXIBILITY

A large four-digit LED display and three-color bargraph panel provide complete status update by indicating parameter values as they are set and change, input error, space remaining in the message memory and fullness of the 64-character type-ahead buffer. The *UltraPro* has twelve different code practice modes to increase your copy speed, including one that can improve your typing skill! Yet it's so easy to use, a 9-year-old Novice can sound like a pro in minutes. *UltraPro* CW. There's no better name for it. Or the feeling you get from using it.

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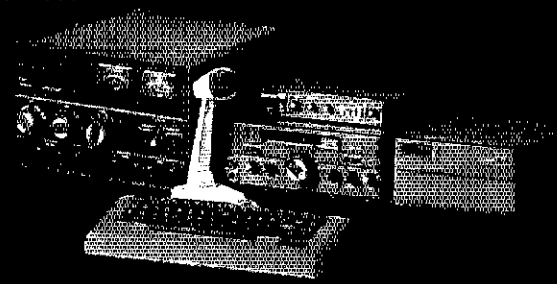

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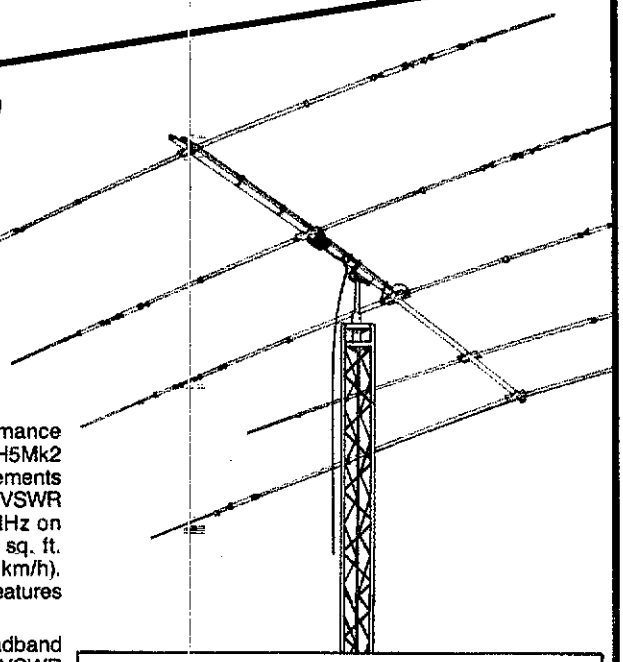
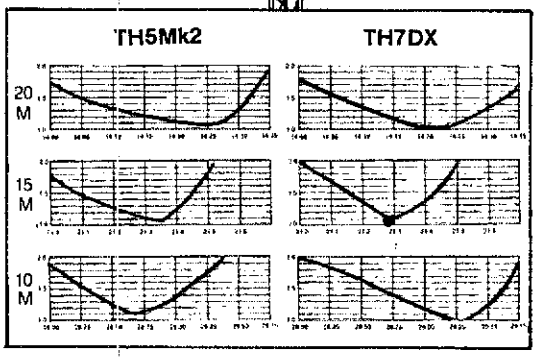
THUNDERBIRDS

NEW BROADBAND TRIBANDERS LOAD NEW AUTO-TUNE SOLID STATE RIGS



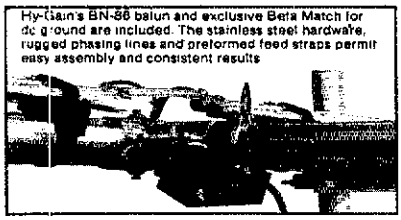
TH5Mk2 Now you can enjoy outstanding broadband antenna performance in a size to fit most city lots. With 5 elements on a 19 ft. (5.8 m) boom, the TH5Mk2 has 4 active elements on each band. Hy-Q traps and monoband parasitic elements achieve gain and front-to-back ratio comparable with stacked monobanders. VSWR is less than 2:1 over the 20 and 15 meterbands, and from 28.0 to 29.4 MHz on 10 meters. The TH5Mk2 weighs only 57 lbs. (25.8 kg). And with just 7.5 sq. ft. (.68 sq. m) surface area, wind-loading is 190 lbs. at 80 mph (86 kg-129 km/h). In addition, the TH5Mk2 offers the same solid construction and outstanding features as the TH7DX. See common features below.

TH7DX The new standard of comparison for high performance broadband tribanders. Using a dual driven 7 element system, the TH7DX maintains a VSWR of less than 2:1 on all bands including ALL of 10 meters. This computer aided design uses a unique combination of Hy-Q traps and inner-laced parasitic monoband elements. The result is gain and front-to-back numbers that add a whole new dimension to your station capability. Even with this amazing performance, the TH7DX boom is only 24 ft. (7.3 m) and the entire array is no bigger than the famous TH6DXX. Weight of the TH7DX is 75 lbs. (34 kg) with surface area of 9.4 sq. ft. (.87 sq. m) and wind-loading of 240 lbs. at 80 mph (108.9 kg-129 km/h).



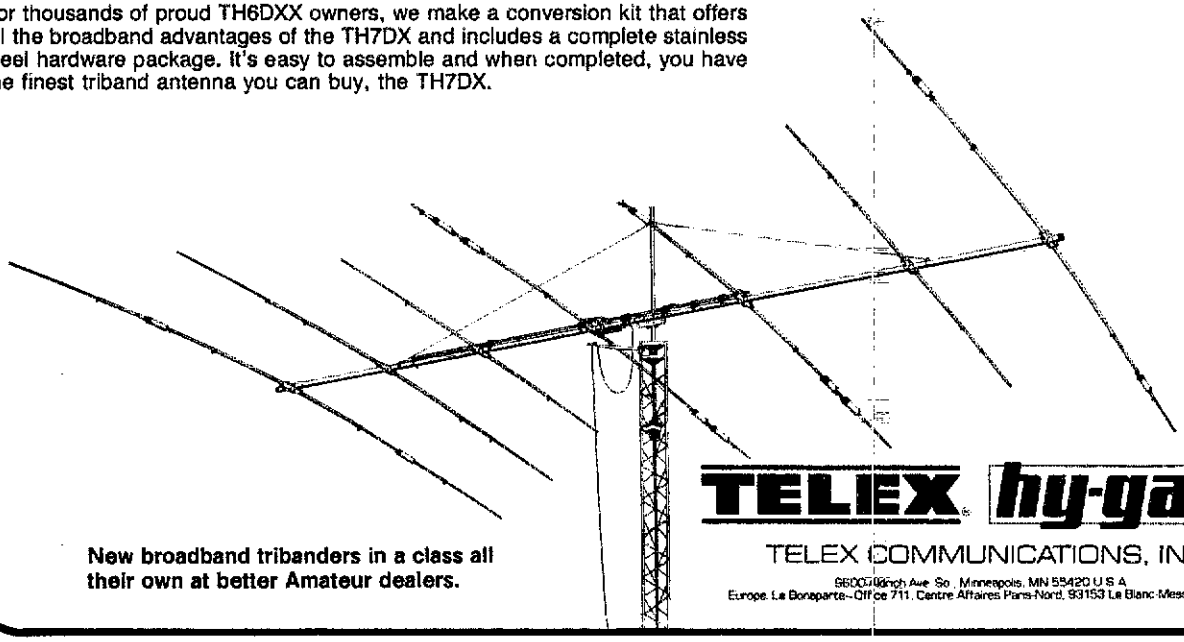
FEATURES COMMON TO TH5Mk2 AND TH7DX

- Broadband dual driven element system.
- Separate, highly efficient Hy-Q traps for each band handle maximum legal power with a 2:1 safety margin.
- Unique Beta Match assures efficient energy transfer.
- dc ground for lightning protection.
- BN-86, 50 ohm balun included.
- Performed feed straps.
- Stainless steel hardware and compression clamps for all electrical and most mechanical connections.
- Taper swaged 6063-T832 thick-wall aluminum tubing.
- Rugged die-cast aluminum boom-to-mast bracket.
- Twist and slip proof, die-formed heavy-gauge aluminum element-to-boom brackets.
- Packaged in two boxes suitable for UPS shipment.


Hy-Gain's BN-86 balun and exclusive Beta Match for dc ground are included. The stainless steel hardware, rugged phasing lines and preformed feed straps permit easy assembly and consistent results

CONVERT YOUR TH6DXX

For thousands of proud TH6DXX owners, we make a conversion kit that offers all the broadband advantages of the TH7DX and includes a complete stainless steel hardware package. It's easy to assemble and when completed, you have the finest triband antenna you can buy, the TH7DX.



New broadband tribanders in a class all their own at better Amateur dealers.

TELEX hy-gain

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte–Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France

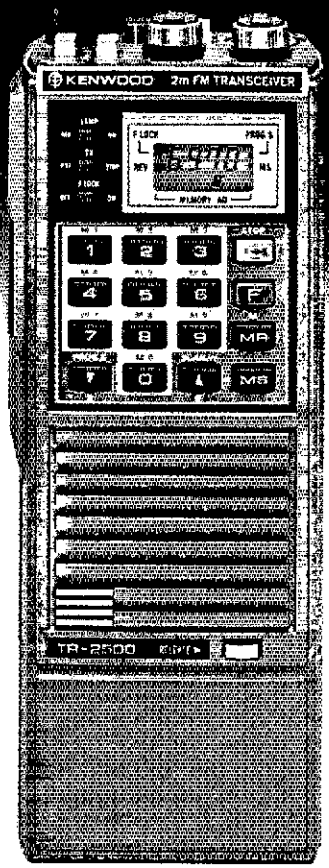
TR-2500

2m performance, small size, smaller price!

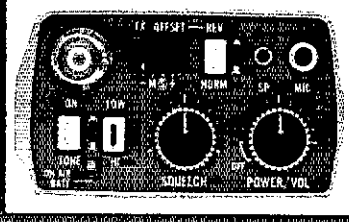
The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.

TR-2500 FEATURES:

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



CONVENIENT TOP CONTROLS



AC charger supply for operation while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

Optional accessories:

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

TR-3500

70 CM FM Handheld

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

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

TR-7950/7930

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

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

TR-7950/TR-7930 FEATURES:

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

Optional accessories:

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

KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

Digital DX-terity...

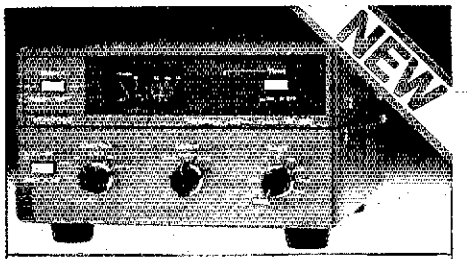
General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch...COMPACT!

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.

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... pacesetter in amateur radio

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

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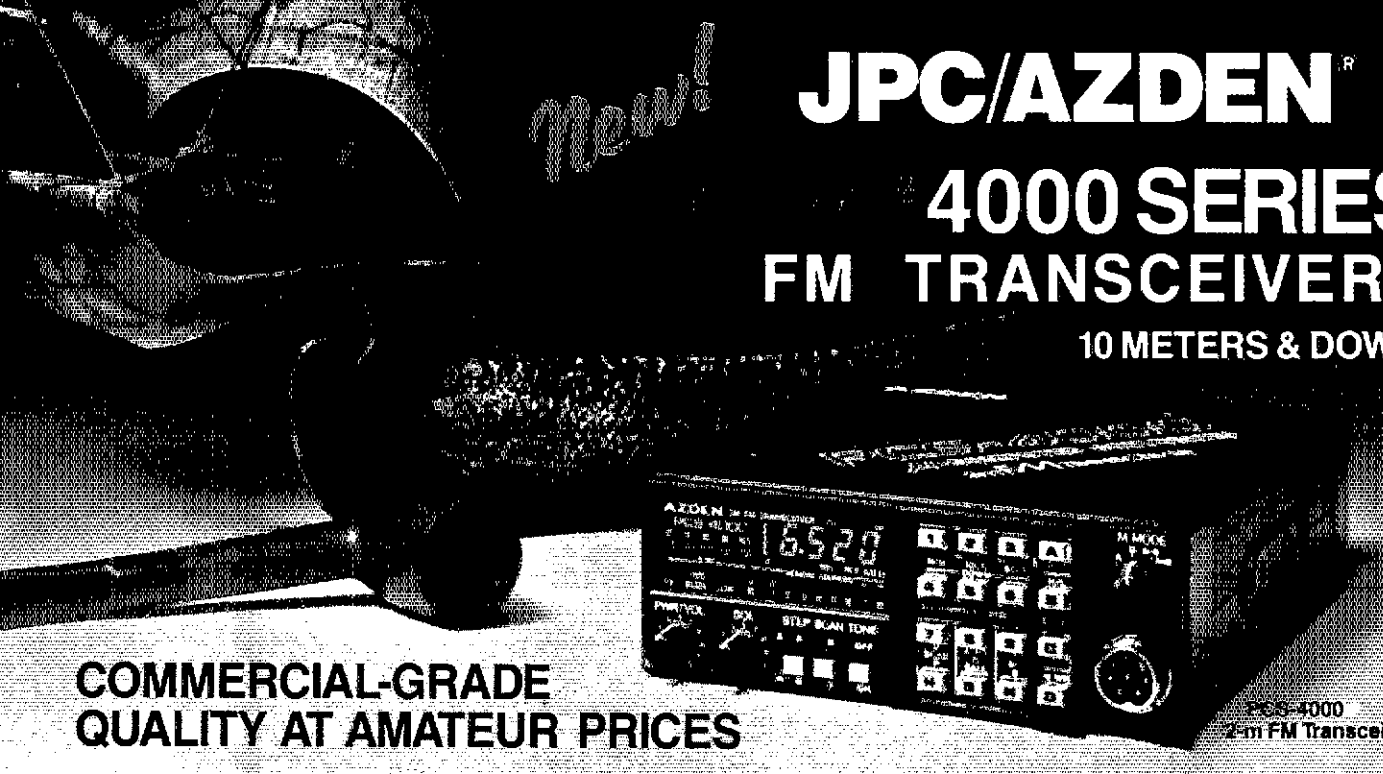
4000 SERIES
FM TRANSCEIVERS
10 METERS & DOWN

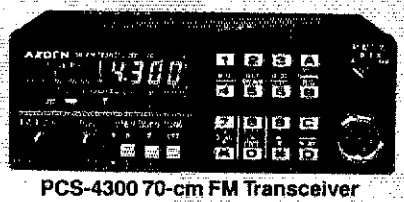


PCS-4000
2-m FM Transceiver

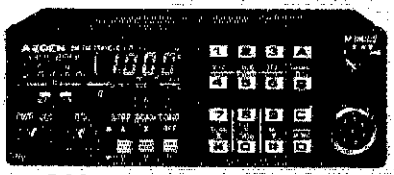
COMMERCIAL-GRADE QUALITY AT AMATEUR PRICES

EXCLUSIVE 1 YEAR LIMITED WARRANTY! *COMPARE!*

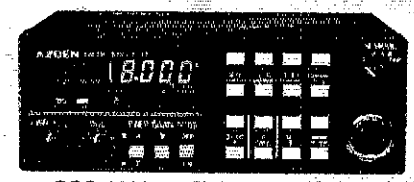
THE 4000 SERIES



PCS-4300 70-cm FM Transceiver



PCS-4500 6-m FM Transceiver



PCS-4800 10-m FM Transceiver

COMING SOON
PCS-4200 1¼-m FM Transceiver

PCS-300
2m Handheld
FM Transceiver
142-149.995 MHz

- **WIDE FREQUENCY COVERAGE:** PCS-4000 covers 142.000-149.995 MHz in selectable steps of 5 or 10 kHz. PCS-4200 covers 220.000-224.995 MHz in selectable steps of 5 or 20 kHz. PCS-4300 covers 440.000-449.995 MHz in selectable steps of 5 or 25 kHz. PCS-4500 covers 50.000-53.995 MHz in selectable steps of 5 or 10 kHz. PCS-4800 covers 28.000-29.990 MHz in selectable steps of 10 or 20 kHz.
- **CAP/MARS BUILT IN:** PCS-4000 includes coverage of CAP and MARS frequencies.
- **TINY SIZE:** Only 2"H × 5.5"W × 6.8"D. COMPARE!
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NONSTANDARD SPLITS:** Ultimate versatility. COMPARE!
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard simplex or plus/minus offsets. Standard offsets are 600 kHz for PCS-4000, 1.6 MHz for PCS-4200, 5 MHz for PCS-4300, 1 MHz for PCS-4500, and 100 KHz for PCS-4800.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. COMPARE!
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. COMPARE!
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 secorids on a busy channel; autoresume can be overridden if desired. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency, no matter what the offset.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative power output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting (except in PCS-4800).
- **PL TONE:** Optional PL tone unit allows access to private-line repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and audio fidelity.
- **HIGH/LOW POWER OUTPUT:** 25 or 5 watts selectable in PCS-4000; 10 or 1 watt selectable in PCS-4200, PCS-4300, PCS-4500, and PCS-4800. Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! COMPARE!
- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
- **ACCESSORIES:** CS-7R 7-amp ac power supply, CS-4.5R 4.5-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE YEAR LIMITED WARRANTY!**

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Food for thought.

Our new Universal Tone Encoder lends its versatility to all tastes. The menu includes all CTCSS, as well as Burst Tones, Touch Tones, and Test Tones. No counter or test equipment required to set frequency-just dial it in. While traveling, use it on your Amateur transceiver to access tone operated systems, or in your service van to check out your customers' repeaters; also, as a piece of test equipment to modulate your Service Monitor or signal generator. It can even operate off an internal nine volt battery, and is available for one day delivery, backed by our one year warranty.

- All tones in Group A and Group B are included.
- Output level flat to within 1.5db over entire range selected.
- Separate level adjust pots and output connections for each tone Group.
- Immune to RF
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak
- Instant start-up.
- Off position for no tone output.
- Reverse polarity protection built-in.

Group A

67.0 XZ	91.5 ZZ	118.8 2B	156.7 5A
71.9 XA	94.8 ZA	123.0 3Z	162.2 5B
74.4 WA	97.4 ZB	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

- Frequency accuracy, ± .1 Hz maximum - 40°C to + 85°C
- Frequencies to 250 Hz available on special order
- Continuous tone

Group B

TEST-TONES:	TOUCH-TONES:		BURST TONES:			
600	697	1209	1600	1850	2150	2400
1000	770	1336	1650	1900	2200	2450
1500	852	1477	1700	1950	2250	2500
2175	941	1633	1750	2000	2300	2550
2805			1800	2100	2350	

- Frequency accuracy, ± 1 Hz maximum - 40°C to + 85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

Model TE-64 **$79.95**

COMMUNICATIONS SPECIALISTS

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POWER UP!

DRAKE L7
2kW Linear Amplifier

• 2kW PEP, 1kW cw, RTTY, SSTV operation — all modes full-rated input, continuous duty cycle • 160-15* meter amateur band coverage, plus expanded ranges for any future hf band expansions or additions within FCC rules. These ranges also include increased coverage for MARS, embassy, government, or other such services. • The Drake L7 utilizes a pair of 3-500 Z triodes for rugged use, and lower replacement cost compared to equivalent ceramic types. • Accurate built-in rf watt-meter, with forward/reverse readings, is switch selected. Calibrated 300/3000 watt scales. • Temperature controlled two-speed fan is a high volume, low noise type and offers optimum cooling. • Adjustable exciter agc feedback circuitry permits drive power to be automatically controlled at proper levels to prevent peak clipping and cw overdrive. Front panel control. • Bypass switching is included for straight through, low power operation without having to turn off amplifier. • Bandpass tuned input circuitry for low distortion and 50 ohm input impedance. • Amplifier is comprised of two units — rf deck for desk top, and separate power supply. • Operates from 120/240 V-ac, 50/60 Hz primary line voltage. • Manufactured in U.S.A. •

*Export model includes coverage of the 10-meter Ham Band.

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FREE CRYSTAL FILTER and 30-DAY MONEY-BACK GUARANTEE

Just buy your Ten-Tec Corsair between Sept. 15, 1983 and Jan. 15, 1984. See your dealer for details.

CLEANLINESS...
a unique CORSAIR virtue

Cleanliness in the TEN-TEC CORSAIR means unusual spectral purity of both received and transmitted signals.

In Receive mode, even with the r.f. preamp in operation, the 3rd order intercept (at 20 kHz tone spacing) is +5 dBm. With the preamplifier off, the 3rd order intercept rises to a superlative +18 dBm and remains constant even at 3 to 6 kHz away from the pass-band.

In Transmit mode, if you look at the output of the CORSAIR on a spectrum analyzer, you note an almost complete absence of phase noise—a phenomenon which plagues most PLL transceivers. At 20 kHz from the carrier, the generated phase noise in the CORSAIR is a spectacular −148 dBc/Hz, and at 1 kHz it is −132 dBc/Hz.*

This breakthrough in circuit design, using proven crystal mixed oscillators with the latest USA solid state technology, is setting new standards of cleanliness and purity of signals. All of which means enhanced reception with less fatigue, lower noise floor, no overloading and more DX worked. And your signal will be a bit easier to read under adverse conditions. Compare.

Other virtues of the CORSAIR include:

• All solid state, broadband design • All 9 hf bands • Triple conversion receiver with 0.25 μV sensitivity on all bands and better than 90 dB dynamic range • Variable bandwidth plus Passband tuning • Dual range, Triple mode, Offset tuning • Variable Notch filter • Built-in Speech Processor • Built-in Noise Blanker • 200 W input, 100% duty cycle • Dual-speed QSK (full or semi) • Many operating conveniences including headphone attenuator, cw signal spotter, 5-function meter, WWV reception, adjustable ALC threshold lighted status indicators, selectable AGC, adjustable pitch and volume of sidetone, complete interfacing. • Full accessory line including remote VFO, keyers, microphones, power supplies, antenna tuners, ssb and cw filters. • Reliable American manufacture and service, fully warranted.

See CORSAIR at your TEN-TEC dealer, or write for full details.

TEN-TEC, Inc., Sevierville, TN 37862

**Specifications measured by independent laboratory*

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Whether you are *Honor Roll* bound or just beginning to collect QSL cards for the Worked All States award, you'll find the addresses you need quickly and easily in this new ARRL publication! It has 1090 pages of the addresses of U.S. Amateur Radio licensees listed alphabetically in callsign order. There is even a separate section covering club stations. You can't beat the price!

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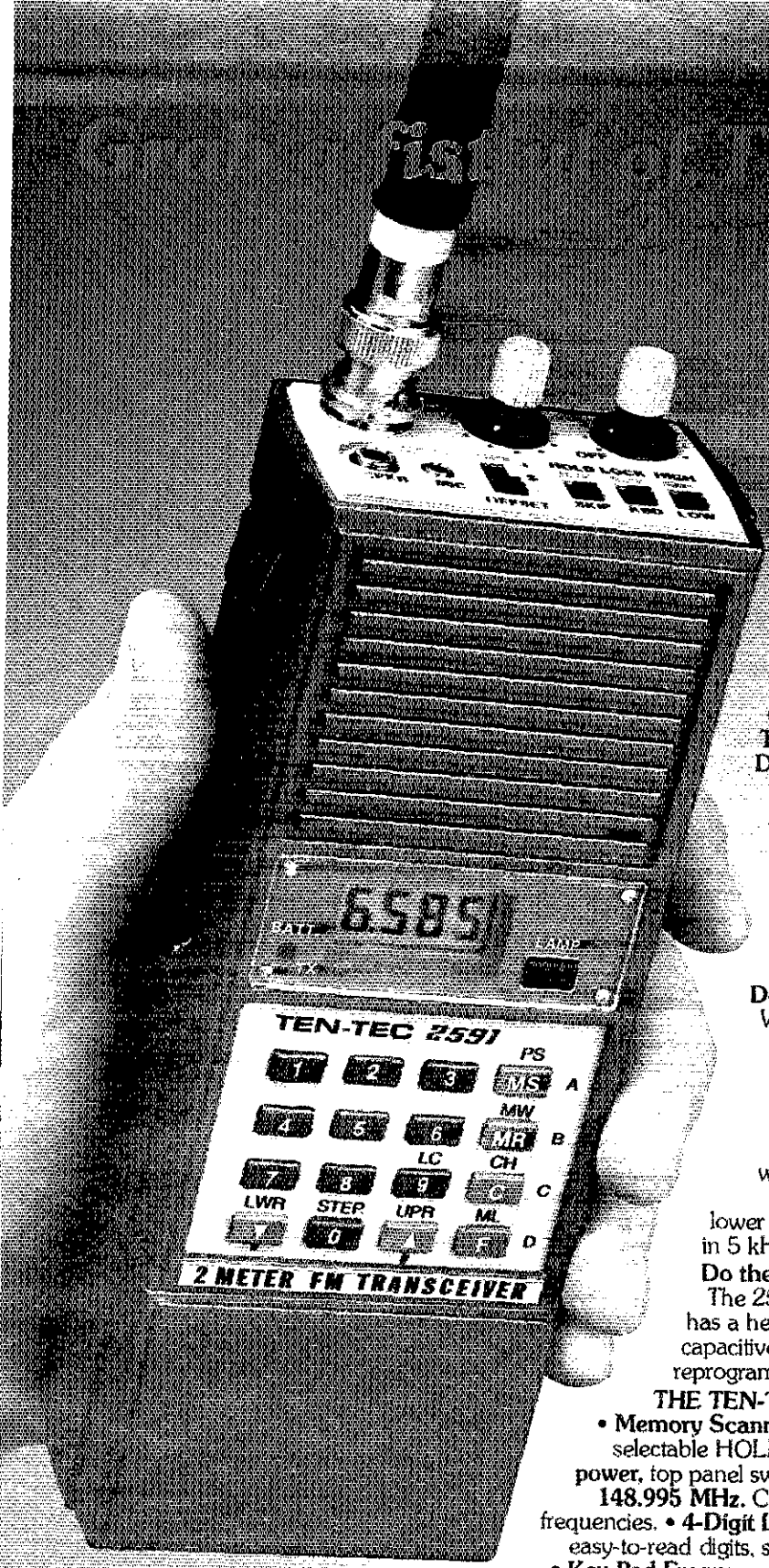


it has features never before available in one handheld, it's made in the USA and it's priced right!

COMPARE TENNESSEE TECHNOLOGY WITH THE OTHERS...

Do their handhelds have memory lockout?
Exclusive memory lockout on the TEN-TEC 2591 allows scanner to temporarily bypass channels for quick lockout of busy frequencies yet retain them in memory for normal operation on demand.

Do theirs store transmit offset?
The 10 memories of the 2591 allow stored offset for easiest operation. And memory channel 0 accepts any non-standard offset.

Do theirs offer selectable SKIP or HOLD?
When scanning with the 2591, choose HOLD to stop and stay on a busy frequency. Choose SKIP to stop for several seconds and continue.

Do theirs offer modifiable Band Scan without complete reprogramming?
With the 2591 you can scan any section of the band with user defined upper and lower limits in steps of 5, 10, 15, 25, or 30 kHz. Change step size, upper and lower limits independently. Manual Scan also, up or down, in 5 kHz steps.

Do theirs have Quick-Release NI-CAD Battery Pack?
The 2591 battery pack slides off easily, yet is secure in use, has a heavy duty 450 mAH rating at 8.4v, and the 2591 has capacitive memory retention to permit pack changing without reprogramming.

THE TEN-TEC 2591 HAS ALL THE RIGHT FEATURES...

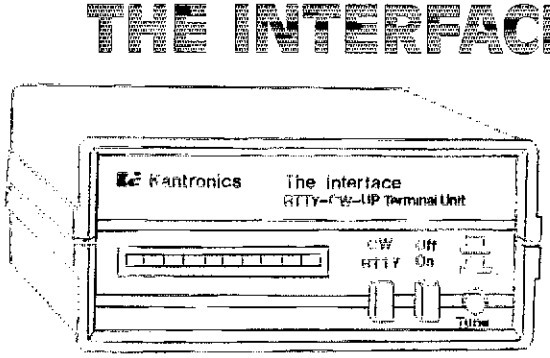
• **Memory Scanner scans only programmed channels** and has user selectable HOLD or SKIP • **Selectable 2.5 Watts or 300 Milliwatts power,** top panel switched • **Extended Frequency Coverage—143.5 to 148.995 MHz.** Covers full Amateur Band plus some CAP and MARS frequencies. • **4-Digit LCD Readout with Switchable Back Light** —large, easy-to-read digits, selectable for frequency or memory channel number. • **Key-Pad Frequency and Function Control** —16 key dual tone encoder • **Dual Function LED**—shows battery status and transmit mode. • **Electret Microphone** plus separate speaker for superior audio. • **Compact, Lightweight, Complete**—easy to handle and rugged. Standard equipment includes flexible antenna with BNC connector, AC charger, belt clip, connectors for mike and speaker. Options include: adaptor pack for +12 VDC mobile operation, speaker/mike, 25 watt power amplifier, leather case, desk charger, subaudible tone module, and spare NI-CAD pack.

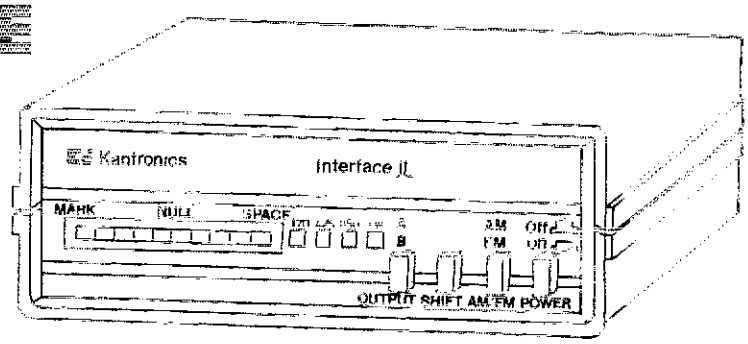
TEN-TEC

DESIGNED AND MANUFACTURED IN TENNESSEE and it carries the famous TEN-TEC 1 year warranty. See your dealer for the best in 2 meter FM—the TEN-TEC 2591. Or write for information to TEN-TEC, Inc., Sevierville, TN 37862.

Blueprint for Success

THE INTERFACE





THE INTERFACE II

Kantronics | TITLE: THE INTERFACE – INTERFACE II PROPOSAL

THE INTERFACE is the original Kantronics terminal unit that broke through the barrier of multi-computer compatibility. **THE INTERFACE** is an amateur modem for transceiver-to-computer communication. With **THE INTERFACE** and Hamsoft or Hamtext for your computer you can send and receive Morse Code, Radioteletype, and ASCII. **THE INTERFACE** is also compatible with our new software for AMTOR communication, AMTORSOFT. **THE INTERFACE** is our most popular unit combining active filtering, easy tuning, six-computer compatibility, and low price for an unbeatable package.

Suggested Retail $169.95

INTERFACE II is the new Kantronics transceiver-to-computer interface. **INTERFACE II** features a new highly sensitive front end with mark and space filtering and a unique new tuning system. Even the most discerning operator will be surprised with the **INTERFACE II's** ability to dig out signals in poor band conditions, and our new tuning system even displays signal fading.

X-Y scope outputs and dual interface outputs for VHF and HF connections make **INTERFACE II** compatible with almost any shack. All three standard shifts are selectable and **INTERFACE II** is compatible with the industry standard Kantronics programs: Hamsoft, Hamtext, and Amtorsoft. Step up to state of the art in computer-amateur communications with **INTERFACE II.**

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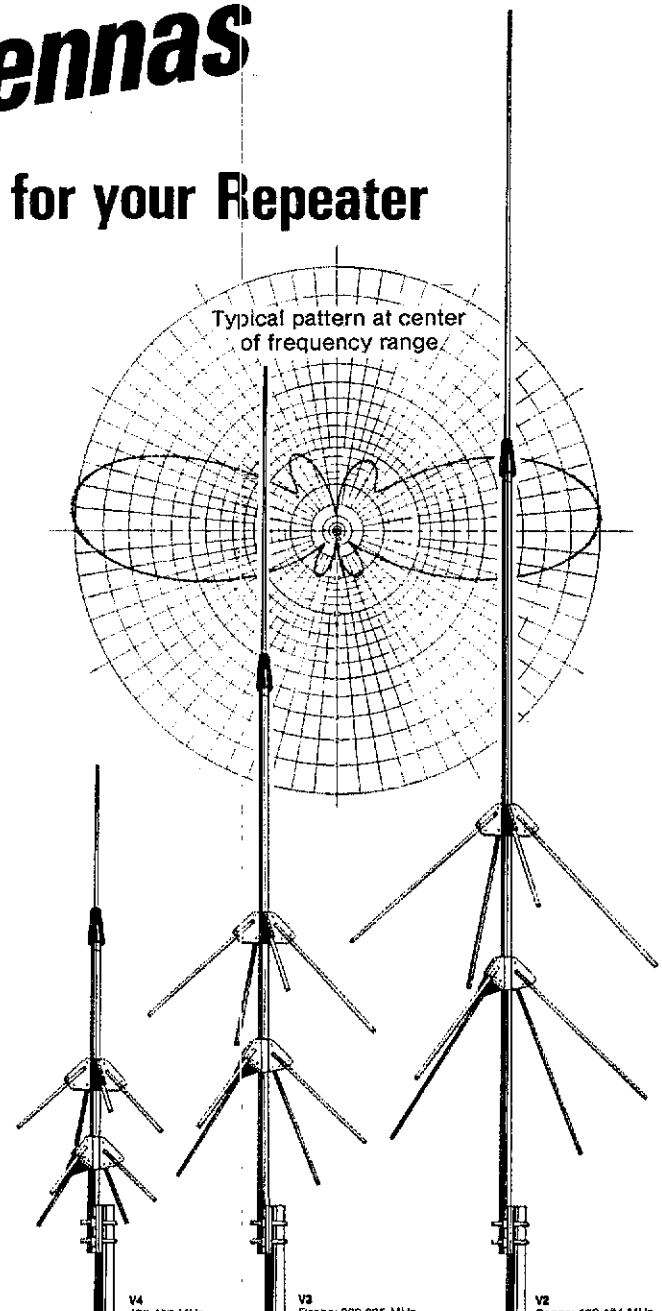
Hy-Gain V Series antennas focus the omnidirectional pattern evenly at the horizon, without high angle lobes or horizontally polarized content. By concentrating the power at the horizon you get cleaner transmissions over longer distances, improved communications in valleys and reduced picket fencing of the signal between tall structures. A Hy-Gain V antenna is like adding an amplifier and receiver pre amp. And, because antennas which "talk" louder, also "hear" better, a V Series antenna is also ideal for your home QTH.

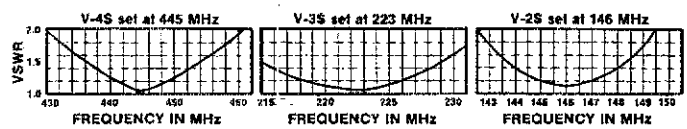
Extended double zepp V Series antennas consist of two stacked .64 wave vertical sections in phase. Two sets of 1/4 wave radials decouple the antenna from the mast and feed line so all RF goes into the antenna and is not radiated by the coax. The feed line connects through the lower section to the center matching coil. This not only provides weather protection for the connector (SO-239 connectors for V2, V3. Type N connector for V4) but also places the entire antenna at dc ground to reduce lightning hazard and QRN.

V Series antennas are easily assembled in one hour or less. Rugged and maintenance free, they're made of seamless, corrosion resistant 6063-T832 aluminum and all critical hardware is of passivated stainless steel. They'll withstand winds of 100 mph (160 km/h). V models accept mast diameters up to 2" (50 mm) so you can readily mount a V above your HF antenna.

Since a Hy-Gain V Series antenna costs only a fraction of a re-tuned landmobile antenna, you can now realize the *full* potential of your communications with the repeater or your home station, economically.

For unbiased information ask any of several thousand V2 users or read the product review in QST May '82 or Amateur Radio Profiles Vol. 2, No. 3.





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This booklet contains papers presented at the "Packet Radio" Conference held in San Francisco during March, 1983.

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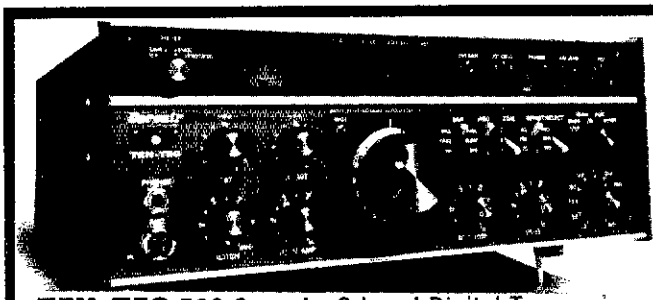

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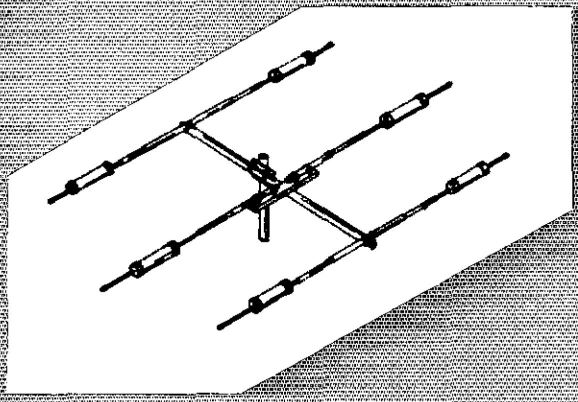

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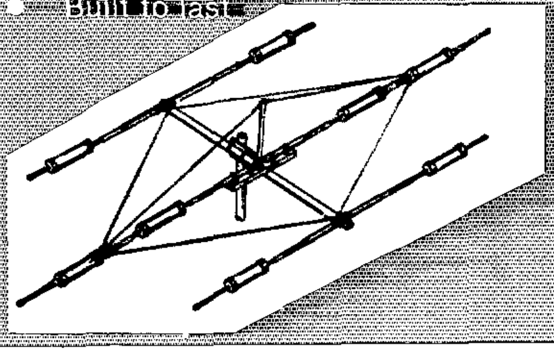

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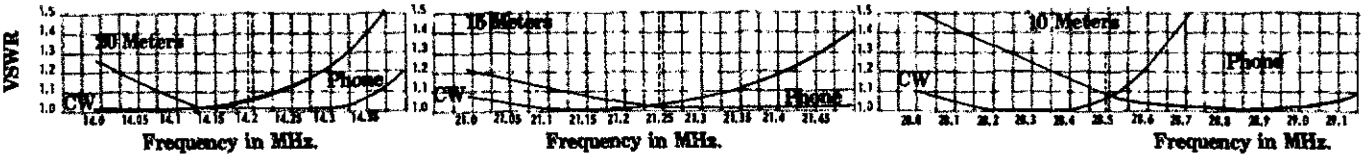

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Front to Back Ratio		
Power rating	CW	1 KW
	SSB	2 KW P.E.P.
Feed point Impedance		52 ohm
VSWR at Resonance		1.5 to 1 or better
Matching System		Mosley
Number of Elements		3
Longest Element		28'
Boom Length		14'
Mast Size		1¼" to 2"
Turning Radius		15.6'
Wind surface area (in sq. ft.)		
Wind load (EIA standard 80 mph)		114 lbs.
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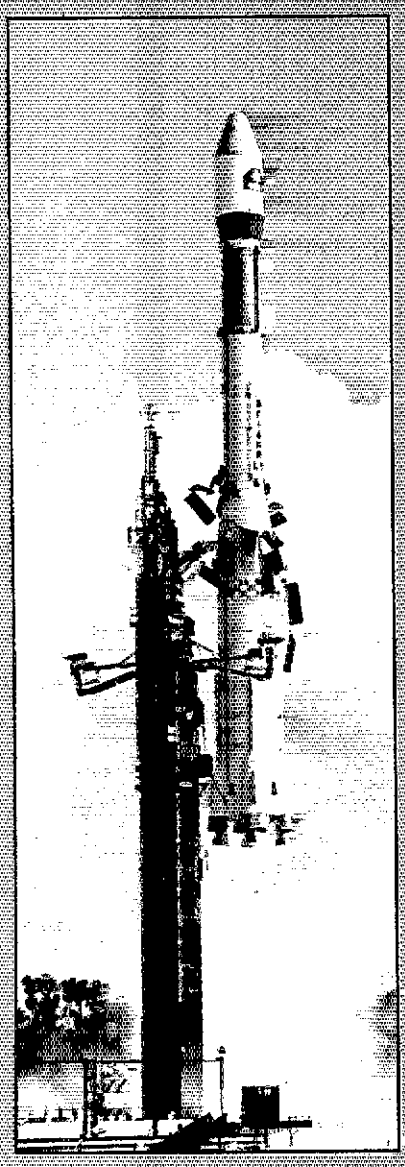

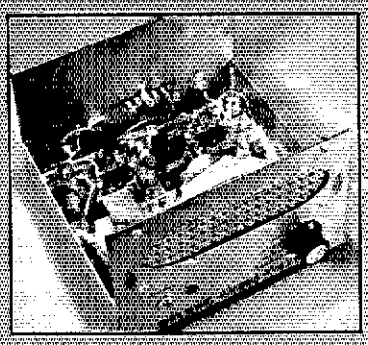

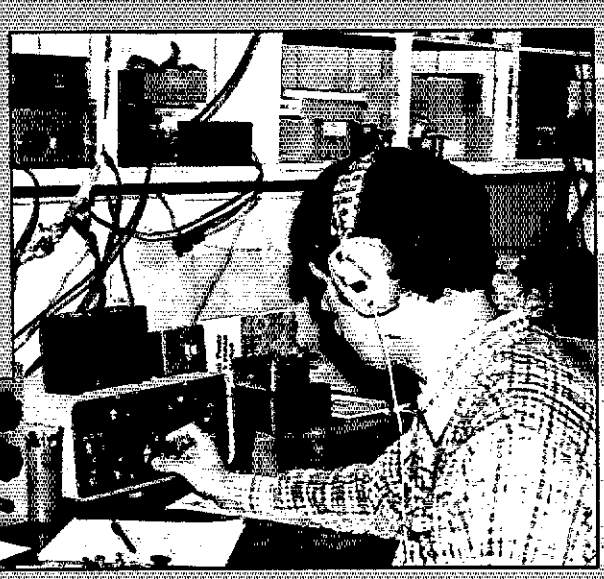

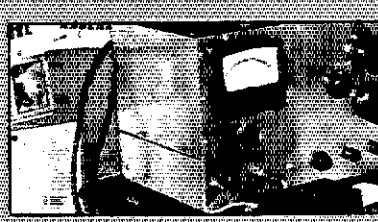

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has been very busy this year, and we will miss hearing him on the air. KAØARP has been named as the new SEC, and has quite a background in public service including ARES. He will be a welcome addition to our structure. We wish him all the best in his assignment. Sidelights: Congrats to ADØS who recently became pres. of the North Am. Chapter of IARS. Once again, the Paul Bunyan Wireless Assn. is sponsoring this year's Minn. QSO Party. It will run from 1800Z Oct. 15th to 2300Z Oct. 16th. For more info, contact KCØUJ. A reminder that the annual SET is coming up in Oct. Let's make this one our best ever! Net news: asst. net mgrs. have been named for both MSPN nets. KAØJUX will be assisted by WBØJUL on the Noon net, and KCØT will be KCØUJ's assistant on the Evening net. We hope to work this program of asst. net mgrs into the CW nets soon. Welcome to new Novices: KAØQGC KAØQGD KAØQGE KAØQKT KAØQNK KAØQPK KAØQVC KAØQXB KAØQXC KAØRCX KAØREW. Recent upgrades include: Novice to Tech-KAØOGF; Novice to General-KAØJSW KAØNQJ KAØODQ KAØPEQ; Tech to Advanced-NØCPS; General to Advanced: WDØBZU NØCXP KDØHH KAØHJR WØIPY; Advanced to Extra-KØYST. Congrats to you all! Several clubs have reported to me on the recent Field Day activities including the St. Paul RC, the Paul Bunyan Wireless Assn. and the New Ulm ARC. I hope to hear from more clubs in the state on this and other activities as well. It shows our section is alive and well! In closing, I regret to report that WØCO, originally licensed in 1913 as 1AE is now a Silent Key. Our sympathies to his family. Also, I'm hopeful that by the time you read this, W9DM and WBØYSQ will be back on the air with us. Both gentlemen are presently in the hospital. We wish them good health and a speedy recovery. I hope that everyone survives the very hot summer we are having, the cool — then the cold — will be with us soon.

Nets	Freq.	Time	QNI	QTC	Sess.
MSN/1	3685	6:30 P	---	---	---
MSN/2	3685	10:00 P	270	58	31
MSSN	3710	7:00 P	215	12	28
MSPN/N	3945	12:05 P	702	189	31
MSPN/E	3929	5:30 P	1010	277	31
MNAMVXNT	3929	6:15 P	---	---	---
PICONET	3925	DAILY	2769	229	26

Traffic: KT9I 627, KBØMB 556, WAØTFC 492, KAØCIR 358, KTØU 273, KAØEPY 248, NØCLS 180, WØHZU 164, KAØARP 142, W9DM 127, KDØCI 83, WØMFW 82, KAØJUX 69, KCØUJ 62, NØJP 47, WØGRW 46, WØRIQ 35, WBØHOX 25, KTØR 22, KØOGI 10, KYØX 10, KN9U 8, KBØWV 5, KAØODJ 4, KXØV 3.

NORTH DAKOTA: SM, Dean R. Summers, KQØC — KØQQ has accepted SGL position. RRR Flyer looks really nice; KSØG is using new word processor. WBØFDY has new TS430S. KØTYY is now at Catholic University in Washington, D.C. for post-grad work. NØBXQ is new Forx newsletter editor. New QTHs NØDDS & KAØNUD. Most clubs have past over summer picnic with good turnout. Remember that after Novice classes this winter the written test can be administered immediately following the code portion. Use FCC Public Notice 1035A. Correction: NØEKB put up a nice rptr in Beulah on 7.69/09. Net reports received from NØAFP KAØFSM & WØOSP. DATA net 104 QNI, 20 QTC.

DATA	3.9965 MHz Dy	2330Z	KAØFSM
Goose River	1.990 MHz	1400Z	WØCDO

SOUTH DAKOTA: SM, Fredric Stephan, KCØCQ — SEC: WØYMB. STM: WØKJZ. SGL: NØØD. TC: KØAS. ACC: WBØPWA. Public service is what it is all about. We owe our knowledge and assistance to others as well as to our fellow amateurs. While this is supposed to be a fun hobby, at the same time we have a legal and moral obligation to be very strongly involved in public service. With that in mind, please don't forget to participate in the SET activities this month, on both your local and section levels. S Dak section manager's public service awards of one years' paid up ARRL membership have this time been awarded to WØJHZ and NØCFS. Congrats and keep up the fine example. NTS TEN and DTEN liaison stations were WØKJZ KØFRE WBØSUM and KCØOO. PSHR: WØKJZ NØCFS KCØOO. S.D. CW net 58 QTC; SD Traffic Info Net 36 QTC; SD Evening Emergency Net 34 QTC; SD Sun Mng Emg Net 11 QTC. Traffic: WØKJZ 111, KØFRE 69, WØDVB 64, KCØOO 52, NØCFS 51, WØYMB 25, W7UDB 23, WBØOMF 22, WBØSUM 11, WBØLTV 9, WAØBZD 5, NØCDX 3, WØURQ 2.

DELTA DIVISION

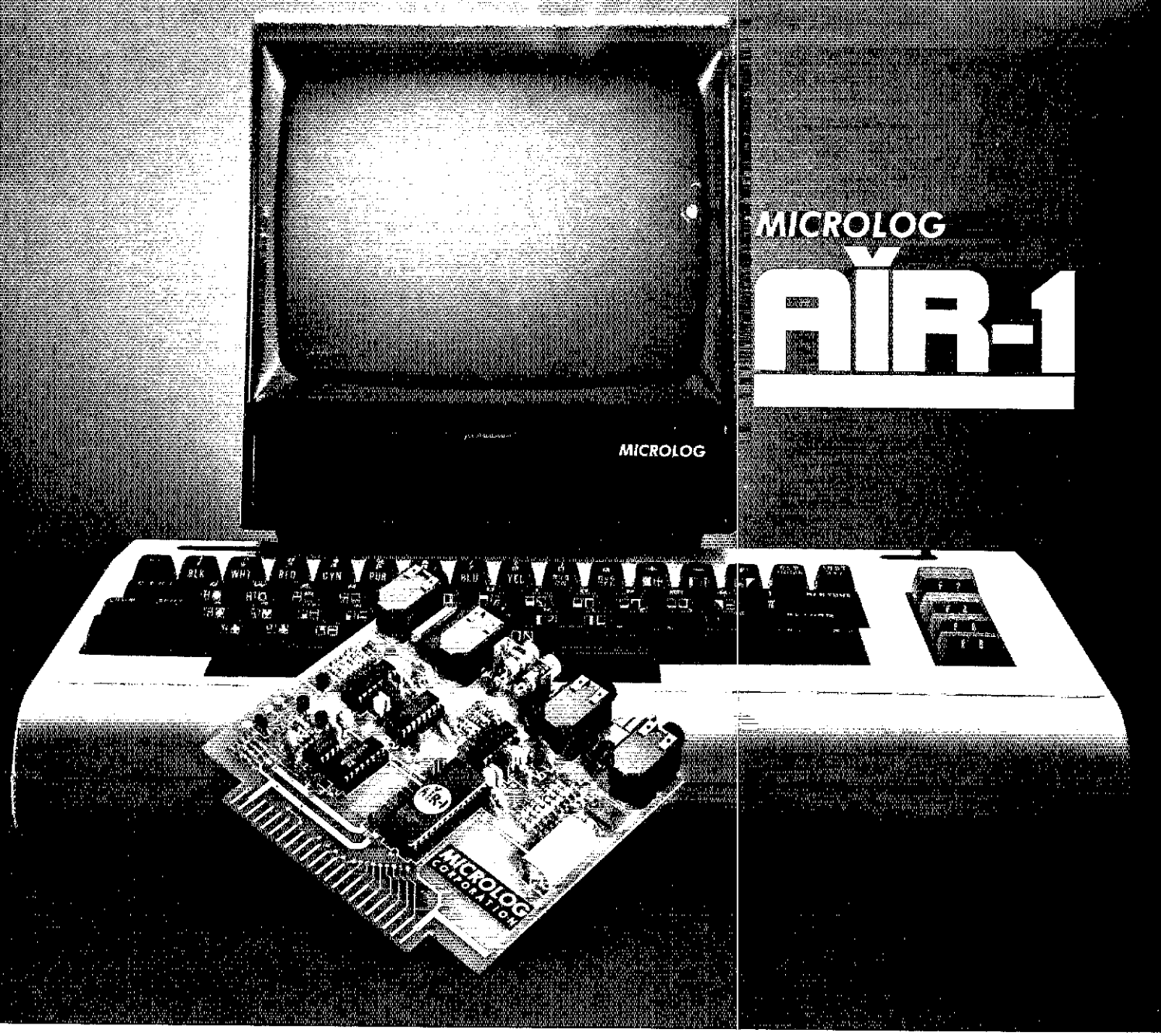
ARKANSAS: SM, Joel M. Harrison, WB5IQF — SEC: N5BPU. STM: AE5L. TC: W5FD. SGL: W5LCI. The section is in need of a few good dedicated amateurs to fill the post of Public Information Officer, Affiliated Club Coordinator, Bulletin Manager, and Official Observer Coordinator. Contact me if you are interested or if you know of someone. We are also in need of county Emergency Coordinators in some areas. Contact N5BPU if interested. The Caron Club in Little Rock, headed by Technical Coordinator W5FD, is very active with Packet Radio. If you are interested in this mode of communications, contact W5FD. Will be looking forward to working as many of you as possible in the upcoming SET, Sweepstakes, 10-Meter contest, and 160-Meter contest. Get your equipment ready.

LOUISIANA: SM: John Meyer, N5JM — ASM: KC5SF. STM: W5GHP. SEC: WA4MUW. PIO: KO5R. Interested in ARRL and other info? Computer buffs can call KC5SF's Bulletin Board at 318-688-7078. KO5R, journalist for the *Times-Picayune* has become the section Public Information Officer; his past efforts have been well publicized. STM W5GHP is running for Delta Div. Vice Dir.; his experience is a big plus and he would welcome your support. AMACOM holds fourth on Oct. 15th & 16th at Delgado College, bigger and better than ever tnx to WA5MJM and his workers. Lighting has played havoc with W5ACS K5ML and N5JM's shacks; luckily all minor. KB5XF and KB5UV tied the knot on July 1st, congrats! K5KX shared VKØ, country #306, putting him on the Honor Roll along with 5 other DDXA members; nice going! The LRN (RTTY net) is QRT until some check-ins surface; meanwhile check-in to one of the nets listed below.

Net	Freq. kHz.	Time	NM
LAN	3615	7 & 10 P.M. Dy	N5BFV
LTN	3910	6:30 P.M. Dy	N5ANH
LSN	3703	7:30 P.M. M-F	WD5CWK
LEN	3910	8 P.M. M	WA4MUW
CCTN	146.01/61	6:45 P.M. M-F	GNOARC

Traffic: KA5HDT 156, W5GHP 109, K5TL 104, N5BFV 78, N5ANH 31, W5LQ 26, WB5LBR 19, KC5SF 6.

MISSISSIPPI: SM, Tom Hammack, W4WLF — Congrats are due as follows to N5DTG and KC8IS on upgrading to Extra; to the crew of the Neshoba Co. Fair special events station. Seems that I claimed that N5AMK is net mgr for MSN. Thanks to KW5T for pointing out that it is N5DSK. All three are hard workers. Sorry for the goof. AJØX has



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TENNESSEE: SM, John C. Brown, NO4Q — ACC: WA4GLS. STM: K4YOL. SEC: K4TKQ. TC: W4HHK. It is with much sorrow that I indicate in the "Section News" this time of the untimely death of our State Government Liaison, former Delta Division Director and former ARRL Vice President, and at the time of his death the national secretary of the QCWA, Max Arnold, W4WHN. His death occured on 31 July. He was buried with full military honors at the Temple Cemetary, Nashville on 1 August. The amateur call W4WHN will ring a familiar note to all that knew him. As was said of him many times "Max always had to help a struggling ham along the way" often to his own detriment. Our Technical Coordinator made a bit of history for the US at 08:05 CDT July 28, W4HHK worked W8YIO, over-the-horizon (tropo) on 2304 MHz. Both used CW for a distance of 582.9 miles, a new US record but not a world record. The path was also open on 432 MHz between the two locations. The twice daily schedules will continue on 2304 MHz. Congrats to the two operators. Good work. Others are invited to join the program. The section traffic report: LF - sessions 91, QNI 3225, QTC 209; VHF - sessions 84, QNI 2377, QTC 563; CW - sessions 58, QNI 391, QTC 106; RTTY - sessions 29, QNI 82, QTC 2. The section was represented 93% on the DRN5 net and 95% on the RN5 net. Still have openings for all to try. Cw net honor roll for this month on TSN was N4BBB W4DDK K9IMI/4 NG4J K4UJZ KA4URN W4ZJY and KA4ZNU. Congrats. This traffic list is short for the month. How about giving the Section Manager a call with your station activity. Traffic: NG4J 259, W4ZJY 165, W4DDK 88, K4WWQ 71, W4PFP 30, KA4BSG 21, K4WOP 19, KE4LS 12, W4TYV 11, NM4W 10, W4PSN 6, WA4RMP 5, K4UMW 5, WA4HKU 4, NN4S 4, (June) K4WOP 8.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Sloan, KA4GFU — STM: KA4BCM. SEC: WA4JAV. OO/RFI: N4GD. TC: KJ4W. BM: WA4AGH. ACC: W4OYI. CW ops needed to help out on KYN and KSN. Help us keep these nets active.

Net	QNI	QTC	Net	QNI	QTC
KRN	409	29	PAEWTN	193	15
MKPN	964	151	SEKEN	30	—
KTN	843	132	TSTMN	440	41
KYN	166	102	WTEN	38	6
KSN	213	99	NKARC	22	—
KNTN	319	91	3ARES	39	8
KEN	74	10	4ARES	58	3
KYPON	69	10	5ARES	63	1
MWRTTY	215	52	7ARES	32	—
BARES	89	5	11ARES	46	4
CARN	119	12			

Traffic: WA4JTE 261, WD4IYI 164, WA4YPQ 126, KA4BCM 120, KA4MZY 92, KB4QZ 80, WD4IYH 76, KA4GFU 73, WD4BSC 66, KA4SAA 56, WB4NHO 46, KA4SKV 40, K4MHL 33, KA4MTX 31, NW4P 31, WA4EBN 29, N4GD 29, WD4RWV 28, W4WQV 28, NW4A 21, WB4ILF 20, KD4TY 18, WA4JAV 17, KA4YIV 17, WA4AVV 16, WB4APC 13, WA4AGH 12, WD4CQF 10, WD4CJQ 9, N4HZT 8, WA4SWF 8, WB4AUN 7, K4AVX 2.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. DECs: K8BTH N8CUH WD8IXZ W8VWY. NMs: WA8DHB K8LNE K8KMQ K8KQJ KA8NCR W8SCW KV8U W8YIQ K8ZJU.

Net	Freq.	Time/Day	QNI	TFC	Sess.
MITN*	3953	1900 Dy**	1728	966	92
QMN*	3663	1800 Dy	2679	906	215
MACS*	3953	1100 Dy**	1308	371	92
GLETN	3932	2100 Dy	2793	305	92
UPN*	3922	1700 Dy	1510	237	104
MNN*	3722	1730 Dy**	793	206	178
WSSBN	3935	1900 Dy	1520	110	91
TASYL	3922	1900 M	20	4	4
VHF nets 29 rpts			3006	57	203

*NTS nets. Times local. Figrues are for May, June & July. **QMN late net, 2200; MNN late net, 2000; MACS Sn 1300, ARES net Sn 3832 at 1730; Traffic Workshop Sn 3953 at 1600; ARRL Info net, M 3953 at 1945, 3932 is MI HF emer. freq. Silent Keys, with deep regret: WB8ANR WA8ZQC. New EC for Oakland Co.: N8DTI. Many thanks to retiring WB8SIW for his long and excellent service in this post. New ORS: WD8OUO. The annual trek to the U.P. Hamfest, this year in Ishpeming, to celebrte the 51st anniversary of the Hiawatha ARC (and 50 years of ARRL affiliation), was as worthwhile and enjoyable as ever. The hams in the U.P. are very much a part of the MI scene, but sometimes are forgotten by people in the downstate areas who are not in daily contact with them. How about a "U.P./L.P." event, like a QSO party with appropriate certificates and awards, setting a theme to emphasize friendship and unity rather than geographical isolation. Like the idea? Sponsors, come forth! Is this idea working, composite 3-month traffic data? July reports were way down, even allowing for July being normally a "down month. So many of you liked the idea when I first proposed it. Where are you now? I'll give it until the end of the year, and (assuming I am re-elected), if the decline continues, I will take a hard look at perhaps going back to the old system. Please let me know what you think. This is my first try at computerized traffic compilation. My new Vic apologizes for any/all omissions/errors. Please look at your total and let me know about any discrepancies. Smart remarks on the air will earn negative credit! BPL: AF8V. Traffic (May/June/July): AF8V 1471, KA8CPS 998, WD8LRT 793, WD8RHU 681, W8QHB 599, K8KQJ 425, KA8OWN 333, KA8NCR 262, WB8YDZ 254, WA8DHB 222, K8GXV 206, WA8WZF 190, WD8EIB 149, W8PDP 131, N8DNC 130, WB8HPZ 123, W8IHX 116, W8VIZ 112, W7LVB 110, WD8MJB 109, KA8EQO 108, W8CUP 98, K8OCP 90, KV8U 87, W8YIQ 85, W8SCW 70, WB8TTA 65, KI8Q 62, K8UPE 62, N8CNY 53, K8ZJU 53, KA8JCL 45, WA8EFK 43, KT8G 33, WB8TPM 33, KB8QT 29, WB8WYA 29, WB8ITT 27, WB8YRY 24, W8LDS 23, W8URM 23, W8YZ 23, W8DSE 21, N8EOI 21, N8BBY 20, KD6FF 20, K8LNE 19, WB8SYA 18, WD8DJS 16, WA8PIM 12, WA8QAF 12, WD8ROK 12, KA8QKR 5, WB8HSN 3, K8DD 2, WD8ECM 2.

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	355	185	62	6:45/10 P.M.	3.577
BNR	216	77	30	8:00 P.M.	3.605

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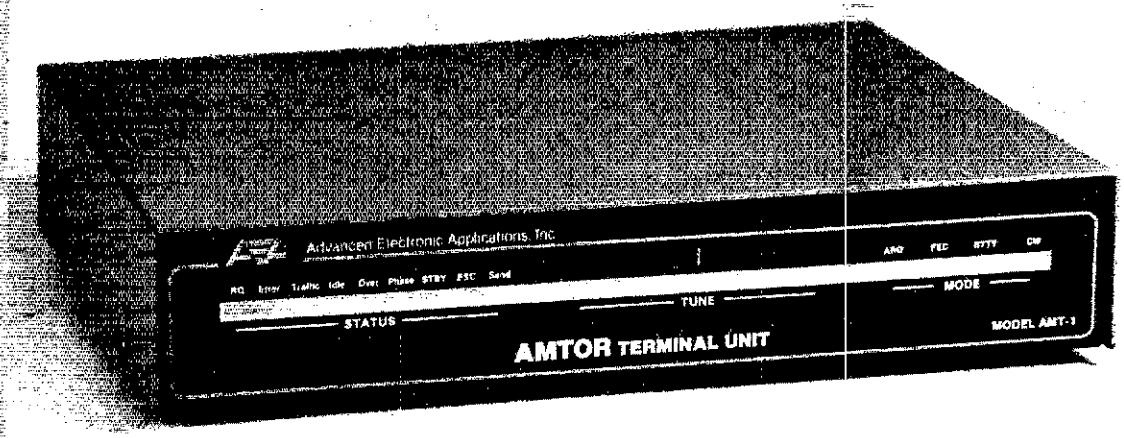
The Definitive AMTOR Terminal Unit



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It was originated by Peter Martinez, G3PLX (see June 1981 QST, p. 25). He first interpreted the international marine CCIR 476-1 specification for amateur use. Virtually all of the 400+ stations presently on AMTOR world wide are using software/hardware designs originated by Peter. The AMT-1 is a proven product which represents his latest and most highly refined design. It represents the culmination of over three years of development and on the air testing, and sets the standard against which all future AMTOR implementations will be judged.

Not only does it incorporate the latest AMTOR specification, but it gives superlative performance on normal RTTY, ASCII and CW (transmit only). As well as some fairly incredible real time microprocessor software, the AMT-1 boasts a four pole active receive filter, a discriminator type demodulator, a crystal controlled transmit tone generator, and a 16 LED frequency analyzer type tuning indicator, which is very easy to use.

Driven from a 12 volt supply, the AMT-1 connects to the speaker, microphone and PTT lines of an HF transceiver and to the RS-232 serial interface of a personal computer or ASCII terminal. All mode control is via ESCAPE and CONTROL codes from the keyboard (or computer program).

It used to be that C.W. was the ultimate mode for "getting through" when QRM and fading were at their worst. That's no longer true — AMTOR will get through with perfect error-free copy when all other conventional transmission modes become useless.

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BSSN	371	297	61	9:45 A/7:15 P.	3.927
ONN	—	—	—	6:30 P.M.	3.708
OSN	214	70	31	6:10 P.M.	3.577
OSSBN	2086	848	92	10:30 A.M., 4:15 & 6:45 P.M.	3.9725
OSSN	102	32	26	6:45 A.M.	3.577
O6MN (June)	380	13	30	9:00 P.M.	50.160
(July)	303	31	31		

One last plug for the Great Lakes Convention/Cleveland Hamfest to those of you who will get early copies of October's QST. I hope you're not going to miss this tremendous affair, including the Saturday night banquet and the Sunday forums, starring W8RC and his ARRL Forum. It's Sept. 24th and 25th for those of you who need another reminder. I know that time does fly, but I was caught by surprise when the Executive Committee approved the dates for the fourth annual Ohio State Convention in Cincinnati — Feb. 25th and 26th, 1984, unexpectedly early, I thought. Then when a confirming radiogram from K8JE (convention majordomo) arrived I knew that the dates are correct and the 1983 was, as usual, outrunning me. You now have no excuse for missing what has become a tradition in Ohio and adjoining states. Each year has been much better that the preceding year, so the 1984 Convention has to be tremendous. See you there! Congrats to Ohio's officers of Inland Seas Chapter XIV, Society of Wireless Pioneers, Inc.: Director, W8TP; W8OK, asst. director; WA8HGH, secy./treas. And congrats to upgrades to Extra KA8MEB and ND8T.

Local Nets	QNI	QTC	Sess.
BRTN	180	86	31
COARES	95	1	3
Hardin Co. ARES	36		5
Huron Co. ARC	38	2	4
Lorain Co.	53	6	12
Medina Co.	301	47	31
NCTW	42	35	20
RARA	58		4
TSRAC	1051	52	27

Traffic: K8NCV 752, K8OZ 529, WD8MIO 514, KD8IC 217, K8JDI 183, N8DSU 178, WA8GMT 161, KA8IAF 161, K8YUW 148, W8SKP 137, KF8J 136, AB8P 124, KA8MEB 117, WB8DMF 106, W8EK 106, WD8NEC 104, K8DL 103, N8EES 102, WB8JGW 101, WA8SSI 88, WB8UBR 85, WD8KBW 77, KA8GJV 66, N8CWU 62, WD8IKC 52, K8TVG 50, KA8GGZ 39, N8CJS 36, WA8HED 35, K8AN 31, KA8ICB 31, WA8DYX 30, WD8RGP 28, K8CKY 23, N8JR 22, W8ZM 22, WB8YTD 21, KG8H 19, WD8RGS 19, W8TXV 19, WD8AYH 18, KA8DJZ 18, WB8MRL 18, N8EVC 17, W8CXM 16, WD8DOS 16, KA8GMF 16, N8CGM 13, WD8HDZ 12, W8WEG 12, WA8QYJ 11, WB8VOA 11, WB8NHV 10, W8BHL 7, N8CW 7, W8FUP 7, K8JE 7, WB8KWD 7, W8OQL 5, N8AJU 4, WB8NTR 4, WB8QHU 4, W8RG 2. (June) N8CWU 44, W8TXV 44, W8WEG 27, K8VOY 11, WB8QHU 7, W8DYF 4.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — SEC: KB2KW. STM: WA2SPL. ACC & SC: N2BFG. BM: WB2EAG.

Net	Time/Day	Freq.	NM
EPN	2200	3.902	AG2X
ESS	2200	3.590	W2WSS
NYS	2300/0200Z	3.677	N2APB
NYS/M	1400Z M-S	7.077	WB2EAG
NYS/M	1400Z Sn	3.677	WB2EAG
NYPON	2100Z	3.913	WA2KOJ
NYSPTEN	2200Z	3.925	KA2Q
NYS RATT	2230Z	3.625	W2ODC
CDN	2230Z	146.34/94	WB2ZCM
HVN	2330Z SSnM	144.535/135	N2BDW
HVN	2230Z T-F	146.37/97	N2BDW
SDN	0130Z	147.66/06	K2ZVI
SCRN	0000Z	147.735/135	KV2U

CLUB NEWS: Schenectady ARA had good picnic 21 August. Crystal RC had fine article on front page of local paper about Field Day with pictures. Overlook Mtn ARC members WA2RUX & N2EIK provided comm. for bike race in Rhinebeck. OMARC also has DX info net on 855/255 rptr Tuesdays at 9 P.M. Net reports: EPN-QNI 147, QTC 93; AESN: QNI 68, QTC 8; NYPON QNI 453, QTC 262; NYS QNI 734, QTC 507. Thanks to all who attended ENY staff meeting. Don't forget SET! PSHR: WB2MCO K2ZM KC2TF W2BIW WB2VUK K2ZVI KA2MBP. Traffic: WB2MCO 461, WA2SPL 223, K2ZM 191, KC2TF 117, WB2VUK 92, W2BIW 85, K2ZVI 60, AG2X 55, AK2E 48, KA2MBP 30, WA2JQL 24, AA2Y 22, N2AWI 18, WB2SON 16, N2BFG 11.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2KKJ. STM: K2GCE. ACC: WB2IAP. OO/RFI: NB2T. TC: W2JUP.

NLI CW*	3630	1900/2200	W2LWB
NLIPN*	3928	1815	KS2G
NCVHF	6.145/745	1930 M-F	K2MT
SCVHF	4.77/5.37	2030 M-F	WA2ARC
BAVHF	6.07/67	2000 M-F	N2BQD
ESS	3590	1800	W2WSS
NYS	3677	1900/2200	N2APB
NYS	7077	1000 M-S	WB2EAG

*Denotes section net; all times are local; please try and help out by checking in whenever possible. Plan now to attend the ARRL National Convention July 20-22 at the New York Statler. Dr. Owen Garriott will be the guest speaker at the banquet. Radio Central ARC will hold their indoor flea market on Sunday, Nov. 27 at Temple Isaiah. Contact K2RPZ for further info. W2LH and his XYL, W2EEO, will lecture on antennas and W2HD will also be a guest speaker. The International Mission Radio Assn. net meets on 14280 kHz M-S at 1900-2000 UTC. For further details or a copy of their newsletter, contact Rev. Michael Mullen, C.M. WA2KUX, St. Johns Univ., Jamaica, NY 11439. Welcome to newly affiliated club at Rockaway Beach Jr. H.S. KE2N is the pres. WA2PMW, the OO/RFI Coordinator is now NB2T. Congrats. If you hold an OO appointment he would like to hear from you. Please let him know if you're active. Also, mail your reports to him. On May 22 and June 12, the Tu-Boro ARC provided emergency communications for the Bayside Volunteer Ambulance Corps during two community road races. Officers for Staten Island ARA (SIARA) are: WA2ZBE, pres.; WA2AMJ, secy.; KA2AHE, treas. Congrats to new upgrades: to Extra WA2AMJ now NA2V, and W2MUD & N2DYJ (now KC2ZF) to Advanced. SIARA will also honor W2GIS at their annual installation dinner. W2GIS first joined SIARA in 1936 and is now a 50-year member of QCWA. ACC (Affiliated Club Coordinator) WB2IAP would like all clubs to notify him of any upcoming events that your club is doing, marathons, flea markets, etc. Please help out so we can avoid conflicts in scheduling of events. Traffic: N2AKZ 276, W2AHV 167, W2GKZ 80, W2DBQ 44, WB2IDP 39, KA2FFC 23, K2IZ 16, KS2G 13.

Our numbers talk

424B

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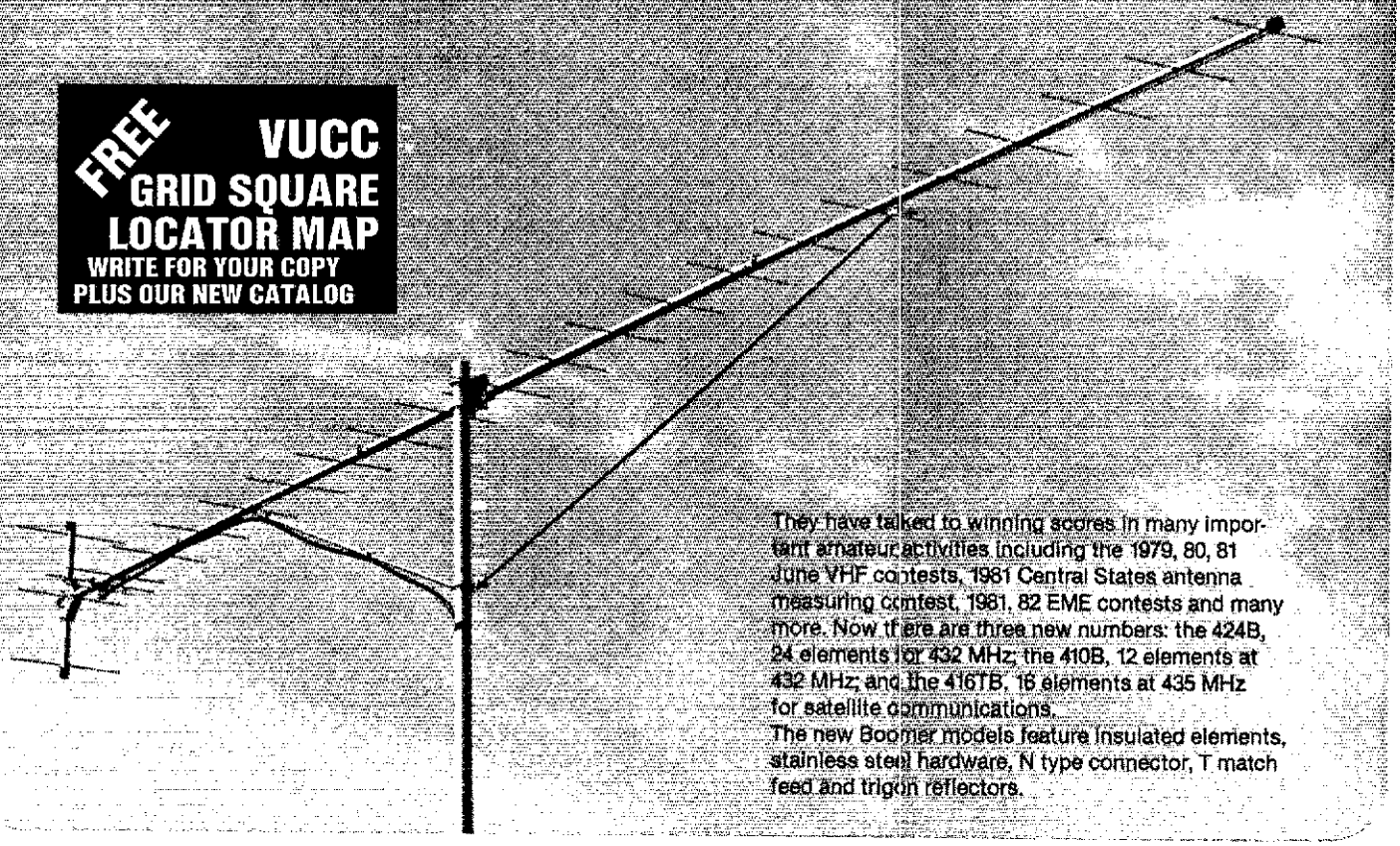


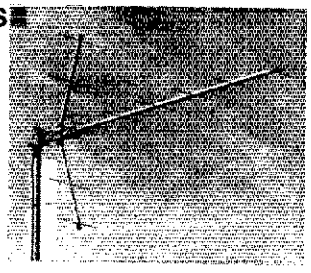
They have talked to winning scores in many important amateur activities including the 1979, 80, 81 June VHF contests, 1981 Central States antenna measuring contest, 1981, 82 EME contests and many more. Now there are three new numbers: the 424B, 24 elements for 432 MHz; the 410B, 12 elements at 432 MHz; and the 416TB, 16 elements at 435 MHz for satellite communications.
The new Boomer models feature insulated elements, stainless steel hardware, N type connector, T match feed and trigon reflectors.

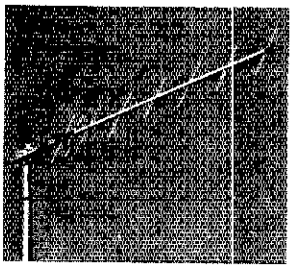
SPECIFICATIONS AND FEATURES

424B:
424-435 MHz, 7.6λ, gain *maximized, F/B ratio *excellent, beamwidth 19*, length 17.42 ft. 5.2 m.

410B:
424-435 MHz, 2.2λ, gain *maximized, F/B ratio *excellent, beamwidth 33*, length 6 ft. 1.83 m.

416TB:
428-438 MHz, Circular Polarization 2.2λ gain *maximized, F/B *excellent, beamwidth 34*, length 6.7 ft. 2.03 m.





MORE BOOMER NUMBERS

32-19	144-146 MHz	19 elements
214B	144-146 MHz	14 elements
214FB	145.5-148 MHz	14 elements
228FB	145.5-148 MHz	28 elements
220B	220-223 MHz	22 elements
617-6B	50-51 MHz	6 elements

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NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — SEC: WB2VUF. STM: W2XD. BM: N2BOP. ROC: W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACC: KK2U.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	7063	1000 Dy	31	165	50
NJN/E	3695	1900 Dy	31	360	123
NJN/L	3695	2200 Dy	31	233	82
NJPN	3950	1800 Dy	31	211	163
		0900 Sn	5	---	---
NJVN	49/49	2230 Dy	31	274	86
TCETN	147.255	1930 Dy	30	160	44
OBTTN	147.12	2000 Dy	31	247	63

Upgrades: to Extra-N2BNB W2RRX K2MHP WB2SHK; to Advanced: N2DPN N2EDF. New Novice KA2TAU. State Line ARC has applied to become reaffiliated with the League, and their new newsletter reports WB2TBB has worked WAS on 6 meters. The first edition is excellent. Congrats! Sussex Co. ARC reports a FB fleamarket. They are having a Novice class starting Sept. 26. WA2SUY is the instructor and classes will be held at Sussex Vo-Tech. Cost of class is $25. Ramapo Mountain ARC reports W2AKW is a new member who was first licensed in 1916. N2DSY recently married. Metroplex reports taking part in the largest Honeywell Teleconference Net ever. They were part of 97 repeaters linked via landlines to 49 states. The next net will be Sept. 1st at 8:30 P.M. featuring K7UGA and WA2LQQ of AMSAT. N2BLC is now NB2B. Neptune ARC reports W1GD is a new father. KO2V has moved to NH. Traffic: N2XJ 208, W2XD 117, AG2R 115, K2VX 100, KA2GSX 79, KY2P 71, WB2GHN 62, WB2QMP 49, W2ZEP 35, WB 2KLF 33, W2CC 25, N2EBA 23, W2UH 18, N2DPN 18, N2BNB 17, KC2YT 13, W2KB 6, W2ODV 2, W2RRX 2, KB2WI.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM KAØX. BM: KØIR. PIO: KBØZP. TC: KØDAS. ACC: WBØQAM. SGL AKØQ. July has been the most active month in activity with a record number of reports, activity and traffic counts. Keep up the FB work. The Story Co. ARC appears to be the first SSC club in Iowa with a FB program. If your club qualifies, send info to the ACC. Our SEC spearheaded the agreement between the ARRL and APCO (Assn. Public Service Comm Officers) The special event station during the Hot Air Balloon Championship was again very successful as was the state fair stn. NIARC has a working agreement with the RC during storm season. Would like to have reports of results of the Nat. Tel. Con relay; maybe we will do it again. A great DSM Hamfest. Kudos to the Ft. Madison club, our newest affiliated club. Our total membership in the section is up considerably, welcome to all and thanks for the new ARRL support. Remember, activity breeds activity which means membership. Look at the record traffic reports

TLCN	3560	2330-0300	Dy	295	271	62
75 M Phone	3960	2300-1830	M-S	1856	284	52
ICN	3713	0100	MThS	78	46	13
ITEN	3970	2230	Sn	76	59	5

Traffic: WAØAUC 479, WØSS 249, W4JL 243, KØGP 171, KØCY 167, WØHTP 155, WDØFWB 142, WDØHND 132, KCØSC 127, KAØADF 106, KØKQJ 93, KAØD 86, WBØJFF 86, WØYLS 76, WØAK 74, NØCWW 73, KQØP 50, KAØJQG 49, KQØI 46, WAØRCU 34, KAØX 31, KDØER 31, WAØAVW 26, WA4VWV 26, WØBW 24, KA9GBG 9, WAØMIZ 8, KBØOZ 8, WDØDOK 6, NØCUB 2, KAØJZF 2, KØWKT 2. (June) KDØER 50, KBØOZ 12.

KANSAS: SM, Robert M. Summers, KØBXF — STM: WØOYH. SEC: WØKL. It is with deep regret again that I inform you of a Silent Key in Kansas. WØEUS of KC passed away after a recent illness. The general comment this past month was "HOT and DRY out here!" WØKL reports that KAØQKL and KAØPZN have upgraded to Tech and KAØOPK to General. Congrats also to NØBIW of KC for being recently elected as pres. of the Kansas Amateur Repeater Council. Another upgrading ham, KAØQVN to Tech. Officers of the Pilot Knob ARC are: NØCWR, pres.; KAØKHK, v.p.; NØCWK, treas.; KAØKKH, secy. Club bulletin editor is WDØDOT. The officers for Johnson Co. ARC are KZØO, pres.; WDØDZE, v.p.; WDØDQJ, secy.; KBØG, treas. Bulletin editor is KAØGAG. To get the BEAR facts out of Wichita, you must contact KAØBKX, editor totally responsible for the publication of the Boeing Employees ARS/Ø. From this fine publication I found the notification of 2 more additions to the Silent Key list, KAØORF and WDØENU. Traffic reports were a little slow this month and the comments on those received were even fewer to extract info from. Guess the reason is the HEATWAVE we have been having in Kansas. Keep cool: Cu next month. Traffic: WØFRC 210, WØHI 171, KSØU 122, WØFIR 111, WØOYH 84, WBØZEN 83, WAØLBB 66, WØFDJ 82, KØBXF 34, WØCHJ 25, KØGSC 25, WØRBO 15, WØQMT 14, WØKL 13, WAØOWH 7, WØPB 6, KAØE 2. (June) WØRBO 10.

MISSOURI: SM, Ben Smith, KØPCK — On July 2nd, 3rd and 4th the St. Louis VP Fair was held with an estimated 5.3 million people attending. The St. Louis ARES provided communications for the Red Cross from their Hq to vans, first aid stations and the Army MASH hospital. Thirty three St. Louis amateurs took part in the operation with around 1025 man-hours being expended. It was another public service project well done by the St. Louis amateurs. Several stations received Field appointments in July: NØAJI KDØGY WØDLG and KBØEA all OBS; KBØKD PIA; and WAØITU endorsement of OO. We need to have all net reports and station activity sent to KØSI by the 6th of the month. The section news, net reports and station activity must be in the mail by the 7th. KØSI and I appreciate the increased number of reports being turned in to us and hope more stations will report their monthly activity. With fall approaching and people spending more time on the air, keep track of and work toward Public Service Honor Roll points and report the totals to me at the first of the month. I would like to see more Missouri stations on PSHR. Fred Whitson, WØGEF, 76, of Cape Girardeau died as the result of a fall from a 35-foot antenna tower July 21. He had been an amateur for over 50 years. Our sympathy to his family and friends.

Net	Freq.	Time/Dy	QNI	QTC	Sess.
JCCN	146.4/7.00	8 P.M. W	45	0	4
MON	3585	7 P.M. Dy	347	146	62
CMEN	146.16/76	9 P.M. W	69	6	4
MOSSB	3963	6 P.M. Dy	598	81	31
PHD	147.63/03	9 P.M. M	47	6	4
MEOW	3963	5:30 P.M. Dy	392	31	31
HØN	7280	12 P.M. M-F	403	19	22
SARN	147.63/03	9 P.M. T	66	0	4
RRARN	146.19/79	8 P.M. Dy	479	23	30
NARN	145.43	7:30 P.M. MWF	21	3	4
IFN	147.84/24	7:30 P.M. M	21	0	4
KCARN	146.37/97	9 A.M. S	30	0	5

Traffic: KØSI 204, WØBMA 120, AIØO 108, KØPCK 88, NØBLB 58, KT5Y 52, WAØYJX 50, WØOUD 40, K2ONP 40, KØDSQ 34, WBØNUB 20, WBØKUH 8, WBØHOP 6, KDØGY 6.

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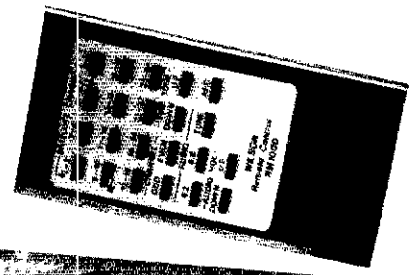
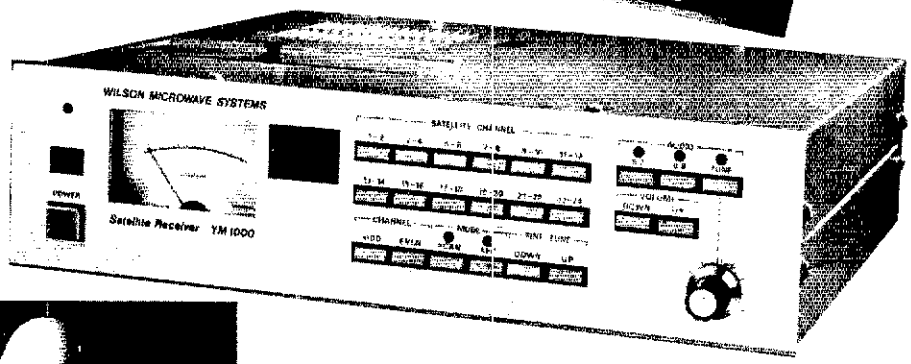
YM-1000 Satellite TV Receiver
with infrared Remote Controller



Features:
- Channel scanning
- Automatic polarity changing
- AFC
- Automatic antenna switching
- Built-in modulator
- Digital channel display
- Fine tuning
- Lighted meter



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MD-9 9 ft. Satellite TV Antenna

An alternative to one-piece antennas. Simple to assemble - only a single person is needed for the total installation; no individual component weighs over 20 lbs and no professional concrete work is required. Surface tolerances are held to 1/32" for optimum performance and the .385 F/D ratio perfectly matches all popular feed assemblies. The polar mount is simple to install utilizing the single pipe mount and rotatable base which mounts on a 3" *schedule 40* pipe secured in concrete. *Note:* Pipe is not included from the factory. The adjustable declination angle sweeps true for all parts of the country and the azimuth crank is easily interchangable for either East or West coast installations.

MD-9 Specifications

ANTENNA

Diameter	8'8"
Construction	12 panels, 18 ga. steel
Finish	Tan, industrial grade
Weight	180 pounds
Wind-operational	50 mph steady load
Survival	100 mph steady load
Temperature range	-60 to +125°
Frequency	3.7 to 4.2 GHz
VSWR	1.1 to 1
Gain	dB
F/D Ratio	.385
1/2 power beamwidth	1.8°

FRAME

Type	True polar, rotatable base
Construction	1/4" - 3/8" steel
Weight	70 pounds
Finish	Brown
Azimuth Sweep	91°
Elevation	66°

MISCELLANEOUS

Total shipping weight	350 pounds
Warranty	4 year limited

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NEBRASKA: SM, Reynold Davis, KØGND — This is the month when we'll hear Amateur Radio from outer space for the first time! Exciting! Congrats to WBØTED & KØDKM for 100% participation in CAND in July; also to all who helped with DTEN as NE was 1 of 2 states with 100% representation during the second quarter. Starting Oct. 1, DTEN will start an early session at 1:45 P.M. Central time at 7232 kHz. I am currently receiving newsletters from: Elkhorn Valley ARC, Lincoln ARC, Aksarben ARC, Pine Ridge ARC, Central Nebraska ARC, Grand Island ARS, Blue Valley ARC, Midway ARC, Scottsbluff ARES & Prairie Valley ARA. Info from these is shared weekly on the Nebraska Section Bulletin at 1715Z on 7085 kHz RTTY, and at 1815Z on 7283 kHz SSB during the NE 40 SSB Net. Pse send me traffic re your club meetings & programs. Traffic: KØDKM 154, WBØTED 77, WØKK 66, WAØSCP 47, WØSGA 43, WØHOP 27, KAØBCB 25, KØIXY 23, KØGND 21, WØZNI 21, KAØBWM 16, NØDGM 8, WBØGWR 6, WØNIK 6, WAØBOK 5, WBØGMQ 5, WAØOOX 5, WAØPCC 5, KØSFA 5, WDØBOX 4, KAØIOM 3, KØODF 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD — SEC: K1WGO. STM: K1WIC. OO/RFI: KA1ML. ACC: N1AZF. TC: W1HAD. PIO: K1NGL. SGL: K1AH. BM: WA1DWE.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2000	218	317	K1EIR
CPN	3965	1800/1000 Sn	275	275	KA1BHT
NVTN	28/88	2130	32	270	WA1ELA
WCN	78/18	2030	43	324	WB1GXZ
RTN	13/73	2100	27	259	K1UQE

Upgrades: KA1IGI Gen; N1CTF Tech; KA1KPT Nov. Call change WA1LYS/KQ1Q. Attention VHFers: W1YOL is contemplating construction of a 6-meter repeater. Would like to have your input to justify expense. The 147.15 repeater is now sporting a 6-meter link. Our section has a new Public Information Officer (PIO); welcome to K1NGL. Congrats to SARA, the first club in our section to submit the paperwork for SSC status. Other clubs are encouraged to contact ACC N1AZF for assistance. All instructors should be aware that new testing procedures are now in effect for the Novice class license. Contact C&T at ARRL with an SASE for for a copy of PR-1035A and 610 forms. W1BDN has been selected Ham of the Year in the Shoreline ARC. The SET and Halloween are coming. This is an ideal opportunity to clubs and individuals to provide a valuable public service and to practice emergency traffic procedures. K3ZJJ recently assisted in supplying communications for the Swimming Marathon around Manhattan Island. KA1KD recently joined the ranks of computer operators. New output power regulations are now in effect. Ham ops came out in force against the No-Code proposal, 25 to 1. This month marks a special happening in the development of Amateur Radio, direct transmissions with the space shuttle. An excellent opportunity for PR and personal achievement. Get your antennas ready and shoot for the stars. Remember, even if you don't make contact, SWL reports will be confirmed. Welcome to our section's newest affiliated club, the Valley Amateur Radio Association. Traffic: W1EFW 295, WB1GXZ 279, WB9IHH 157, K1UQE 90, KA1AQE 47, KA1EGE 47, K3ZJJ 35, WB1ESJ 27, W1YOL 26, W1CUH 5.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GBS. 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	452	394
EMRIPN	3.959	1730/Dy	274	171
EM2MN	23/63	2000/Dy	461	101
NEEPN	3.945	0830/Sn	66	31
HHTN	04/64	2230/Dy	679	233
EMRISS	3.715	2030/Dy	148	73
CI2MN	045/645	1930/Dy	185	50

As a result of a suggestion by WA4STO, we have started a new net. The last thing we need in EMA is another net you say? Well, this one is not an ordinary net for traffic, DX, certificates or anything like that. It is for ARRL members and officials in Eastern Mass. What's an official? If you hold an appointment like OO, OBS, OES, DEC, ORS, etc., then you're an official. The purpose of this weekly get-together is simply to discuss issues pertaining to the ARRL Field Organization in Eastern Mass. and maybe solve some problems along the way. The ORSs have it easy; they run into other ORSs every day on the nets, but some of the other appointees like OOs and ECs do not have regular contact with their counterparts in other parts of the section. A problem that one of them has may already have been solved by someone else, and a few words of wisdom may be all that is needed to get a problem solved. And who knows we may uncover some better ways of doing things that none of us has heard of before. Also with the new section-level appointees coming on board it will give them a chance to get to know people sooner. The net will be called "The Eastern Mass LO Net," and it will meet at 4:30 P.M. on Sundays on 3.958 MHz. It will last no longer then an hour because EMRIPN meets on that frequency at 5:30. So see you there. By the time you read this, the net will be in full swing so please tune or check in. WA4STO also notes that OO and OBS activity is on the increase but more volunteers are needed. If your repeater doesn't have ARRL bulletins read on a regular basis, find someone in the repeater group to become an OBS and contact WA4STO. W1XA, EC for Bellingham, reports that the new emergency plan for the town was accepted by the Board of Selectmen. AE1X has fabbed an 80-watt 2-meter amplifier PC board. The annual EMass traffic handlers picnic was a huge success as usual with everyone wishing WA1TBY and KA1GBS the best in their new roles as outgoing and incoming STM respectively. Traffic: KA1GBS 532, N1BHH 285, N1BGW 263, KO1O 216, N1AJJ 215, WA1TBY 174, W1AF 185, KA1EPO 104, WA4STO 92, KA1KEP 88, KA1EXJ 81, WA1LPM 79, WA1DXT 74, KI1I 50, WB8TDA 47, KA1MI 45, WA1FNM 31, KA1DJV 26, W1BZD 25, KA1AMR 17, W1QLL 16, W1CE 13, WB3FOC 12, KA1R 8, K1LCQ 6, KA1KF 5, W1ZHC 5. (June) W1MJ 15, KA1KF 7. (May) W1MJ 26.

MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG/1. STM: AK1W. ACC: KA1EIW. OO/RFIC: W1KX. SGL: K1NIT. PIO: KA1TJ. TC: KQ1L. BM: W1JTH. K1YFY is now KQ1L; congrats on upgrading. Eleven hams provided the communications for the Annual Friendship Sloop Races July 28-30. W1BYK W1CUW W1JRS W1RWG W1VYI K1VFG K1YXO WA1JZP WA1KEE WA1WYT and WB1FYH were commended by the Race Committee for making the races more enjoyable for the spectators and making the official conduct of the races easier.

Net	Sess.	Checkins	Tfc	Mgr.
PTN	52	436	171	AC1G/N1BJW
SGN	26	884	169	K1GUP
CMEN	9	155	23	W1WCI
MPSN	5	54	2	KL7IJG/1
AEN	4	41	0	WA1YNZ

PSHR: AK1W W1RWG KL7IJG WA1YNZ N1BJW KA1AVU

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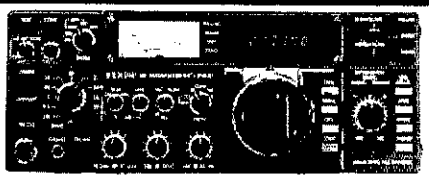

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IC-740* 9-band 200w PEP Xcvr	$1099.00	949.95

*plus **FREE** PS-740 Internal power supply &

$50 Factory Rebate until gone!

PS-740 Internal power supply	$159.00	149.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52/A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53/A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-44/A SSB filter (2nd IF)	159.00	144.95
MB-12 Mobile mount	19.50	
HM-10 Mobile scan microphone	39.50	
IC-730 8-band 200w PEP Xcvr w/mic	$829.00	599.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44 SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
HM-10 Mobile scan microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band Xcvr/.1-30 MHz Rcvr	$1349.00	899.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 KHz AM filter	49.50	
MB-5 Mobile mount	19.50	
IC-7072 transceive interface, R-70	112.50	
IC-745 9-band Xcvr/.1-30 MHz Rcvr	$ 999.00	899.95
IC-751 9-band xcvr/.1-30 MHz Rcvr	$1399.00	1229
PS-35 Internal power supply	160.00	144.95
PS-15 External 20A power supply	149.00	134.95
FL-52A 500 Hz CW filter	95.50	89.95
FL-53A 250 Hz CW filter	96.50	89.95
FL-33 AM filter	31.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
External frequency controller	TBA	
High stability reference crystal	TBA	
Accessories: 720/730/740/751	Regular	SALE
PS-15 External 20A power supply	$149.00	134.95
EX-144 Adaptor; CF-1/PS-15	6.50	
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95
CC-1 Adaptor; HF radio to PS-20	10.00	
CF-1 Cooling fan for PS-20	45.00	
SM-6 8-pin electret desk mic	39.00	
SP-3 External speaker	49.50	
Speaker/phone patch (specify radio)	139.00	129.95
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
MT-100 Manual antenna tuner	249.00	224.95
AH-1 5-band mobile ant w/tuner	289.00	259.95
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IC-551D 80w 6m Xcvr	$699.00	599.95
PS-20 20A switching ps/spkr	229.00	199.95
EX-106 FM adaptor	125.00	112.95
IC-451A 430-440 SSB/FM/CW Xcvr/ps	899.00	769.95
IC-451A/High 440-450 MHz Xcvr/ps	899.00	769.95
AG-1 15 db preamp, IC-451A/45A	89.00	79.95
IC-271A 2m, 25w xcvr	699.00	629.95
IC-471A 430-450 MHz, 10w xcvr	799.00	719.95
PS-25 Int. p/s for 271A/471A	TBA	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
VHF/UHF FM:	Regular	SALE
IC-25A 2m, 25w, up-dn-ttp mic, grn leds	$359.00	319.95
IC-25H as above, but 45 watts	389.00	349.95
IC-45A 440 FM xcvr, 10w, TTP mic	399.00	359.95
IC-22U 10w 2m FM non-digital Xcvr	$299.00	249.95
EX-199 Remote frequency selector	35.00	
VHF/UHF Multi-mode mobiles:	Regular	SALE
IC-290H 25w 2m SSB/FM Xcvr, TTP mic	549.00	489.95
IC-560 10w 6m SSB/FM/CW Xcvr	489.00	439.95
IC-490A 10w 430-440 SSB/FM/CW Xcvr	649.00	579.95
VHF/UHF Portables:	Regular	SALE
IC-202S 2m port. SSB Xcvr. 3w PEP	$279.00	249.95
IC-505 3/10w 6m port. SSB/CW Xcvr	449.00	399.95
BP-10 Internal nicad battery pack	79.50	
BC-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
IC-3PS Power supply	95.00	89.95
IC-20L 2m amp, 10w PEP or FM	98.00	89.95
IC-30L 432 amp, 10w PEP/FM	105.00	94.95
1.2 GHz	Regular	SALE
IC-120 1w 1.2 GHz FM xcvr	$499.00	449.95
RP-1210 10w 1.2 GHz repeater	TBA	
Cabinet for RP-1210 or RP-3010	249.00	

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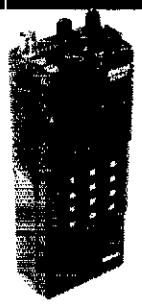
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44 SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
EX-299 (CK-70) 12V option	9.95	



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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	299.95	219.95
220 MHz:		
IC-3A .15/1.5w 220 HT/batt/wall cgr	269.95	234.95
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	234.95
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	
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	
BA-TTN 16-buttom TTP front 2A/3A/4A	39.50	
CommSpec SS-32M 32-tone encoder	29.95	
IC-M12 12 ch Marine hand-held	SPECIAL $269.95	
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 (Regular $99.95)	SALE 94.95	

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KA1TJ KA1GCW. Traffic: AK1W 163, W1KX 151, W1ISO 145, W1RWG 97, WB1BYR 82, KA1AVU 69, W1BMX 64, N5YX 54, KL7IJG 46, N1BJW 42, KA1TJ 35, W4SME/1 30, WA1YNZ 16, W1JTH 15, W1CTR 10, W1WCI 10, N1BME 5, KA1FTL 5, W1OTQ 4, WA1ZTL 4, W1AHM 3, KA1ENL 1. (June) N5YX 54.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — SEC: AK1E. STM: W1TN.

Net	QNI	Sess.	QTC	NM
GSFM	722	31	139	KI1M
GSPN	213	36	112	W1VTP
NHN	229	36	112	N1NH
RCARES	48	4	3	WA3BZM

Advancements: N1CHY, Extra; K1IEE WA1YOQ KA1JLK KB1IK, Advanced; N1CTP, Tech.; KA1KPU, Novice; KA1JOB, General. Noted DXer W1VKQ moved to North Carolina. WA3BZM worked YI1BGD. Welcome back from hospital W1IIQ, AF1B has pool in cellar. Traffic: KI1M 356, KK1E 206, W1TN 175, W1GUX 162, N1NH 161, AK1E 114, N1CPX 68, W1ALE 49, KA1BJ 41, WB1CFP 38, WA1YZN 35, W1CUE 26, WA1PEL 25, W1VTP 22, WA3BZM 20, N1AKS 16, K6UXO 16, W1MHX 14, W1FYR 12, N1ALM 10, K1OIQ 10, KA1IIP 8, W1NH 2, K1NH.

RHODE ISLAND: SM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: W1EOF. TC: AB1D. NM: WA1OSL (RIEM2MTN) Endorsements: KA1EHR SEC; AE1S K1DA W2MCF EC; KB1G OES; W1YNE OO, K1DS, AMSAT Coordinator, has earned OSCAR WAS #83. He is available for AMSAT video tape demonstration. Interested clubs may contact him. Congrats to AE1S for making DXCC, Newport Co. RC has met requirements for SSC designation, First club in section to do so. The club provided comms for the "Ocean Drive" footrace. The PRA ATV repeater is nearing completion. W1OP/R on 220 has become second link of New England rptr network by passively linking with KG1C/R on Monadnock. Traffic: W1EOF 838, KA1KML 37, WA1CSO 18, N1RI 12, AE1S 4.

VERMONT: SM, Reed Garfield, WB1ABQ — STM: N1ARI. PIO: W1RNA. BM: AE1T. SGL: W1KRV. Congrats & welcome aboard to W1KRV as new SGL. The LO slate is continuing to grow. Congrats to W1HRG W1TBG & VE2GWA/MM for their valuable assistance to Coast Guard during boating mishap & drowning on Lake Champlain 7/21. Belated Congrats to K1LPS for DXCC/RTTY. New upgrades: KA1EHF & N1BGS to Extra, and to KA1HIY to Advanced. Anyone with info for this column or *New England Report* newsletter contact me before end of each month. Nets: VTN (NTS) 31/143/70; VFMN 31/601/88; VSBN 30/551/124; Carrier 26/474/35; GMN 26/355/34; RFD 5/96/11; VPN 5/80/7; CVFMN 5/47/2. Traffic: N1ARI 132, N1COB 114, W1KRV 70, WB1ABQ 66, K1BQB 60, AE1T 59, W1OAK 53.

WESTERN MASSACHUSETTS: SM, William J. Hall, W1JP — There are two factions in US/Canadian ranks. One says, "Support the ARRL," while the other voices unconvincing reasons not to. The excuses vary, but in my opinion hold no water. It is to those who suppport the League that I want to address this column. Support to me means participation in ARRL affairs, not just renewing an annual membership and reading *QST*. The new Field Organization (FO) which reports to the New England Division Director in our case, provides intimate contact with Newington. As Section Manager (SM), I represent you and also manage League affairs in W. Mass. The ARRL FO now has eight appointed positions available covering programs like emergency communications, traffic, RFI and monitoring, affiliated clubs, public relations, state government, technical activities and bulletins. I have been both SEC and SM. I took both on with great reluctance and arm twisting because both offered the frightening prospects of the unknown. To my surprise, both jobs have been extremely satisfying in terms of my own personal growth and granting me a much deeper appreciation of Amateur Radio and the ARRL in particular. I offer you the same opportunity. Support your ARRL by volunteering to participate in the new Field Organization. PSHR: WB1HIH W1PUO KA1T K1JHC. Traffic: KA1T 247, W1UD 161, W1PUO 153, WB1HIH 140, K1JHC 63, K1PUG 45, W1JP 31, KR1R 25, W1ZPB 17, WB1FSV 16, WB1HKN 12, KA1EKQ 4, WB1GTO 4, W1SJV 3.

NORTHWESTERN DIVISION

ALASKA: SM, Will Darsey, AL7AC — Comments have been filed with the FCC by WL7BIL to include Alaska in the 40-meter phone band expansion as proposed in the "Further Notice of Proposed Rulemaking" in Docket PR 82-83. If approved, the expansion would permit Alaskan amateurs to operate A3 in the subband 7075 — 7100 and would help relieve the heavy interference from powerful broadcast stations in Asia. W8SJJ in southeast Alaska has some great ideas for linking repeaters. He just needs a bit more support. Would it be feasable to link up the entire state someday? The Anchorage ARC recently elected the following officers: Wilse Morgan, KL7CQ, president; Bryce Rumery, AL7DL, vice president; Daniel Stevens, KL7WM, activities manager; Lance Dunbar AL7BK, secretary; Fred Wegmer, KL7HFM, treasurer. Congrats and the best of luck to the state's largest club. ARRL records indicate that the Mooseshorn ARC is now a LEAGUE affiliated club. Did someone forget to submit an application? Let's go clubs!! Traffic: KL7VY 116, KL7LA 43, AL7AC 19.

IDAHO: SM, Dennis Hall, KK7X — Congrats to W7GHT, new Section Traffic Manager. I am sure that with his experience that he will do a GREAT! job. STS-9 may or may not be history by the time you read this. What a great promotion for Amatuer Radio. Had a chance to talk with Roy Neal, K6DUE, in length about his involvement with the project. We in the state of Idaho should show as much enthusiasm for the hobby as he does single handedly. I have my computer on RTTY on 147.32/.92 in Spokane. Using the Super-Ratt program it can be accessed with the code :KK7X. With the winter months coming up I would be able to have the machine on 80 meters one or two days a week for input of traffic news or section activities into the mail box. Let me know if you are interested in this form of communications with the Section Manager. 73 till next time.

Net	Freq.	Time	Sess.	QNI	QTC
IMN	3635	8 P.M. M-F	21	172	94
ICD	3990	7:10 A.M. M-F	21	622	24
FARM	3935	8 P.M. Dy	31	1439	43

Traffic: W7GHT 188, KA7GQP 129, K7TM 19.

MONTANA: SM: Les Belyea, N7AIK — Mnay thanks to both our division director, W7QGP, and K1ET from ARRL Hq. for taking time out of their busy schedules to visit with seven clubs in our section. They covered over 2000 miles in one week. W7LBK of Laurel has moved to Spokane, WA. He has been a very active EC, OO & ORS; tnx for the fine service. A number of amateurs from the Gallatin ARC took turns at the Hyalite Reservoir Diabetic Camp to provide vital communications via 2 meters. Beartooth ARC members assisted on the Beartooth Run foot race. The WIMU hamfest was well attended, and a vote was taken

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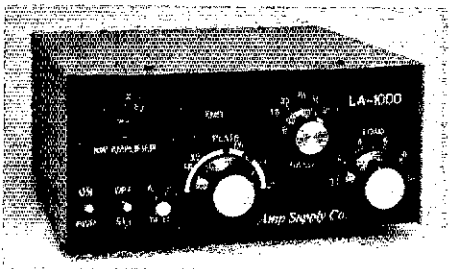
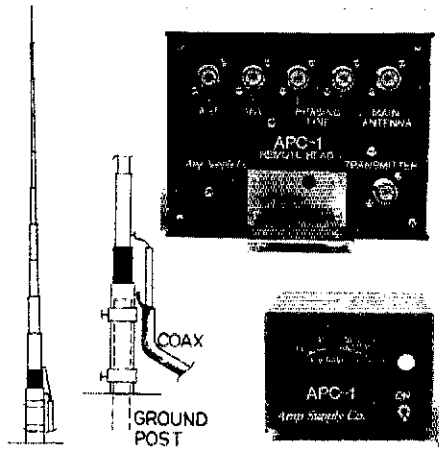


LA-1000A

The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1000 watts PEP SSB 700 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish.

This is a super linear for all purposes, the LA-1000 excelled during the Heard Island DX pedition with over 30,000 contacts. The rugged design lends itself to continual use during contests and users are even running it on RTTY at 500 watts input.

LA-1000A **$399.50***

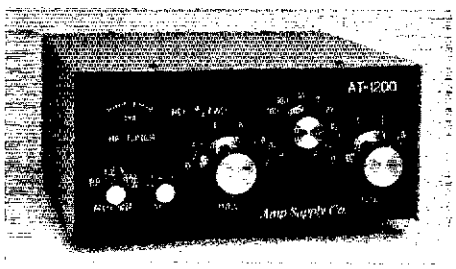


AEX-1, APC-1

The AEX-1 is a 33' self-supporting vertical full 1/4 wave on 40 meters (or any band). It is constructed of adjustable seamless aluminum, and will handle 4 KW.

The APC-1 is a two piece phasing control for verticals, dipoles or loops. The outside switching box and the indoor control system combine to eliminate all phasing guess work.

AEX-1 ..... **$79.50***
APC-1 ..... **$99.50***
APC-1 + 3 AEX-1 antennas .. $299.50*
This combination provides complete 360 degree rotation.
80 Meter Add-on **$24.50***



AT-1200

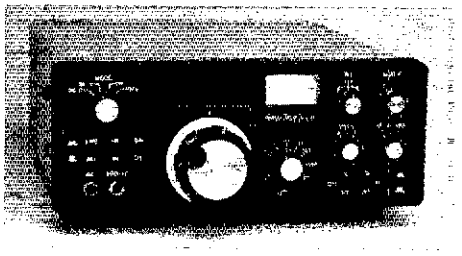
The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifer running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

AT-1200 ..... **$169.50***

NVR Signal Injector Antenna

The NVR antenna is an excellent all band 102 foot dipole. It comes completely assembled and will handle 2KW PEP. This antenna was originally developed in Great Britain and has enjoyed worldwide acceptance for years. It consists of 102 feet of copper antenna wire, 31 feet of 300 ohm transmission line, 70 feet of RG-8X coax, 2 end insulators, 1 center insulator 1 PL-259 and sleeve connector.

NVR Antenna **$50.00***

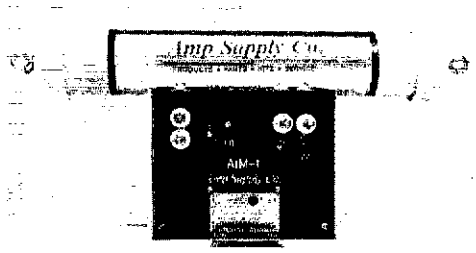


ASR-1

The Amp Supply ASR-1 is an 80-10 meter solid state transceiver, great for mobile, portable or fixed station operation. It is finished in an attractive gray-on-gray color scheme and matches the Amp Supply product line.

- PTO w/digital display readout
- Receiver sensitivity 0.3uV
- RIT ± 3KHz
- Notch filter 200 Hz – 3.5 KHz
- QSK full break in CW
- Two level power 10 watts & 100 watts PEP input
- 4"H × 9"W × 12"D
- CW, SSB, SSTV, RTTY 100% duty

ASR-1 ..... **$599.50***
AC Supply **$119.50***



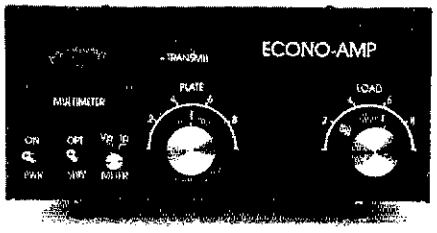
AIM-1™

Major Antenna break through!

The AIM-1 is an antenna impedance matching network for random, long wire or loop antennas. It provides continuous coverage from 500 KHz - 30 MHz, is completely *automatic*, no knobs to turn or coils to tap. Installation is simple; hook on wire antenna, ground, coax cable to station and balancing module at opposite end of wire. The antenna is ready for transmission from 1.8 - 30 MHz at up to 3KW PEP.

- SWR max 2:1, 1.5:1 average
- wire lengths should be 1/2 wave on lowest frequency for maximum efficiency.
- inverted V, inverted L, rombic, random wire or loop antennas
- weatherproof
- 2 year warranty

AIM-1 ..... **$119.50***
with 130' antenna wire and insulators $129.50*
Stranded Ant. Wire .08 ft.



EA-160M

160 meter 1200 watt Amplifier

The 160 meter Econo-Amp will give you the edge on "Top Band" this season. With 100 watts of drive, the Econo-Amp will produce 1200 PEP input on SSB or 700 watts CW. This is a great little amp for "Top Band".

- 1200 watts PEP
- 117/234 VAC
- Tuned input
- Pi-net output
- 4 - 6MJ6 tubes
- Forced air cooled

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Special: EA-160M **$289.50***

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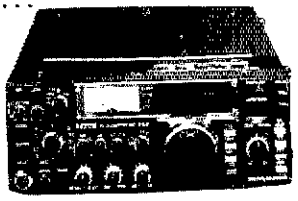
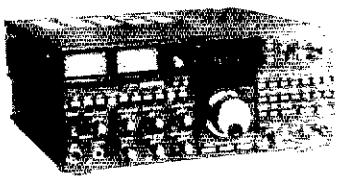
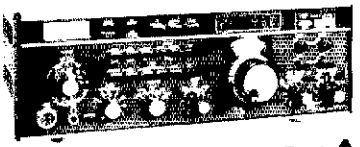


ICOM

IC-R70, IC-720A, IC-730, IC-740, IC-25A/H, IC-35A
IC-45A, IC-251A, IC-2KL, IC-471A, IC-290H, IC-751



YAESU



FT-ONE, FT-980, FT-102, FT-77, FT-707, FT-230R FT-757
FT-726R, FT-480R, FT-720RU, FT-290R, FRG-7700, FT-625RD

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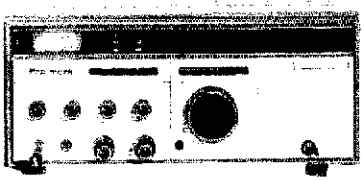
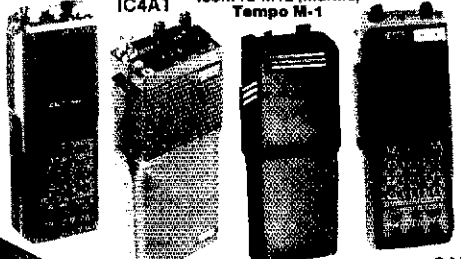
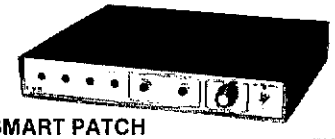
IC2AT
IC3AT
IC4AT

Land-Mobile H/T
Midland
Wilson Mini-Com II
Yaesu FTC-2203, FT-4703
Icom IC-M12 (Marine)
Tempo M-1





DRAKE TR-5, TR-7A, R-7A, L-7, L-15, Earth Satellite Receiver ESR-24, THETA 9000E & 500, EARTH SATELLITE STATION ESS-2250



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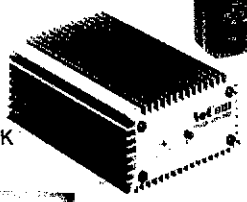
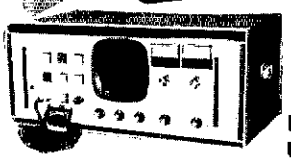
CES-Simplex Autopatch 510-SA Will Patch FM Transceiver To Your Telephone. Great For Telephone Calls From Mobile To Base. Simple To Use - $319.95.

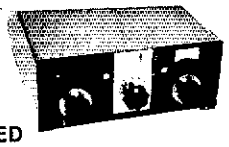
ROCKWELL/COLLINS KWM-380

VoCom/Mirage
Tokyo Hy-Power
Amplifiers &
5/8λ HT Gain
Antennas IN STOCK





SANTEC
ST-220/UP
ST-144/UP
ST-440/UP



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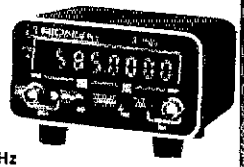

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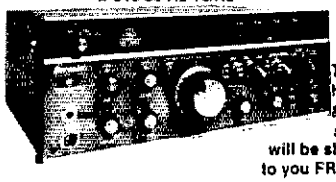
Trionyx-
Model TR-1000
0-600 MHz
Digimax Model
D-510 50 Hz-1GHz



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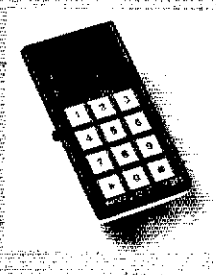
Morse Keyers & Trainers by AEA

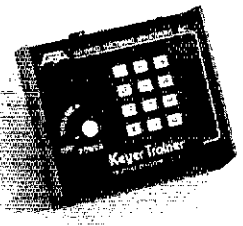
AEA produces the finest Morse keyers and trainers in the world. All AEA keyers operate with any standard keyer paddle and offer selectable monitor tone, selectable dot and dash ratios, full weighting and selectable dot and/or dash memory. In addition, all our keyers offer full, semi-automatic or straight key modes. The keyers and trainers are keypad controlled which significantly reduces the complexity of operation for all the features offered. Each keyer has separate + and - keyed outputs for keying any modern transmitter. All keyers and trainers operate from 12 VDC (or 117 VAC with optional model AC-1 wall adaptor) which makes them ideal for portable operation. AEA microcomputer-based products are all subjected to a full burn-in and test prior to shipment, as well as being designed for maximum R.F. immunity.

NEW BT-1



The **BT-1 Basic Trainer** is a hand-held computerized unit which teaches the code one character at a time at 18 or 20 words per minute. The BT-1 contains a self-paced training program that allows serious students the possibility of learning Morse to 20 wpm in as little as one month! Each character represents a separate practice session in which the character is first introduced by itself, and then presented 50% of the time along with all previously learned characters. There are no tapes to memorize, wear out, or break. No programming skills are necessary; the BT-1 is very easy to use. The tone oscillator can also be keyed for sending practice. An earphone jack is provided for private listening. The BT-1 will go as high as 99 WPM in 1 WPM increments. A battery operated version, the BT-1P, is available with wall charger and internal NICAD batteries.

NEW KT-3



The **KT-3 Keyer-Trainer** unit uses the teaching program used in the BT-1 trainer. In addition, the KT-3 features a full function Morse automatic keyer for keying any modern transceiver, or for sending practice. Speed range is 18-99 wpm for transmitting and 1-99 wpm for training.

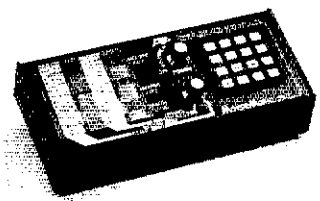
KT-2 Keyer Trainer

The **KT-2 Keyer-Trainer** is a computerized keyer with all the features shown above, plus a Morse proficiency trainer. It is designed to increase your existing code as quickly as possible. The unit can be set for beginning practice speed, ending practice speed, and duration of practice. The microcomputer does all the rest by gradually increasing the speed during the practice time selected. You can even select between fast code (Farnsworth) or slow code methods. The characters are sent in 5 letter groups, or random word lengths. Two levels of difficulty can be selected; common Morse characters or all English Morse characters. A 24,000 character answer book is provided for the 10 separate starting positions. There is also random practice mode for which no answers are available.

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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to hold it in Jackson Hole, WY again next year the first weekend in August. A new solar powered 22/82 repeater is on the air on Flattop Mt. south of Big Sky. This machine gets into many areas of Yellowstone Park. PSHR: WA7GQO WB7WVD.

Net	Sess.	QNI	QTC	Mgr.
MTN	21	810	86	KB7SE
IMN	21	172	94	K7RX

WB7WVD 88, WA7GQO 51, N7AIK 30, W7JMX 11, W7LBK 2.

OREGON: SM, William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. Section still needs someone to manage the bulletin stations and to recruit more stations to keep information flowing throughout the section. Upgrades: KA7NZR (Gen); N7CHF WB7EDL KA7FEH K7AWP (Adv.); ND7T KA7MTY ND7U KD7CK WB7VBQ (Extra). K7WWG and lady have a new baby girl. Congrats to all! Salem ARC did such a fine job last year at the Oregon State Fair they have been asked to return this year for three days. Don't miss it. Are there any interested stations for a Novice net on 7.138 MHz at 7:30 P.M. on Thursdays? Let KA7JOA know if you are interested. With the forthcoming FCC/amateur monitoring program, there are too few Official Observer stations in Oregon. If you are interested in rendering a valuable service to Amateur Radio, you can get in on the ground floor, NOW. Contact SM or N7SC, Section OO Coordinator for info. Sunset Empire ARC in Astoria invites all amateurs to visit the U.S. Coast Guard Lightship "Columbia" and see club station in the original radioroom, which also contains the original equipment used when the ship was in commission. If you can't visit the ship, listen for the station on the air. Some regular info will not make the column this month owing to vacation departure. BSN totals: QNI 541, QTC 301. Traffic: W7VSE 810, WA7LGN 142, KN7B 111, KA7ELI 80, AL7W 80, KA7AID 80, WB7OEX 55, W7ZB 52, KM7Z 34, KI7Y 32, N7BGW 29, W7LNE 26, WB7OFI 4, KA7DNV 2.

WASHINGTON: SM, Joe Winter, WA7RWK — SEC: K7SH. STM: W7GB. ACC: K7RS. TC: K7UU. BM: KD7G. PIO/SGL: W7CKZ. OO/RFI Coord.: KB7WC.

Net	Freq.	Time(Z)	QNI	QTC	Sess.
WSN	3590	0145/0445	408	310	60
WARTS	3970	0100	2729	195	31
NTN	3970	1900	934	50	31
NWSSBN	3945	0130	898	46	46
EWTN	146.64	0030/0430	64	59	50
PSTS	145.33	0030/0530	194	110	62
SCARES	147.18	0230 (Wed)	17	3	—

Clallam Co. ARC's WB7EGL saw a car on fire, smoking and pulling off the road. He called for help on the 146.76 rptr. and contacted WB7RHT who notified his OM WA7DNA in the Police Dept. Bruce, Sr. had fire & emerg. equip. dispatched immediately. N7FIP was also on scene to assist. Congrats fellows. My visit to CCARC was very enjoyable. Tnx for your warm hospitality. WWDXC — the 31st NW DX Convention at Southcenter (Sea.) was great. We enjoyed the good programs, fellowship, food & hospitality. Good prizes were also given. Recommend you attend next time! Seventeen mbr's of the Yakima ARC furnished comms. for the 1st Annual Air Show. The hams did so well that they were requested for next yr. KA7DWH saw a fire expanding towards 2 parked vehicles & a bldg., and put out a call on the 146.85 rptr. WA7BIQ responded & called the fire dept. Neighbors moved the slightly damaged vehicles while KA7DWH & others contained the fire with a bucket brigade until the fire dept. arrived. Well done! Radio Club of Tac. had great success with its fireworks stand this year at a new location. Experiencing chest pains one night at 10 P.M., KA7NSR called on the club rptr. 147.28. N7BXI N7AZN & WA7RWK called for an aid car and a close-by friend to proceed to the scene. He's OK. No heart attack but the hams were there to help. RCT will again have a booth at the Western Wa. Fair in Sept. KA7DCX is in charge. Mike & Key ARC filed a reply to the No-Code proposal. Rebels Bar-B-Q was a total success at the WA7BLE & WA7BLF QTH. New officers: K7TVO pres.; W7IGC, v.p.; WA7FNC, secy./treas.; W7ZMG, custodian. Ck. into the new net Tues. 9 P.M. on 3975 kHz. BEARS mbr. AI7N heads comms. for tennis tourney in Bellevue. Sevens hams helped keep the event going coordinating 463 players using 50 courts at 13 sites. The hams are expected to return next yr. Lower Col. ARA: I enjoyed my visit to LCARA and appreciated the opportunity to talk about the new ARRL field org'n. KA7CRN is heading a project on ELT. I also appreciated addressing the Clark CARC on the new org'n. Traffic: WB7OUG 940, W7DZX 566, WB7WOW 522, KS7I 326, W7LG 246, KD7ME 180, N7ANE 168, W7HNA 157, K7GXZ 144, K7CTP 66, KR7F 62, N7DDP 58, WA7BDD 56, W7GB 54, W7IEU 53, N7AFZ 39, N7AFY 34, W7APS 32, W7LUP 32, K7AJT 20, KD7G 18, KA7INX 13. (June) KR7F 48.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG — ASMs: W6ZF N6DHN VE2AQV/W6. SEC: W6LKE. STM NI6A is slowly getting back on the air from his new QTH. Most club editors must be on vacation, as only two newsleters were received! EBARC is making headway on their plan to buy a new xcvr for Salvation Army Hq. Eighteen of their members pledged $10 each last month, bringing their fund total to $350. MDARC members KA6ODX W6KLM KA6DPW W6BXE KA6AEV KA6EBF WA6QAZ & WA6DQN provided communications for the 20-mile Ride for Reseach on Mt. Diablo. Alameda Co. RACES members K6JNW WD6EVM W6RGG WB6NMW WB3FCV KA6PNL KD6PC K6CSL WB6UZX WB6QFQ WB6VIV WA6NJR W6KCV N6FSV WA6RBS & N6IG provided communications for CDF firefighters at the Del Valle fire scene and at the county EOC. Also at the fire scene were members of Livermore RACES and the CDF VIP program. Amateur Radio was well represented and well received. N6XN W6AVD WB6VGC & WB6FHH are active on the Napa Valley Emergency Net. W6ZF home from a visit to the hospital for tests and has a new monopole on a 40 ft mast. Traffic: NI6A 143, K6APW 142, W6VOM 138, WB6DOB 66, K6AGD 54, WB6UZX 28, N6RO 2.

NEVADA: SM, L. M. Norman, W7PBV — STM: W7BS. Volunteers are needed from qualified members for section appointments. W7JVF has moved to New Mexcio. W7PBV out of hospital cardiac intensive care unit, is home recuperating doing fine. Boulder City group meets each Saturday morning for coffee break. Las Vegas group meets every other Tuesday at 76 Truck Stop for dinner. Reno group meets second Saturday each month for breakfast. K7WLY, author of the northern NV emergency communications plan, is a Silent Key and will be missed by all. W7KFI is State Army MARS Director, and K7ZOK is State Assistant Army MARS Director. Sagebrush Net 3906 meets Monday thru Friday. NCSs are W7BS KA7FPN K7QOP WB6MXA/7 and WB5VDV/7. K7EP is State CD communications officer. CD net meets on Mondays 3996.5, 1900 local. NV weather net meets Monday thru

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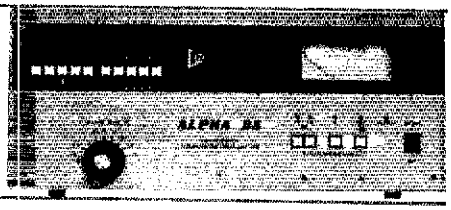

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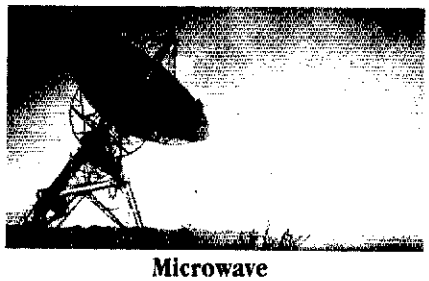

Microwave

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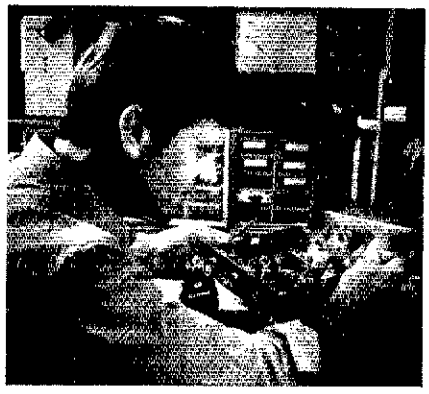
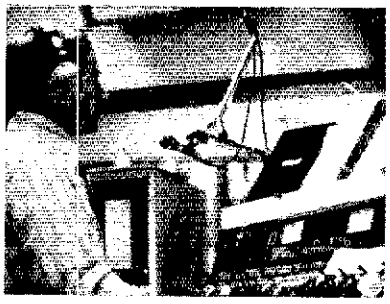


CB Radio



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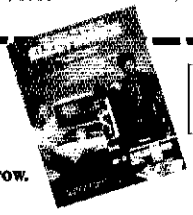

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Saturday 3992, 0600 local, KA7EUA NCS. Traffic: W7BS 103, W7PBV 3.

PACIFIC: SM: Army Curtis, AH6P — Aloha and hafa adai to all of the Pacific. Mauna Loa has a new beacon. In addition to his beacons on 432 and 1296, KH6HME has added a new one on 2 meters. Operating on 144.052 MHz, the beacon runs 48 watts ouput to a 7-element yagi, horizontally polarized, aimed at the mainland. The old man of the mountain, KH6EJ in Hilo, was on the Cable News Network giving the world an update on the volcano erupting here. Nice work! The crew on Maui busy again with the Jr. Tennis Tournament and the Run to the Sun. The Hawaii Afternoon set a new record with QNI 284 for July. That's an average of 9 checkins each session! Traffic: KH6B 228, KH6HIJ 64, KH6S 44, KH6H 16, KH6CCL 5, AH6K 4.

SACRAMENTO VALLEY: SM, Norman Wilson, N6JV — SM elect and SEC: N6AUB. ASM: KI6T. Congrats to KA6YXZ and KB6AEK on making Tech, and to KB6BIM on making Novice. KA6VLA is now N6IOS, KA6YIZ is now N6IUG and KA6YZR is now N6IUJ. A reminder to all club officers to make sure the new SM is on your mailing list for your club news letters. The GEARS, Chico, will hold their annual steak-bake on Sept. 10 at 5:30 P.M. at the Chico Elks Lodge. The Sacramento ARC is now meeting at the Army Reserve Center at the Sacramento Army Depot. Traffic: N6YR 4, N6JV 2.

SAN FRANCISCO: SM, Bob Smith, NA6T — SEC: N6BLN. STM: K6TP. Sorry to hear that WB6CIE is a SILENT KEY. She will be missed by all. She was a driving force in MARC and ACS as well as various community interests. Don't forget the ACS dinner in Occidental on Sept. 10. FWRA-HARC ARES/RACES net is meeting on Wednesday after FWRA area net; listen to the net for frequencies and call-up times. Sorry to hear that KA6SSM, is a Silent Key. He was renewing his interest in Amateur Radio after retirement and was very active in SCRA. SFRC's new repeater is in fine working order, lots of new coverage and activity. Check 145.15 MHz (– 600) when you're in SF area. Tks to N6IMS and WA6DQP for a job well done. REXDA enjoyed W6OAT's presentation on Johnston Island. Sounds like it would be a good place for RF 1984? Hope everyone had a good time at Reno for the PACIFIC DIVISION CONVENTION. I was glad to see a good representation from the SAN FRANCISCO SECTION. Glad to meet you all.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. SMs: W6TRP K6YK, K6AYL and K6EIA are SILENT KEYS. K6PMG is ORS. Appts renewed. OBS-N6AM W6XK W6NTK N6OZ; ORS-W6SX; EC W6BWM. Officers of the Porterville RC are: Pres WA6CYN, VP K6LSB, S/T KA6DWL. Officers of the Central Cal Teleprinter Society (CCATS) are: WB6ITM, pres.; W6PJD, v.p.; WA6CTR, s/t. KF6JN is Extra. KA7OSF is N6IYW. KA6WHO is KG6DA. W6SX has DXCC on cw. N6HFU has a Kenwood TW4000. WA6TJW has a Santec 220 MHz handheld. N6AWH has a TR7950. WA6EXV is the SJV Technical Coordinator. He will be contacting clubs regarding programs. A copy of the film, *The World of Amateur Radio*, is in the SJV. It is available for clubs or PR. Contact the SM for scheduling. Your EC should be preparing for SET. Contact him to offer your help and register for ARES. Amador Co. is now in the Sacramento Valley Section. Traffic: N6AWH 90, WA6YAB 32, W6DPD 11, K6PMG 9, W6SX 1.

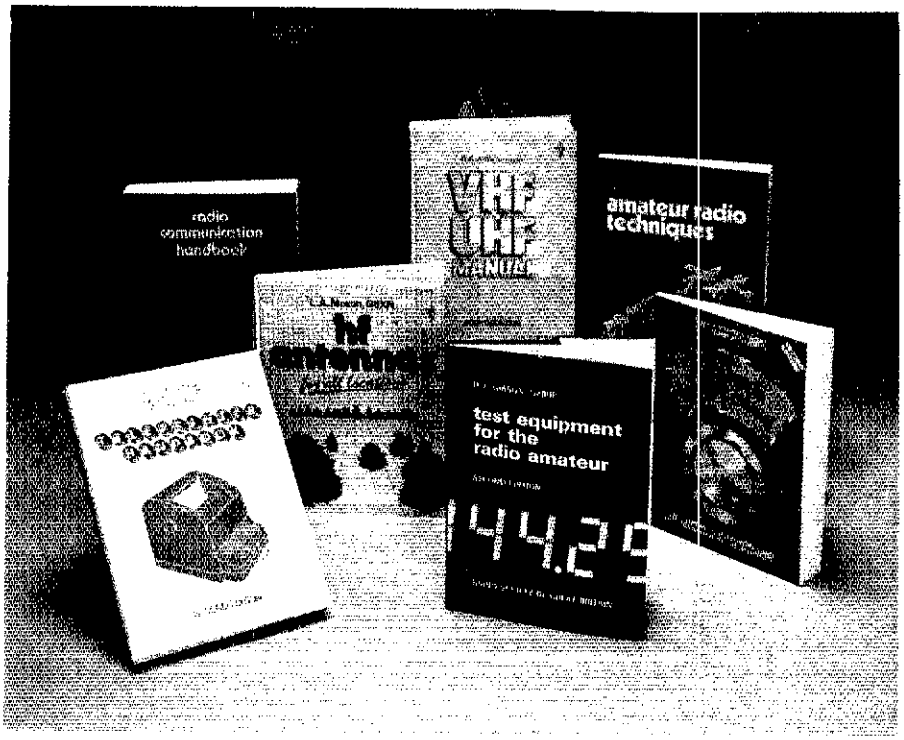
SANTA CLARA VALLEY: SM, Ross Forbes, WB6GFJ — SEC: KA6R. STM: W6ZRJ. PIO: WB6PBU. ACC: W6MKM. ASM: KB6ZV. The Reno convention was great. The forums and talks were informative and attendance was good. WADG deserves a pat on the back. Tune in any evening on 75 meters and say hello to regulars KA6AOS KD6NZ KA6AFY WA6KRA and others at 2100 local time on 3.850 MHz. No formal net, just lots of ragchewing. K6HLE recently presented an outstanding talk on "FM" to the SCV Rptr Soc. Congrats to recent upgrades to Extra Class; WB6WKM & N6HMO. K6AEP usually leads discussions and answers questions about color computers, SSTV, & programming on 145.51 simplex in the evenings. Santa Clara Co. AHA had their annual "Old Timer's Night" in Sept. It is interesting to talk to some of the hams who were pioneers in Amateur Radio. Many hams in the section are excited about the DXpedition of W5LFL aboard STS-9. W5OL is scheduled to give a talk to the Santa Cruz Co. ARC at their November meeting. His topic: Direction Finding. N6EVD & N6EVL have just returned home to Santa Cruz after 2 years of sailing in the Pacific. They made good use of ham radio during their trip. KD6BD & wife sold their home and now live aboard their boat on Monterey Bay. The new NCDXC officers are: K6RK, pres.; K6TMB, v.p.; WB6ZUC, secy.; WB6WKM, treas. K6XN W6SZN & N6QR have all earned 5BDXCC. WA6PWW was just elected pres. of the Memorex RC. City of San Jose has given S.J. RACES group a van for emergency communications. Contact WB6UGG or N6FBA if you would like to help convert van over to a mobile emergency comm. vehicle. No. Peninsula Electronics Club visited the U.S. Weather Bureau in Redwood City and learned about communications and satellites used in weather forecasting. San Mateo RC provided all the communications for the "Special Olympics" for the handicapped which took place at Mills High School. Traffic: W6PRI 112.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ian C. Black, WD4CNR — STM: W4EAT. SEC: KU4W.

Net	Time(z)	Freq.	QNI	QTC	NM
CMN	1145	3927	539	202	W4EAT
CSN	2200	7115	170	38	NJ4L
JFK	2230	3923	685	60	WB4WII
CEN	2245	3893	562	161	WB4MJH
THEN	2330	3923	435	32	WD4LRG
CN	2300/0200	3574	507	259	K4WJR

July brought its quota of good newsletters to this desk. Seems like this month is vacation time with several clubs mentioning low attendance at club meetings and also slower activity on the nets. Same was true on the low bands-tfc came in spurts when it came, and often there was no tfc at all. Thanks to KA4TAU, I now know one more newsletter editor. Hope all you editors & clubs are aware of the Director's Newsletter contest. If interested, get in touch with Div. Director W4UG. I think NC has winners in every category. Our Section lost another friend and active amateur in July when W8JUP passed away. He was active on most of the NC tfc nets, and will be missed by his many friends in the section. Asheville hamfest was attended and enjoyed. I haven't heard if it was a financial success or not, but as a good and well planned affair it was super. Not quite as easy to find as the previous location but excellent talk-in work took care of most problems. I'm giving WD4AAK the prestigious "Never Have So Many Been Confused By So Few" award this month. Can't close without recognizing the great job of liaisoning set up by the principle VHF nets in our section. CNCTN, PCTN &



PUBLICATIONS FROM THE RADIO SOCIETY OF GREAT BRITAIN

VHF-UHF MANUAL by G. R. Jessop, G6JP. You will find the new fourth edition of *VHF-UHF Manual* jam-packed with practical theory and construction projects for the region above 30 MHz to 24 GHz. the microwave chapter has been expanded to 83 pages; and includes information on: converters, cavity amplifiers, Gunn diodes, waveguides, directional couplers, and antennas. Receivers and Transmitters for these bands are covered in 181 pages. The balance of this 512-page book contains chapters on propagation, tuned circuits, space communications, filters, test equipment, antennas, and a handy data section. (Since this is a British publication, there is little coverage of the 6-meter band, but many of the 4-meter band projects can be adapted by the experienced amateur for use on 6-meters.) Copyright 1983. Hardbound **$17.50.**

AMATEUR RADIO OPERATING MANUAL by R. J. Eckersley, G4FTJ. Get the British side of operating. Besides such chapters as Setting up a station, and Mobile, Portable and Repeater Operation, the reader will find information in the Appendices most useful. There are continental and regional maps which show the prefixes assigned to each area and listing of countries showing ITU callsign allocations, callsign systems for each country, notes on foreign amateur operation, addresses of licensing administrations and the names and addresses of National Amateur Radio Societies. 189 pages. Copyright 1979, 2nd Edition. Softbound **$10.00.**

HF ANTENNAS FOR ALL LOCATIONS by L. A. Moxon, G6XN. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna: Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwith; Antenna Design for Reception; The Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00**

TELEPRINTER HANDBOOK with mechanical teleprinters available at inexpensive prices these days, this book shows how you can set up a RTTY station and keep the equipment running. Besides covering British made machines, the *Teleprinter Handbook* also covers maintenance, repair and operation of Teletype Model 15, 19, 28, 32, 33, and 43 units. Also covers reperforators, power supplies, demodulators, polar relays, keying methods, filters, and test equipment. 353 pages, Copyright 1983, 2nd Edition, Hardcover **$21.00.**

RADIO COMMUNICATION HANDBOOK 5th Edition. You probably have the ARRL *Radio Amateur's Handbook* in your library. Now you can have a second source of authoritative radio frequency and electronics information at your fingertips. Contains 23 chapters (778 pages): Principles, Electronic Tubes and Valves, Semiconductors, HF Receivers, VHF and UHF Receivers, HF Transmitters, VHF and UHF Transmitters, Keying and Break-in, Modulation Systems, and RTTY, Propagation, HF Aerials, VHF and UHF Aerials, Mobile and Portable Equipment, Noise, Power Supplies, Interference, Measurements, Operating Techniques and Station Layout, Amateur Satellite Communication, Image Communication, the RSGB and the Radio Amateur, and General Data. Now in one paperback volume. Copyright 1982, **$22.00**

AMATEUR RADIO TECHNIQUES by Pat Hawker, G3VA. Contains 800 diagrams and 364 pages of circuit ideas and devices which the author has gathered during 22 years of writing the *Technical Topics* columns in *Radio Communication*. It is not a text or handbook, but an idea book —RSGB's version of ARRL's *Hints and Kinks*, but on a larger and more in-depth scale. Copyright 1980, 7th Edition. Soft cover **$12.50.**

TEST EQUIPMENT FOR THE RADIO AMATEUR by H. L. Gibson, G2BUP. A great addition to the library of the Radio Amateur who builds his own equipment. Beside measuring techniques, you will find a wealth of test equipment you can build yourself. Construction projects range from simple dummy loads and attenuators to a 150 MHz digital frequency counter and timer. You will find simple signal sources for 1296 and 2304 MHz and 10 GHz. Chapter titles and number of pages devoted to each: Current and Measurement — 23, Frequency Measurement — 23, Wavemeters — 19, RF Power Measurement — 9, Aerial and Transmission Line Measurements — 9, Noise Measurements — 8, Components, Valves and Semiconductors — 12, Signal Sources and Attenuators — 12, Oscilloscopes and Modulation Monitors — 8, Power Supplies — 3, and Reference Data — 8. Copyright 1978, 2nd edition. Hardbound **$11.00.**

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PETN are all making life easier for us on CMN and CEN. Thanks fellows. Traffic: WD4CNQ 165, WD4LRG 155, KU4W 143, WD4CNR 140, K4DDY 116, WA4OBR 115, K4NLK 98, WB4WII 70, NT4K 67, W4GRO 60, WA4SRD 60, K4IWW 51, WB4N 48, KA4KJI 47, NE4J 33, WB4CYN 32, WA4YTO 32, N4EHM 27, W4TWD 27, KB4CUI 26, WD4HTE 20, WD4CEB 19, KZ4A 10, WD4LOO 10, N4UE 10, KC4AM 4, KA4ATK 4.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — ASM: WB4UDK. SEC: K4SUG. STM: W4ANK. OO/RFI: W4NTO. TC: NE4G. PIO: WD4NMF. NMs: K4WJR KA4LRM WB4SOD. Congrats to call the new Novices and also the amateurs that upgraded. We have a number of clubs and individuals doing an excellent job in conducting classes for people wishing to enter the amateur ranks. With summer behind us and school in session, it is time for us to settle down and begin our projects for the winter. Looking for something to do? START A NOVICE CLASS. Nets May-July: SC6SB 3343/301; SCNT 736/152; Blue Ridge 5213/225; Greater Pee Dee 3152/313; Western Carolina 696/34; Anderson 658/27; Lancaster 465/54; Carolina State Line 181/7; Laurens 110/0; Newberry 61/4. Traffic: K4ZN 225, K4WJR 164, W4ANK 100, W4FMZ 79, W4NTO 68, KA4AUR 67, WB4UDK 44, K4FRX 37, WA4MIY 36, WD4NMF 35, K4ZB 18, WD4PLB 16, KA4LRM 15, WØIKT 14, W4DRF 8, WD4FJP 6.

VIRGINIA: SM, Phil Sager, WB4FDT —

Virginia nets		
VA Traffic Net	1 P.M.	7260
VA Sideband Net	6 P.M.	3947
VA Slow Spped CW Net	6:30 P.M.	3680
VA CW Net	7/10 P.M.	3680
VA Late Net	10:15 P.M.	3947

K4IUM and K4JST had the opportunity to use their equipment in a true emergency twice during their vacation. Both incidents involved motor vehicle accidents with injury, with the authorities being notified via 2 meters. K4JST writes, "We learned a couple of lessons from these incidents. If you are in a position to use a HT remote from a base, do not try to use a separate simplex frequency from the local repeater output. Simply use the repeater output frequency. That way both the remote and the base operator can keep track of activity on the repeater. If the remote needs to talk to the base station, the close proximity allows the remote to capture immediately. The base operator must be firm in maintaining control of the repeater frequency. Choose a station who is in reach of a phone and who copies the repeater plainly. Do not waste time with other operators who merely want to know what is going on. Always keep a local repeater dialed into your rig." New OO is KE4EQ from Danville. PVRC looking for new meeting place. Congrats to PSHR WA4CCK K4JST WD4ALY AA4AT WB2RBA KB4WT K4VWK KR4V NN4I KB4OG and WD4OCW. SVEN reports 31 sessions with QTC of 33. STARES reports 37 sessions with QTC of 135. Traffic: AA4AT 469, WA4CCK 418, W3ATO 389, WD4FTK 252, WA4LJI 235, WD4ALY 205, WB4PNY 197, K4KDJ 191, WD4OCW 190, WB2RBA 180, W4JLS 158, W4NFA 148, KB4OG 146, KR4V 127, KA3DTE 123, W3BBN 116, W4UC 106, K4JST 95, NN4I 77, K4AET 65, K4JM 57, KB4PW 53, KB4WT 53, KA4JXZ 45, NT4S 43, NW4O 39, KA4IUM 38, K4VWK 38, K4MLC 30, N4FNT 28, N4HYO 27, WB4UHC 22, KA4ZTB 20, WB2OMZ 17, NF4T 17, WB4FDT 15, W4PVA 10, N3RC 9, W3BBQ 8, WD4DUU 8, WB4RDV 8, WB4ZNB 8, WB4MAE 7, W4TZC 7, K4DHB 6, WB4KIT 5, WB4ODZ 5, WA4TVS 5, W4DM 3, WB4DQZ 3, KI4W 3, N4LE 2, WA4EQW 1, W4LXB 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. SGL: K8BS. TC: K8CG. Rptr. Coord.: WA4KHL. NC8G has returned after nice vacation trip to Iowa, Nebr & Colo. WA8KCJ celebrated 50 yrs. as a ham on 8/7. WB8IHA is now a resident of Chas. and plans to attend WV State this fall. Remember new freq for fone net is 3900. Plan to come back and rejoin us. Congrats to WA4K and committee on staging successful hamfest at Bluefield on 8/26.

Net	Freq.	Time	QNI	QTC	Sess.
WVN	3567	7:00	115	44	29
WVFN	3900	6:00	482	92	30
WVMD	7235	11:45	565	52	31
Hillbilly	14290	1600Z Sn	122	19	5
KFC2M	87/47	8:30 M	73	2	4

Traffic: KZ8Q 80, K8KT 54, W8JWX 53, WA8KCJ 43, K8QEW 31, N8AJC 27, NC8G 3.

ROCKY MOUNTAIN DIVISION:

COLORADO: SM, Bill Sheffield, KQ0J — SEC: KQ0W. DEC-East: WB0UAW. DEC-WEST: N0ACW. STM: WD0AIT. Transmitter hunts are good training. Frequently, repeaters are locked up with unwanted carriers, most of the time unintentional. Recently a local ham left a mike in his vehicle keyed. A number of trained club members made short time of finding him and resolving the problem. Every ham should work with others to train for this type of problem. Many techniques are available; write me for any info. Look forward to many phone company changes during the next year. To protect your repeater autopatches, please start right now making arrangements with your local company. Some options are available, but don't wait until it is too late & you can't afford the costs. Contact SGL WB0FQB for any help or info. WIMU hosted the Rocky Mtn. Div. convention in Jackson Hole, Wyo. It was a successful event, and much was accomplished by the four SMs and Div. Directors. N0ACW with the help of 40 area amateurs handled communications for the Gerald Ford Golf Tournament which raised over $50,000 for charity. This month's name droppers: N0ACW KA0BAD K0CL; congrats. Nets: CWN — 28 sess., QNI 131, QTC 115, QNF 604, CWXN: 31 sess., QNI 2534, QTC 3047, QNF 1290, HNN: 30 sess., QNI 1452, QTC 78, Int 244, QNF 1297. Traffic: N0BQP 1973, WA0HJZ 1942, KA0AN 493, W0ACH 373, W0WYX 231, KA0CZW 173, KA0DMR 172, W0FPT 172, KB0Z 160, WD0AIT 155, N0CXI 146, KA0NLJ 108, W0LAE 76, WB0NHA 60, W0LQ 19, N0EBM 18, W0MDT 10, W0GW 2.

NEW MEXICO: SM, Joe T. Knight, W5PDY — DEC: KB5XD STM: KV5U. NMs WA5UNO KB5LJ W5VFQ. Southwest Net (SWN) meets daily on 7099 at 1930 local, and handled 199 msgs with 215 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 at 0100 UTC, and handled 75 msgs with 918 stations in. New Mexico Breakfast Club meets daily on 3939 at 0830 local, and handled 69 msgs with 1002 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 8 msgs with 360 checkins. Caravan Club 2-Mtr Net 66/06 handled 16 msgs with 142 checkins. Ft. Tuthill (Flagstaff, AZ) was outstanding with abt 400 in attendance. WIMU at Jackson Hole, WY was excellent with abt 400 in attendance. A good time was had by all. Traffic: W5JOV 162, W5DAD 148, ND5T 134, N5SJ 88, W5ENI 44.

UTAH: SM, Ron Todd, K3FR — Had a great time meeting with those who attended WIMU. Next year Utah hosts this convention with myself as chairman. All input and help will be greatly appreciated. New column format; I will

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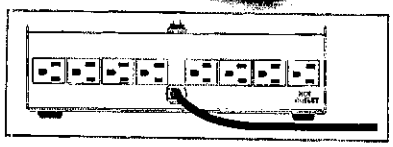

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rotate traffic totals, net activity and leadership flagstaff on a monthly basis, traffic and nets will be shown with 3-month totals only. QARC did so well at Golden Spike that they were invited back for Nat'l Railroaders Festival. UARC Steak Fry got drenched. Wx disasters seem to be on the wane. Most thorough thanks to all who helped out; sorry there wasn't enough room to list you all. We will address emergency preparedness at section level to help things integrate better. Register with N7BHC if you are going to work STS-9. Traffic: K7HLR 181, WA7KHE 65, WA7MEL 56, WA7WIB 19, W7OCX 10, K7CKF 8, K7UM 8, KO7H 4, W7PBV 3, N7BQE 2.

WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: W0OGH. BM: KD7AN. TC & OO/RFI: KC7QY. PIO & ACC: KC7QJ. The Wyo. Hamfest was a great success again this year, thanks to the Sheridan club. If you did not attend you missed a good time. The main prizes were three Handi-Talkies. The 1984 Wyo. Hamfest will again be held at the Meadow Lark Ski Lodge and will be sponsored by Rock Springs club. W7TZK (Co. EC and Co. Civil Defense Coord.) was very active this last month combating numerous forest fires in Crook Co. KD7AN is experimenting with 2M-10M remote base in the Cheyenne area. WB7NHR reports the Wyo. Cowboy Net held 22 sessions with 526 QNI & 10 QTC. WA0PFJ reports the Wyo Jackalope Net held 22 sessions with 325 QNI & 0 QTC. Traffic: WB7HNR 124, W7HLA 43.

SOUTHEASTERN DIVISION

ALABAMA: SCM, Hubert H. Wheeler, W4IBU — congrats to Shelby Co. ARC for being first in SE Division to apply for SSC. The flight of STS-9 with W5LFL aboard has been rescheduled to Oct. 28. Did you know that he will be permitted to operate only one hour each day and that he will be accessible for only a few minutes from your QTH owing to being below the horizon. The time of day of accessibility will depend on launch time, his free time, and orbit time!! Orbit time should be about 90 minutes. A fine antenna and 1500 watts PEP would help!! N4DKE is the new prez of B'ham ARC, and KA4VIK is new editor of BARC newsletter. The FD results should hopefully show some winners in the section. Should the ARRL consider a life membership based on an actuarial basis, i.e. should an older person be permitted to pay less? If you think as I do contact your director. The new ARRL Articles of Assn. and By-Laws are now available!! The election of your new SM has been completed. I do hope you voted!! If not, forever hold your peace. CAND reports Alabama represented 100% by W4CKS and N4FQD. DRN5 reports Alabama represented 100% by WA4JDH W4CKS NW4X WB4IXA W4WJF W4IBU KC4GS N4FQD and KA4AKD. Traffic: WA4JDH 647, W4CKS 69, WA4LXP 64, WB4IXA 60, NW4X 34, W4IBU 34, N4JAW 24, N4FQD 18, K4AOZ 8, W4DGH 4, WB4TVY 4.

GEORGIA: SM, Eddy Kosobucki, K4JNL — STM: W4WXA. SEC: WB4HXE, ASEC: K4SWJ. First of all I want to say thank you from the bottom of my heart for the excellent cooperation you wonderful Georgia radio amateurs have given me for the past four & a half years as your SCM. Now as I commence a new term as your Section Manager I hope that you will continue to give me that fine support. As of Jan. 1st the League's LRPC programs were put into effect. We've made many strides in all of these new areas & I'm hoping that in the next two years we can make many more. Besides the STM & SEC, there are now six more new staff members. After much thought & consultation I have chosen the cream of the crop in each of the fields. I am listing each of the staff & am not publishing their telephone numbers; as of this writing I don't have their personal permission. You can write them with problems or information.

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Public Information Officer (PIO)
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Albert C. Smarr, W4BTZ
P.O. Box 52701
Atlanta 30345

Technical Coordinator (TC)
Curtis E. Greenway, K4UDR
215 Oglesby Rd.
Conyers 30208

Robert E. Good Jr., K4VHC is the OO/RFI Coordinator. (He is moving to near Dacula. I will publish his address next month.) W4BIA has temporarily held the Bulletin Manager position until we can get a permanent one. Any volunteers? See u on 3975 at 6:30, Wed. Oct 5th for the first session of the ARRL Information net. You all come. Traffic: W4PIM 130, WB4RUJ 100, K4EV 40, KA4ATM 39, W4BIA 31, K4BAI 15, K4JNL 14, K4NM 14, W4HON 13.

NORTHERN FLORIDA: SM, Billy Williams, N4UF — SEC: W4UEA. STM: WF4X. ACC: N4ADI. BM: W4GUJ. PIO: WA4PUP. I appreciate the many newsletters which I receive from around the section. Owing to action by the ARRL Board of Directors, our travel allotment has been cut 75%. Because of this action I and the leadership officials in the section have not been able to travel much. Since N Fla is 350 miles length-wise (from Jax to Pensacola), the very limited travel allotment does not go very far. The new section structure was supposed to be an improvement, but this cannot be the case as long as adequate membership contact is not maintained. There have been rumblings from Hq about a revision, but proper planning in the first place could have prevented the problem. As a result of the changes, there are no special service clubs in the section yet. There is no expense money to cover their administration. Fortunately, we have a good corp of newsletters editors here who help fill the void. A recent upgrade to Amateur Extra is WD4FHD. Lots of good publicity this year from Field Day. Several good newspaper articles published in the commercial press and also broadcast publicity. N4ECR W3GEH and W4RTK all made Advanced. K4MZA is now WR4Z. Dates for the 1984 Orlando Hamcation are March 9-11 at the same convention center site. St. Johns Co. ARES Net meets each Thursday at 1930 local on 146.625. NCS is WA4MST. Sorry to hear that W4DOK is a Silent Key. KC4VK lining up potential sites for special events stations for the Daytona Beach ARA. New hams in Gainesville are KB4DSV and KB4FWA. K4DPZ repeater has autodial back in service which among other things provides direct emergency connection when 911 is dialed. Traffic: N4PL 497, WF4X 497, WB4ADL 229, N4GDT 205, WA4EYU 186, WD4HBP 181, WA4QXT 155, KB4LB 146, W4GUJ 86, WB4TZR 74, W4MGO 67, NF4O 58, WD4IIO 58, KB9LT 52, NY4E 43, KD4KK 40, NS4C 39, WD4RIQ 37, WB4YQP 36, KA4ETX 36, WB4AWG 24, WD4RJI 23, KE4GW 19, WA4STZ 17, KF4GY 6, N4UF 6,

N4HGD 5, KX2L 5, K4PYV 2, NQ4P 16, W4LUW 16, W4LUW 9, KD4QZ 24, KA4RBY 15, KA4RMH 3, WB4FJY 15, WD4ORO, (Apr) KF4U 79, (May) WD4MLQ 43, W4KIX 4, W4KIX 45, (Jun) KF4U 75, WD4MLQ 31, WF4Y 344, W4MGO 79, W4PUP 13, W4KIX 29.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. ACC: AA4WJ. This month the number of stations reporting increased significantly over last month! KA4AMC, the new manager of QFNS, went into the hospital at the beginning of July with a heart attack. The good news is that he is back again as of Aug. 1. KA4FZI did an outstanding job as acting manager while KA4AMC was recuperating. WD4COL and N4APZ are the proud parents of Jill Elizabeth, born July 10. K4JLL was elected manager of the SWFTN beginning Aug. 1. Congrats to WK4F, who has done a fine job with the net these past two years. N4GDT in the Norther Florida section has been named assistant manager of TPTN. Congrats to WD4CCX who upgraded to General this month. KF4YE has done another update on the traffic handlers list and plans still another for the Melbourne Hamfest. Just send him an SASE for a copy. He is ex-WB4CDQ if you are looking his address up in the *Callbook*. KI4T sent out a very nice letter to the section letting the amateurs know what his areas of responsibility are as the first Technical Coordinator for Southern Florida. He has provided me with a very detailed description of an aluminum communications console that he designed for the National Hurricane Center. If interested get in touch with him and I'm sure he will provide you with details. KA4ASZ gave a talk on traffic handling and emergency nets in Collier Co. During the talk he checked into QFNS and both received and sent traffic as part of his presentation. K4ZK reports that the Martin Co. CD had a simulated emergency test during July with 16 ARES operators at Red Cross Shelters and other locations. W4LLA handled 38 maritime phone patches. N2WX said he is on HF with homebrew AMTOR mode B, and is working on mode A. N2WX has been very active in his appointment as OO also. W4JM reports that the radio club attendance has been holding up well during the summer months. KB5W reported that RN5 handled 522 messages in July. WA4EIC and W4GUJ, Bulletin Managers of the Southern and Northern Florida section respectively, are certainly doing a FB job of bringing the bulletins to the section level nets. 73 de WA4PFK. Traffic: W3CUL 3364, W3VR 806, WA4PFK 343, K4ZK 267, WA4EIC 243, KA4FZI 133, W4NFK 127, WB4AID 118, KA4GUS 108, K4JLL 101, KY4U 96, K4IA 90, WD4CHO 85, K4SCL 83, W4ESH 78, KA4ASZ 77, WA4HXU 71, W8BZY 68, W4DL 68, WB4WYG 61, KA4AMC 58, K4JI 53, WD4KBW 52, K4EUK 46, W4LLA 36, K5IHH 34, N2WX 33, W1DLP 31, W3TLV 31, NJ4O 31, KF4RL 30, N5FUS 28, K7LCA 27, N4KB 25, WB4GCK 24, WK4F 24, W4YCL 23, KA4YHS 23, KB4KB 21, WD4AWN 21, KM4Y 19, KA4NXF 18, W4WYR 18, AA4BN 15, WD8JFP 12, WB2OUK 12, W4DVO 12, WD9AEP 12, WA1VQB 10, W2HAE 10, W8ARW 8, KA4SIH 8, K4FQU 8, KF4JA 7, W4PKP 7, KE4UD 6, KA4MBR 6, WB4GJH 6, NW4R 6, KY0T 5, N4FNY 5, K4VSN 5, KF4AL 4, K4KKP 3, KA4ALM 3, KA4GDU 3, NX4X 2, W4EOB 2, W4MFD 2, WD4PPA 1, WR4J 1, KA8CXQ 1, K4OVC 1, WA4LKY 1, W3IJC 1.

WEST INDIES: SM, Gregorio Nieves, KP4EW — West Indies Net (WIN) daily 7 P.M. (1100 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (1030 UTC) 145.35 MHz. At their last convention, the Puerto Rico YL Club elected the following: WP4ACC, director; Georgie Ramirez (YL of KP4LT), v.p.; KP4FBV; sec./treas.; KP4CBX KP4EBX, KP4EFV, Tomasita Pabon (YL of KP4DC), Ana Rivera (YL of WP4AQV), members. Congrats to the new elected board; good luck for a new successful year. Members of ARES and RACES groups were actively engaged in the rescue operations of a diver who drowned in an underground river near the town of Manati, PR. This group provided communications at the site of the search, and was composed of SEC NP4CF, KP4ABG, KP4AET, KP4FLW, PRARC president KP4ABN, and WP4CRS. the ill-fated diver was accompanied by WP4CRS while in the search and investigation of underground connections of rivers. Congrats to this group for a job well done. Sunday, Aug. 7, from 7 A.M. to 12 noon, an emergency test was performed, the first of a series in preparation for hurricane situations; participating were KP4ID from the Civil Defense headquarters and it was organized by KP4ANG. New QNI for WIN KP4ABK and WP4CFX; WP4BCV is new WIN representative. WP4BCV reports the following totals for WINC for July: QTR 445, QTC 34, QNI 485, 28 sessions. Plus QTC NP4D 15, plus QNI KP4ABK 25. Traffic: NP4D 128, KP4DJ 61.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP. NMs: WA7FDN WA7KQE. SARC reports having had some difficulty with the USPS and their PO Box all is well now I'm told. SARC's officers for 83 are: KD7FW, pres.; KB7CH, v.p.; WB7PXQ, secy.; N7CMK, treas. Ft. Tuthill is now history. I was able to chat with many section members while there. Many thanks to ARCA for putting on a successful hamfest. Special thanks to W4KFC W6EJJ WA6WZO & WA3NLO for attending. I also enjoyed meeting visiting SMs WA6WZN and W5PDY. I would also like to extend my congrats to WB7BVV on being selected as the Arizona Ham of the Year. Those attending this year's hamfest were able to preview the new film by K6DUE, "Amateur Radio's Newest Frontier." It is with regret that I report the following Silent Keys: W9CI K7HUJ N7XA. W7YS reports that KA7QDK now active on 15M, and that KA7OGE took 1st place honors in AZ for Novice Roundup. RF systems servicing in Phoenix will maintain a list of stolen equipment and will check rigs brought in for servicing against the list. There are still openings for you in the new field organization. PSHR: W5KMF KB7FE. ATEN: QNI 873, QTC 167. Cactus Net: QNI 638, QTC 68. KE7W reports getting his rig fixed and on air. Traffic: KB7FE 161, W7AMM 100, W5KMF 83, W7EP 67, K7UXB 54, K6LL 56, WA7KQE 30, KA7JNU 27, N7CVT 18, K7NMQ 18, N7CQY 12, W7LBW 10, N7EH 8, W7KXE 5, WA7NXL 5, KE7W 4, WA7YUL 3.

LOS ANGELES: SM, Stan Brokl, N2YQ — SEC: N6UK. STM: W6INH. ACC: NF6D. July was busy for me because of an upcoming wedding. I am on my honeymoon as I write this column, so that's why the column is short. Next month's will be longer. LA Olympic Committee has reached an agreement with the area hams. We will be providing communications from the villages. I will need two team captains for the two Olympic villages in LA. Interested hams please contact me. That's all for this month. 73 de N2YQ. The traffic gang is doing a very good job even though conditions are far from being good in our area. Skip has been very bad and QRN heavy. Thanks for the checkins; hope it keeps improving. Traffic: K6UYK 491, W6INH 219, AD7G 140, KT6D 66, AD0A 23, N6DZQ 22, K6CL 18, WA6LAW 11, W6NKE 10.

ORANGE: SM, Sandra Heyn, WA6WZN — SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI Coord: N6PE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. DECs: WB6JBI W6LKN K6GGS WB6YZY. With much regret I must announce the resignation of OBS W6BAM owing to his moving. He first held an appointment in 1927 as an ORS under SCM W6BQ and since then has worked with 19 other SCMs including himself. Tri-County ARA annual hamfest/picnic big success where SEC W6UBQ held meeting of DECs that included SET planning. All ARES members are encouraged to contact their EC to support the SET. An ARES application was sent to all ARRL members in the recent section newsletter. Coronado Chief of Police WA6CUP (formerly of Irvine) produced ARES/RACES promotional video film "At Any Moment...Amateur Radio and Disaster Preparedness" which is available (VHS) from your SEC. Also, the new ARRL video film "Amateur Radio's Newest Frontier" (U-matic) is available from PIO NS6W. We're looking for hams that can contact the media to promote PR for first ham operation in space. KA6WMK has taken over WA6MJS mailbox on RTTY WB6ZIR/R 145.12 (–). So Counties Amateur Teletype Society (SCATS) announced deadline for their "Worldwide RTTY Art Contest" Nov. 30th. AEC N6AXN reports Hughes Fullerton ARC Emergency Comm Team was given special plant ID badges; in an emergency they have a 220 MHz link to El Segundo Hq. Once again Western ARA operating FD at Knotts Berry Farm is expected to win the Orange Co. Council ARO plague. Anaheim ARA has started a new net on Thur 7:30 P.M. KC6K/R 146.79(–); net control is NM6X. WB6ARK conducts a swap net afterwards, followed with code practice by W6JCE. Two Meter Area Spectrum Management Assoc (TASMA) annual meeting elected: WB6MQQ, chairman; WA6GEV, vice chairman; N6BVU, secy.; WB6JPI, treas. They amended bandplan 144.90-145.10 to FM usage, while keeping FM above 144.30. Riverside Co. ARA is sponsoring new ARES/RACES net on Thur 7:30 P.M. 147.51 MHz while maintaining potpourri net on W6TJ/R 146.88 (–). Westlink is now heard Tue & Thur 8 P.M. on Keller Peak WB6RSD/R 146.985 (–). Lake Elsinore Valley ARC repeater W6WPP 146.76 (–) back up with plans to move WB6NLU/R 147.825 (–) to the top of El Cariso grade. DEC WB6YZY reports Bishop ARES members KA6AMT W6VOO W6ZT are equipping Bishop EOC for US Forest Services White Mountain Ranger District. PSHR: W6NTN WB6QBZ WA6QCA. Traffic: W6NTN 146, WA6QCA 136, WB6QBZ 106, KA6HJK 105, K6GGS 58, N6GOT 55, K6ZCE 38, W6RE 33, N6FRW 15, WA6WZO 2.

SAN DIEGO: SM, Arthur R. Smith, W6INI — TC: N6NR. BM: WA6HJJ. PIO: WA6CUP. ACC: WA6COE. STM: N6GW. SEC: W6INI. N6NR has been appointed Technical Coordinator (TC) for the section. See June 82 *QST*, page 55 for outline of his duties. The N. County tfc Net met 30 times & handled 116 msgs. WA6IIK manages the ARES CW Net on 3770 kHz each Sunday at 0930. KM6I is active on RN6D, PAND, SCN1 & 2, RN6. He and his XYL also participate in the California Dept of Forestry's Red Flag Patrol. The Poway ARS meets on third Tuesdays at 1930 at the First Baptist Church, 13604 Midland Rd., Poway. Upgrades: WA6OLI to Extra, W6UUJ to Advanced, KA6DIF to Technician. N6INN is learning to use all the bells and whistles on her new IC751. The 220 Club featured a demonstration of holography at its Aug. meeting, put on by N6EZH. ARES needs more members with 220 MHz capability. If interested, check into net on 224.90(–) at 1900 each Saturday (220 Club rptr, WD6HFR). ARES has breakfast/meeting on second Sat. at Normal Heights Meth Church, 4650 Mansfield, at 0800. Traffic: KT6A 420, K6HAP 262, KM6I 190, W6HUJ 120, KB6AI 74, N6AT 38, N6GW 7.

SANTA BARBARA: SM, Robert N. Dyruff, W6POU — ARRL studies underway to fund increased costs of new Section field structure. Opening for Public Information Officer, Section Emergency Coord., Nominations open for 2-year Section Manager post. Many Ventura Co. ARES ops logged over 500 hrs during Mafillja Fires in support of Red Cross and USFS/county fire agencies ICS system. KA6BPG and KA6BPH especially active. Operation led by WB6RVA and coordinated by W6RIC who instituted message traffic from fire camps onto Nat'l Tfc System. Newbury Park evacuation comms supplied by W6HWK WA6ARU KQ6I K6CAB. Sulphur Mt. rptr 28/88 used throughout operation. Poinsettia ARC supplied Ventura Food Fair comms. Affil. Club Coord. W6ZZN contacting clubs re Special Service Club opportunity. Interest in 1984 section convention arising in Santa Maria and Conejo Valley. Simi Settlers ARC held Field Day at City Hall commencing with TV coverage of AR Week declaration by City Council. K6QYL spearheaded computer course at Boys Club in SBAR. Volunteer examiners sought from all areas of Section for development of instructor corps to serve community licensing needs. Technical contributions received on Radio System Integrator (cross band patch) project by W1UUQ W6PN WB6NXF K6YD K6LPZ. TTY interface for Red Cross data system aided by KY6L. Traffic: W6JTA 72. (June) W6JTA 45.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — A/SM & ACC: NI5V. SEC: W5GPO. STM: W5VMP. PIO: N5FDL. OO/RFI: WB5JBP. TC: WB5IIR. BM: W5OXK. SGL: W5UXP. PIAs: K5HGL WA5EQQ N5DRZ KD5FL WA5GNT. NMs: WD5JYI AE5I. Attended the ARCC (Carrollton) July meeting; it's a most progressive club! New officers for 83/84: WA4PUN, pres.; WB6FEW, v.p.; KB5A, treas.; N5ECY, secy.; WN9NBX, dir. eng. Your A/SM, SEC and I have hit the hamfest trail, with stops at Levelland, Amarillo and Wichita Falls. Sorry we could not make San Angelo this year owing to conflict with Wichita Falls. Too bad they fell on same day. Hope you will make the National ARRL Conv. in Oct. (7-9) at Houston. It's a good chance to meet a lot of Hq, NTS, ARES and top elected officials from all over the country. New EC for Harrison Co. is WB8VPP. PSHR: KA5AZK N5DKW N5BT N5FDL N5EZM KC5NN NI5V KD5FR. WA5QFD is now NI5V. Congrats! Remember, our section emergency frequencies are: 7290 (day), 3961 (night), and 3697 (CW). Disaster response coordination and initial reports from a disaster area will be on these freqs. Traffic: W5TI 299, KA5AZK 204, N5BT 178, W9OYL 99, K5PC 92, KD5FR 88, NI5V 71, WB5OXE 69, WB5NRN 42, N5DKW 20, AJ5F 17, N5FDL 12, K5SOR 12, N5EZM 8, W5YK 4.

OKLAHOMA: SM, Art Roberts, W1GOM — ASM: KB5EK. SEC: W5ZTN. STM: KV5X. ACC: K5CAY. TC: W5QMJ. BM: W5AS. SGL: W5NZS. ADs: WB5LW W5CCV WA5KBJ WA5OUV W5REC AD1S. NMs: W5AS WD5IFB WA5OUV KV5X WA5ZOO W5ZTN. Greetings to the OK section. We're back in the saddle again. I will be assisted in the future by KB5EK. Hurricane Alicia brought Amateur Radio to the aid of the public once again. Many thanks to all for another job well done. TARC homebrew contest was a big success. Your SM will be sponsoring a section-wide homebrew contest at the 1984 ARRL state convention. BPL: KA5CXW, K5CXP, KB5EK. Traffic: W5AS 257, KB5EK 216, KV5X 209, W5REC 178, WB5OHK 144, W5RB 129, KA5CXW 112, W5VXU 76, WB5ELG 66, WA5OUV 65, WD5IFB 49, W5SUG 41, NG5G 34, WD5JCE 30, W5VLW 25, W5VOR 25, WA5ZOO 22, WA5OGC 21, KC5OU 11, KB5XI 11, N0IN 9, K5ENA 4, W5JJ 2. (June) W5AS 291, K5CXP 242, W5VXU 224, KD5OE 214, W5REC 206, W5RB 161, KB5EK 158, KV5X 139, WB5OHK 99, WA5OUV 71, WB5ELG 70, WA5ZOO 53, WD5IFB 52, WA5OGC 42, WB5EAY 40, WD5JCE 32, W5SUG 30, WD5EAA 25, W5VOR 22, W5VLW 22, KC5OU 11, W5FW 9, N5OE 8, K5ENA 8, K5CAY 6, WB5LSW 2, W5JJ 1. (May) KA5CXW 252, KV5X 242, W5REC 227, W5AS 225, KD5OE 214, W5RB 173, KB5EK 172, K5CXP 129, WD5IFB 117, W5VXU 112, WB5ELG 102, WA5OUV 71, WA5ZOO 64, KB5XI 55, W5SUG 36, WD5JCE 29, K5ENA 28, W5VLW 26, WA5OGC 23, WD5EAA 22, W5VOR 20, WB5EAY 16, N5EO 11, WB5LSW 10, KC5OU 7, KA5GGE 5, N0IN 4, W5JJ 2.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — A/SM & TM: N5TC. SEC: WA5RVT. The *W5ES Bulletin* (El Paso ARC) reports KA5DQU made grand tour of China and will touch down briefly in Japan; W1FHP earned the second-in-history WAE100 (worked all El Paso) certificate. The *B-VARC Bulletin* (Brazos Valley ARC) reports the club has generated Amateur Radio inquiries at FCC in Houston through their Amateur Radio demonstration activities; also report N5ELN upgraded to General. San Antonio Rptr Org. reports plenty of public service activity: (1) Beautiful San Antonio River Parade with WB5ZJC WB5FTH WB5ZMK WB5FTG W5FPK WD5BKO WB3GCT WB5UYD N7AKG WD5ADF N5LL KA5HCR KB5EQ K5LDT WA5GWS W5VIV WA4AKJ and K5FQ taking part; (2) Night Parade of San Antonio Fiesta with WB5ZJC WB5ZMK WB5FTH W5FPK WB5UYD KA5HCR KB5EQ K5CDT and WA5GWS doing the work. Brenham ARC reports KA5OUF upgraded to Tech and WA5PMO upgraded to Advanced. CAND mgr W5KLV reports DRN5 represented 100% by Southern Texas ops WB5YDD N5EFG N5AMH N5DFO W5URN and W5KLV. RN5 mgr KB5W reports TEX CW Net represented 100% in July. K5OHU reports KA5QPN of Port Isabel upgraded to General. CHARRO (Brownsville) reports KA5PXS upgraded to Tech and N5FVP and N5FVO upgraded to Advanced. DRN5 mgr WB5YDD reports Southern Texas represented 100% by K5OWK KA5KRI W5URN W5KLV WB5FQU WB5EPA K5WOB N5EFG WA5OYS N5DFO N5AMH W5CTZ KD5CB WA5RVT and WB5YDD. W5CTZ reports that he spent part of the summer in Virginia attending and upgrading school; we await results. Traffic: WB5YDD 524, W5KLV 392, N5EFG 283, W5CTZ 238, N5DFO 206, K5GM 116, KV5W 103, N5TC 87, W5TFB 82, WB5EPA 69, K5HZR 54, KA5KRI 50, K5OWK 38, K5SV 33, W5BGE 24, ND5C 23, W5KR 23, WB5FQU 20, WD5GKH 11, K5RG 8, N5AVR 5 (June) K5GM 102, K5SV 22.

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WAUKEGAN SQUADRON, Civil Air Patrol will hold its third annual Hamfest at Lake County Fairgrounds, Rt. 120 & 45, Grayslake, Illinois, on Saturday, October 29, 1983 from 0700-1700. Large indoor Flea Market, Cafeteria, Tables $5 Admission $3. Talk-in 146.52. Further info send S.A.S.E. Civil Air Patrol, 637 Emerald St., Mundelein, IL 60060.

THANK-YOU for attending 1983 Warren Hamfest, Warren, Ohio. Hope to see you next year, August 19, 1984.

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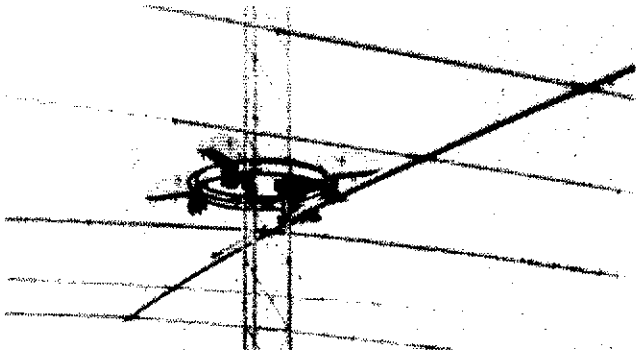

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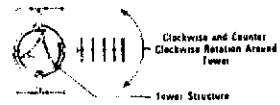

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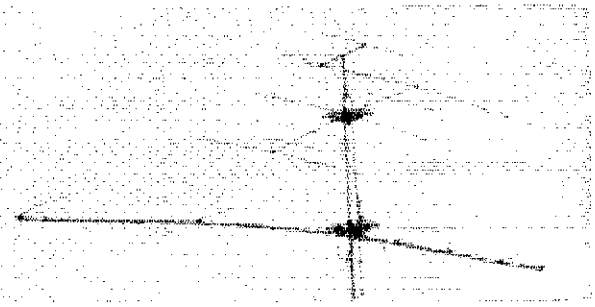

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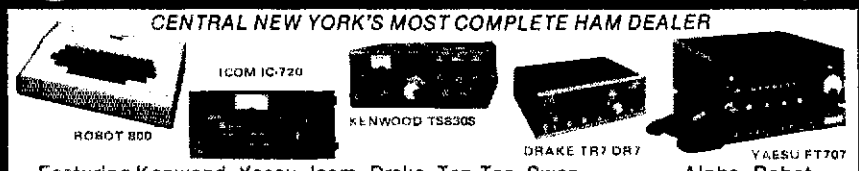

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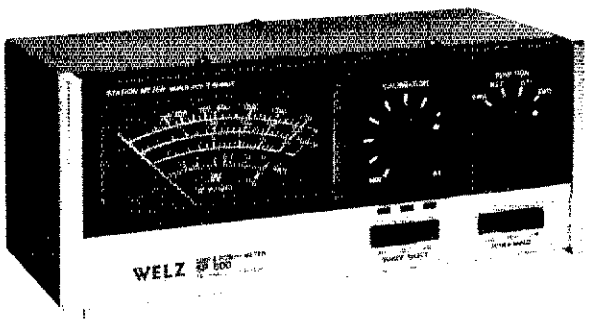

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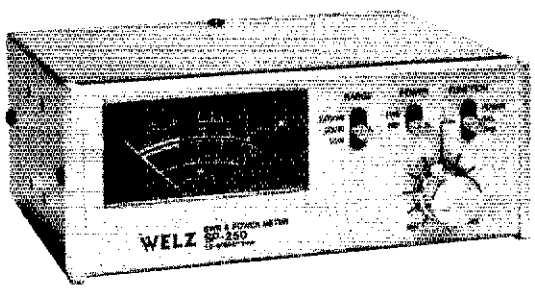

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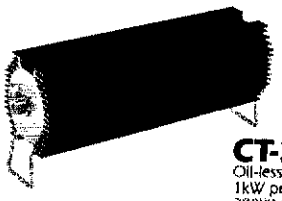

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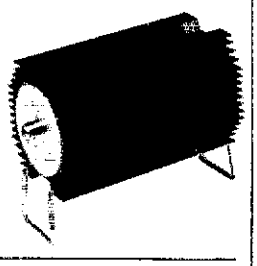

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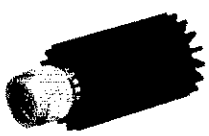

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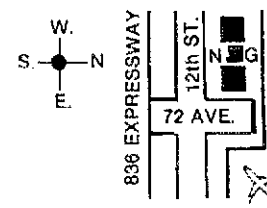

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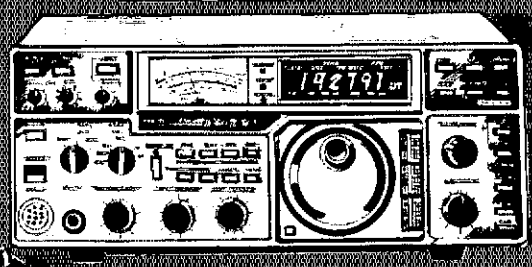

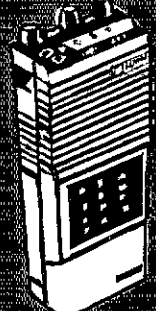

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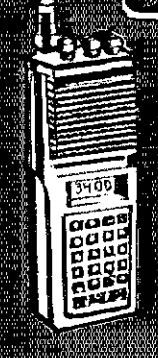

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FAST professional ham repair. N.Y.C. area. All major brands. Commercial FCC Lic. #P2-2-33167. Amateur Extra. In business 7 years, on the air since 1965. Rich Tashner N2EO 212-352-1397.

WANTED - Kenwood TS-700SP transceiver & MARS 7600 adapter C.T. Huth, 146 Schonhardt, Tiffin, OH 14883.

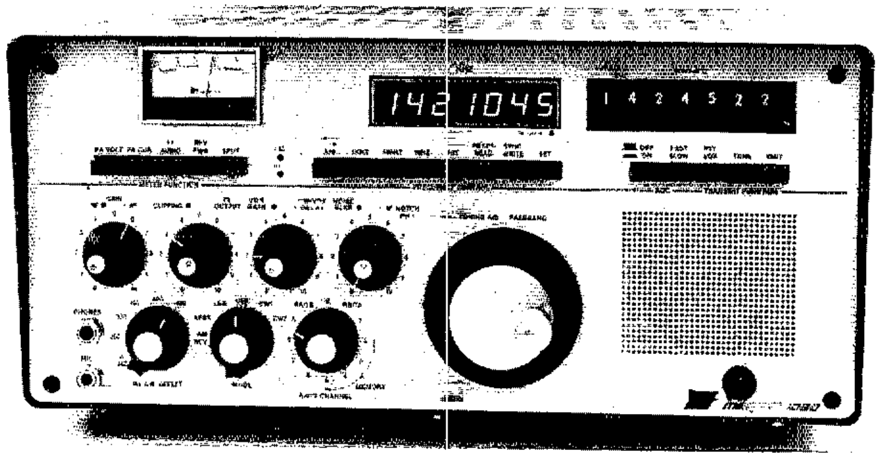
IC-50L wanted. WA2AHP, 2 Rustic Rd., Stoneham, MA 02180 617-665-7058.

WANTED: Motorola VHF repeater, base station or receiver N4EFJ 703-684-8376.

DRAKE R-4, T-4X owners: protect your investment from scarce, increasing cost of vacuum tubes. Use solid-state tubes: Performance with increased sensitivity, dynamic range and gain. Directly replace your vacuum tubes. R-4(A-B-C): 6EJ7/6HS6 (mixers), 6BE6/12BE6, new 6BA6/6BZ6. T-4X(A-B-C): 6EJ7/6HS6, 6AU6, 12BA6, 12AX7A, 6EV7/6FQ7/6AQ8. $18.50 ppd. each. Also kits upgrade performance: Basic Improvement Kit, Audio Low Pass Filter Kit, Audio IC Amplifier Kit, $25 ppd. each. Overseas air $7. VISA/MC. Sartori Associates — W5DA - Box 2085, Richardson, TX 75080. 214-494-3093.

HAVE ONE BUILT JUST FOR YOU...

milspec 1030



The Signal One Corporation continues its leadership with the introduction of the Milspec 1030, **A NEW CONCEPT IN SYNTHESIZER TECHNOLOGY. COMBINING THE ENTIRE DIGITAL FREQUENCY CONTROL SYSTEM, INCLUDING PASSBAND TUNING AND BFO FREQUENCIES, WITH THE MAIN TUNING, FREQUENCY PRESET AND REMOTE COMPUTER CONTROL . . .** we have achieved an ultra fast, real time frequency controlled, high performance, military grade, fully synthesized communications system that will out perform any HF transceiver ever offered in the amateur and commercial market.

Featuring:

- **Fully Synthesized General Frequency Coverage** 10 kHz — 30 MHz in 1kHz 100 Hz or 10 Hz steps. Tunable with encoder or thumbwheel preset. stability of 1 Hz/C°
- **Lever Switch Frequency Pre-Set** Provides instantaneous band change sets to within 10 Hz automatically returns to tuning A/B. The fastest and most convenient method of frequency entry and recall with additional digital display and memory. TUNING C makes this superior to keyboard systems
- **New Synthesizer Technique** 120 dB/Hz phase noise close to carrier. extensive CMOS circuitry used for improved spectral purity and great reduction of digital noise, a problem that plagues other HF transceivers causing unwanted mixing products—that insures weak signals will not be covered by internally generated noise due to adjacent strong signals
- **Real Time Frequency Acquisition.** Not multiplexed. unique synthesizer design allows frequency jumps of 30 MHz in 10 milliseconds, useful in military surveillance applications that demand ultrafast synthesizer switching
- **Remote Control and Programability** Permits transceiver use in computer based communication systems (optional interface req.)
- **Unequaled Receiver Dynamic Range and Front End Selectivity.** + 20 dBm 3rd order intercept point and .25 uv sensitivity offer the best immunity to strong signal overload currently available to the commercial and amateur market. Specially developed high level monolithic, double quad balanced mixers combined with low synthesizer phase noise and up-conversion to 40.455 MHz 1st I-F thru 8 pole Crystal Cross Mod. Filter with a ± 4 kHz bandwidth designed for low intermodulation distortion products makes this performance possible
- **Synthesized Passband Tuning** 1st and 2nd I-F tune in 10 Hz steps over ± 5 kHz range with respect to 1st and 2nd I-F filter passbands. A unique dual passband feature for maximum interference rejection. Controlled by tuning A/B
- **Collins/Rockwell* Mechanical Filters** For maximum selectivity and ultimate rejection performance. Demanded in most military/commercial applications. 2.1 kHz (USB/LSB) each selected for optimum performance on SSB. Cascaded with front end VHF 8 pole crystal filter, active I-F notch filter, passband tuning and noise blanker delivers 16 pole, 1.4:1 performance [illegible] and add up to the most powerful anti-QRM system available
- **Noise Blanker.** Pre I-F blanker with adjustable threshold and 80 dB dynamic range. Gating effectively placed in receiver RF path and triggered by pulsed noise such as over-the horizon radar
- **I-F Notch Filter.** Active 300 Hz notch in 2nd I-F. Adjustable ± 1.5 kHz with 40 db rejection. Receiver AGC not affected by notched signal
- **High Power Transmit System** Motorola* high power final amplifiers with 150 watt CW/SSB output or 200 watt option

EVERY NEW 1030 CARRIES AN 18 MONTH (LIMITED) FACTORY WARRANTY!

- **RF Speech Processing** Clipped transmit RF signal is passed through mechanical and crystal filters for unequaled SSB talk power and elimination of unwanted intermodulation distortion products. This is a preferred process and considered superior to audio type processors
- **QSK CW Full Break-In.** Vacuum relays and 250 Hz filter offer a superb full break in CW System
- **Construction.** All circuit boards, including synthesizer modules, plug in, ribbon cable interconnection and Minisert* sockets for transistor and IC replacement insure ease in self servicing. military and computer grade components used exclusively

RECEIVER PERFORMANCE

Sensitivity. .25 uv (—118 dBm) or better for 10 dB S/N ratio at antenna input 1.6-30 MHz (2.1 kHz width in SSB)

Selectivity 1st I-F 40.455 MHz ± 8kHz [illegible] 1 dB ripple 8 pole crystal filter

2nd I-F 455 kHz mechanical filters [illegible] dB

Standard	Optional	
USB 2.1 kHz	CW1 375 Hz	AM 5.8 kHz
LSB 2.1 kHz	CW2 200 Hz	AFSK/LSB 800 Hz
CW1 1.9 kHz	(extra steep skirts)	(CF high tone pair)

Mixers. Specially developed, high level, monolithic double balanced mixers with hot carrier diodes used in first and second mixer stages

Intermodulation Distortion. (typical) 3rd order input intercept point + 20 dBm for separated signals of 20 kHz

2nd order IMD is —80 db

Cross Modulation. Unmodulated wanted signal of 100 uV together with a modulated (30% at 1 kHz) unwanted signal of [illegible] spaced 30 kHz apart produces 10% cross Mod

Blocking. Attenuation of a wanted RF signal of 50 uV and caused by an unmodulated unwanted signal of [illegible] spaced 30 kHz apart then produces 3 dB blocking

IF and Rejection. 80 dB

Synthesizer Phase Noise. Mean S/N ratio of 1st I-F (typical, reference to 1 Hz bandwidth) 50 dB measurement 1 kHz from carrier. 135 dB measurement 20 kHz from carrier

TRANSMIT PERFORMANCE

Power Amplifier: Solid state, broadband 1.6 — 30 MHz 150 W or 200 W (high power option) CW/PEP output keydown all bands and modes. Automatic power cutback under excessive VSWR conditions. Heavy duty Hypersil* transformer for exceptional regulation and power. For continuous full power "key down" operation blower option required

Third Order Intermodulation Distortion. 35 dB below each of two tones at full PEP output

Unwanted Signal Suppression. Carrier —50 db min. undesired sidebands, 1 kHz —55 dB min. harmonic [illegible] —40 dB to log of [illegible] power output, mixer products —50 min

GENERAL

Frequency Coverage 10 kHz to 29.9999 MHz receive. 10 kHz to 1.6 MHz at reduced sensitivity. 1.6 to 29.9999 MHz transmit

Frequency Control. Memory provides split tuning A/B — using opto-electronic shaft encoder tuning in increments of 1 kHz, 100 Hz and 10 Hz (180 kHz, 18 kHz and 1800 Hz/360° respectively), selectable with front panel push buttons. Tuning C — preset frequency settable to 10 Hz with front panel lever switch. Frequency entered by set button display and BCD registers updated

Memory — frequencies stored in any of 9 memories, recalled for tuning A/B frequencies with read push buttons, frequencies from tuning A/B or C entered into memories with Auto Write or Write push button

Stability 1 ppm/month, 1 Hz/C° 1 ppm after 15 min. warm-up at 25°C typical. For more demanding requirements, high stability reference oscillator option available — will meet military and commercial standards for specialized data transmissions

Modes. USB LSB CW AFSK AM — receive. USB LSB CW AFSK/LSB — transmit

Remote Computer Control via rear panel 24 pin connector

F BCD (1-2-4-8) 12 V CMOS parallel command for	
A Frequency handshake	2 Pulse input to drive shaft encoder counters
B Mode detection	3 AGC output
C Bandpass tuning	4 Receiver mute command
D BFO tuning	

Power Supply Built-in heavy duty AC/DC supply 115/230V ± 5% 50 to 400 Hz. 12 to 15 VDC at 40 AMPS max negative ground. 120 W max in receive. 600W peak at full [illegible] input. Thermal and current overload protection

Size 16.2" wide, 7.5" high, 17.8" deep. **Weight** 50 lbs.

Specifications are subject to change without notice or obligation

[illegible]

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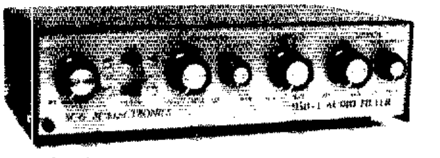
MSB-1 AUDIO FILTER

SSB/CW/RTTY
$84.95



If your transceiver lacks some of the latest conveniences for circumventing QRM, then solve your problem both economically and effectively with the MSB-1 Audio Filter. You will be astounded at what the tuneable 8-pole lo-pass filter section alone, can do for you, considering its incredible 48 dB/octave cutoff rate!

The notch filter has both variable frequency and selectivity controls, and is very effective in removing heterodynes and SSB splatter. Notch depth is 50 dB. For peaking, there is a variable bandpass filter with both frequency and selectivity controls. Highly useful on CW, the controls can be adjusted to emphasize voice on SSB signals. This filter can be switched in or out, independently of the other filters. By the way, there is also a fixed 6 pole hi-pass filter with 300 Hz cutoff. All three tuneable filters cover 300 Hz to 3kHz.

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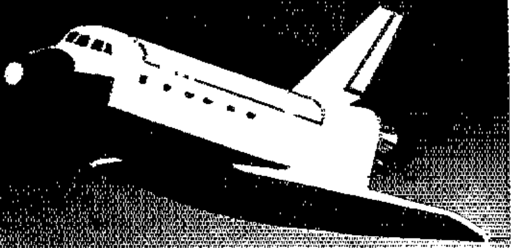

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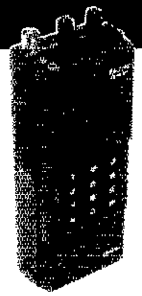

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TR4CW with RIT, RV4C and AC4. Excellent, $475 WB4ZCD 606-441-9684.

WANTED: recent QSTs KC2HQ (KA1APO/2).

TEKTRONIX Dual Trace Oscilloscope with mobile cart. Good condition. $250. KV9P, Box 278A, Louisville, IL 62858 618-665-3030.

COLLINS WANTED!! CT-2 Cable Trough for KWM-2A/S Line; SC-301 Antenna Control Console - replaces blank front panel of 516F-2 power supply; 136C-1 noise blanker for 75A-4; 35U-1 low pass filter for 75A-4; 312A-1 speaker w. Lumiline lamp; crystal gripper for CP-1 crystal packet; 440F-1 extension cable for 516F-2 power supply; any original sales literature for 30K-1 transmitter, circa 1946. Any of the above items, please, in good, clean condition. AC1Y c/o ARRL Hq.

AMRAD (Amateur Radio Research and Development Corporation) is a nonprofit organization of experimenters in packet radio, spread spectrum and digital communications. Monthly newsletter. Mail $15 to AMRAD, 5829 Parakeet Drive, Burke, VA 22015. Add $2 for Canada, Mexico; $8 overseas air, $2.30 surface.

TRS-80 Model I/III/IV Radio Amateur Software. Super-Log & Super-Duper $19.95; Compu-Log $16.95; Antenna Anatomy $14.95; Custom Beam Headings $19.95; Code Trainer II $16.95; General, Advanced or Extra Theory (specify) $19.95 each; more. Add $3 S/H. Specify Model, Tape or Disk? MICRO-80, 2665 Busby Quarter, Oak Harbor, WA 98277.

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DRAKE TR7/DR7 w/ps, SL1600, 500 & 300 filters, AUX 7, NB7; $1300. Drake R7 w/SL4000, 1800, 500 & 300 filters, AUX 7 & NB7; $1200. RV7 RVFO; $125. KB4O 703-941-7760 after 2300 GMT.

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7 to 20 watts out for 0.1 to 3 watts in. Carrier operated T-R switch. MFJ-2040, 144-148 MHz, $79.95. MFJ-2045, 430-440 MHz, $99.95. MFJ-2041, Portable Power Pack, $89.95.

This tiny MFJ-2040 2 meter power amplifier mounts on your handheld between your antenna and HT. You can also mount it separately with a cable.

It provides 7 to 20 watts output for .1 to 3 watts input. T-R switching is carrier operated. Covers 144-148 MHz.

Die cast aluminum body is 1½x3¾ inches. Weighs about 6 oz. BNC connectors.

Requires 12 to 13.8 VDC at 50 ma. for receive and 1 to 2 amps for transmit.

MFJ-2045, $99.95. Like MFJ-2041 but for 430 to 440 MHz. 4 to 15 watts output for .1 to 3 watts input.

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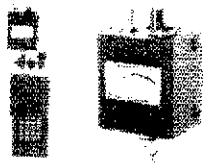
2 Meter Handheld Wattmeter

MFJ-840
$19.95

MFJ-840 lets you accurately check the output of your 2 meter handheld transceiver. 5 watts full scale. 50 ohm load. BNC connector. 2x2¼x1½ inches. Black.

2 Meter Handheld SWR/Wattmeter



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MFJ-841. Connects in line with your 2 meter HT. Read SWR from 1:1 to 6:1 and forward power to 5 watts. Expanded scale. 50 ohm impedance. BNC connectors. 2x2¼x1½ inches. Black.

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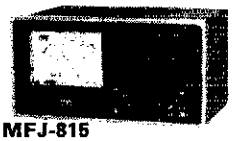

MFJ-815
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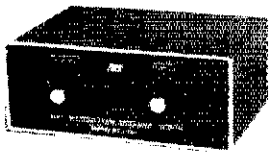
New MFJ-815 Cross Needle SWR/Wattmeter lets you monitor SWR, forward and reflected power at a single glance in 3 ranges (20/200/2000 watts forward and 2/20/200 watts reflected) and SWR from 1:1 to 6:1 on a 2 color scale. Works from 1.8 to 60 MHz. Accuracy is ±10% full scale. Mechanical zero adjustment, push button range selection. All aluminum, black w/ brushed front panel. 6½x3¼x4¼. SO-239 connectors.

Antenna/Transmitter Switch



MFJ-1700
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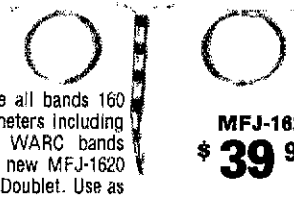
If you have several coax feedlines and more than one rig, this MFJ-1700 gives instant selection of 1 of 6 antennas and 1 of 6 transceivers in any combination. Also plug in an antenna tuner, SWR/wattmeter, linear, etc., so that they are always in the circuit for any antenna/transceiver combination. Handles up to the full legal limit of 2 KW PEP for 50-75 ohm loads. SO-239 connectors. All aluminum, black with brushed aluminum front. 8x2x6.

MFJ-1620 All Band Doublet



MFJ-1620
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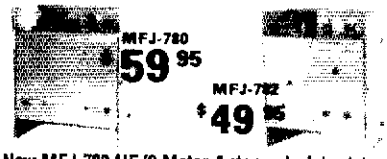
Operate all bands 160 thru 10 meters including the new WARC bands with this new MFJ-1620 All Band Doublet. Use as doublet, sloper, inverted-V or as V-beam. Completely assembled. 130 ft. (hard drawn stranded copper antenna wire) but can be trimmed to fit your lot. Center fed with 100 feet of low loss 450 ohm balanced transmission line. You need only add rope to the ends and pull into position. Antenna tuner with balanced output required.

New Antenna Isolators



New MFJ-782 HF/2 Meter Antenna Isolator lets you use a single coax line to feed a 2 meter antenna and any antenna below 30 MHz. **The new MFJ-780 Antenna Isolator** feeds separate 10,15,20 meter antennas (tri bander, etc.) Both isolators handle 12 KW PEP at 50/75 ohms. Negligible insertion loss. Completely automatic with no relays, switches or other moving parts. Easy outdoor mounting (includes hardware). SO-239 connectors.

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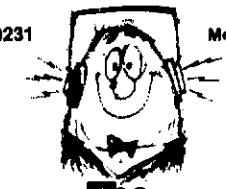

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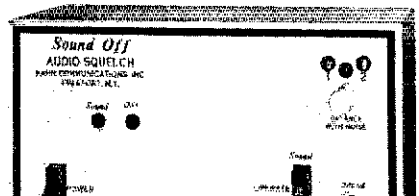

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DRAKE 2B receiver and 2BQ Q-multiplier/speaker, excellent, $135. K7GVQ, 7305 S.W. 25th Ave., Portland, OR 97219. 503-246-1784.

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HEATH SB-100 Transceiver, HP-23 power supply, speaker. Works well. $295 + UPS. KB1IA Brad Lentz, 29 Elmwood Ave., Attleboro, MA 02703. 617-222-6315.

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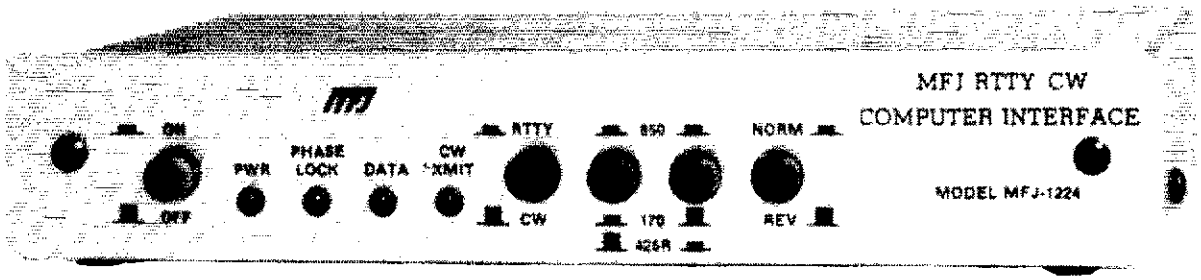
Lets you send and receive computerized RTTY/ASCII/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 Pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or most other personal computers. Uses Kantronics software 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.

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WANT Heath SB104-A; prefer unassembled kit. Jim Sandberg, K8HE, 1138 Rustic Rd., Escondido, CA 92025.

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KENWOOD TS-180S: DFC, all filters, MC-50, SP-180, manuals, $595. Azden PCS-300: speaker mic, 5/8 antenna, cigar lighter cord, $225. Icom IC-3A: Speaker mic, extra BP-3 battery, $200. Icom IC-2AT: extra power mic, BC-30 charger, extra BP-5 battery, DC-1 regulator, CP-1 cord, stubby antenna $250. Prepaid UPS COD. Alex-AF6W 619-281-5363.

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CASH for Gonset equipment, catalogs or manuals. State condition and price. W3BYM, 13806 Parkland Drive, Rockville, MD 20853..

WANTED: Tube Socket for 4CX1000A. KA5EBL 505-456-5423.

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SELL: Heath HW-16 xcvr, HG-10B VFO. Fair condition, $75. Call Bill, KA3AKY, 215-826-3677.

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WANTED: Antenna tuner for 6m QRP. Jerry, KE1S. 617-877-6119 or Callbook.

ICOM-ICR70 communications receiver, 6 months old, hardly used-$575; Heath SB-221 amp (incl. 10 meters), less than 100 hours use, filament inrush protection, power supply mods-$575 (pick-up only). J.H. Ross, Box 138, Sergeantsville, NJ 08557. 609-397-3255.

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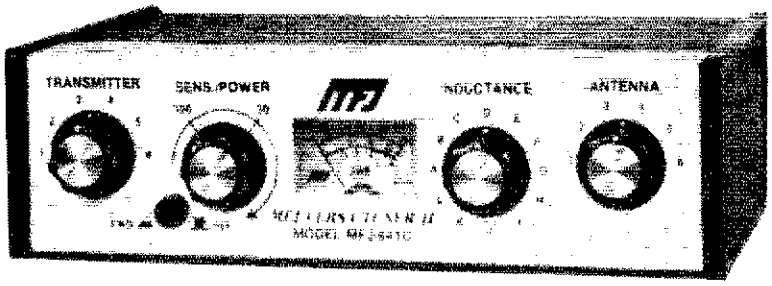
MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.



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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.

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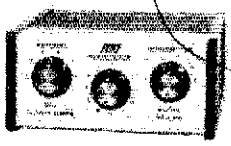
MFJ-900 VERSA TUNER



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.

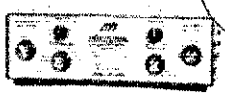
Operate all bands with one antenna.

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

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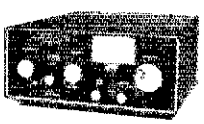

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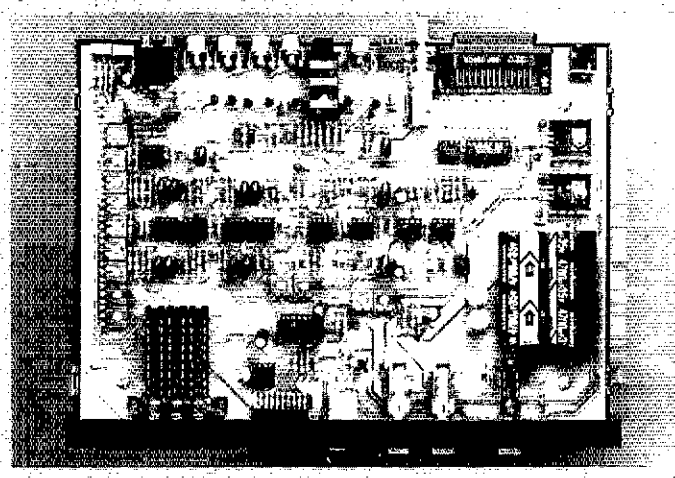

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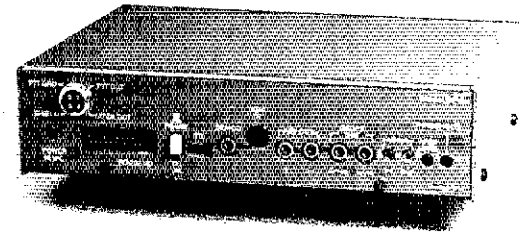

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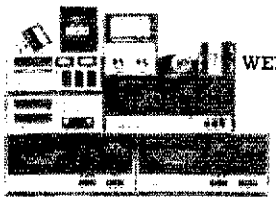
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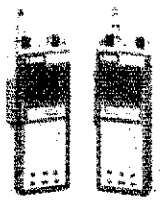
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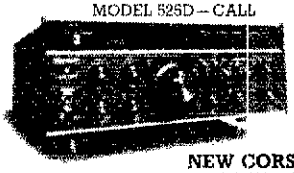
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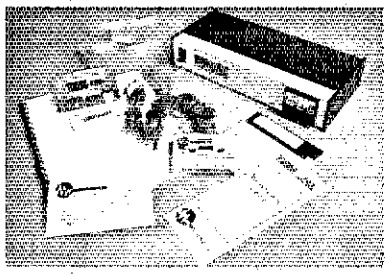

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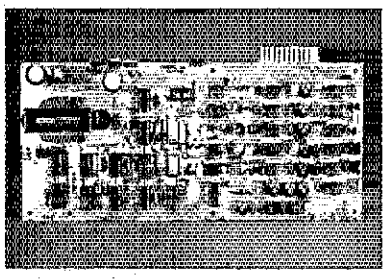

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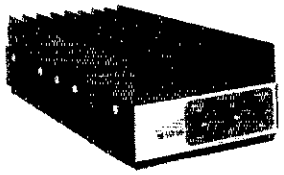

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B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	8A	$179
D1010N	440	No	10W	100W	20A	$289

RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak-Reading Wattmeter $99

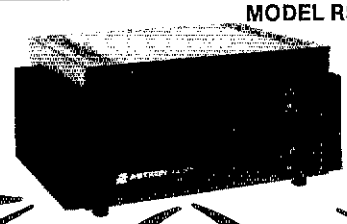
ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage: 105-125 VAC Output: 13.8 VDC ± 05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

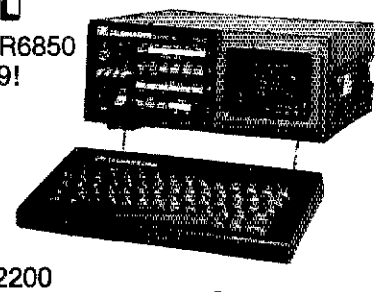
Model	'Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

MODEL RS-50A



HAL Communications Sale!

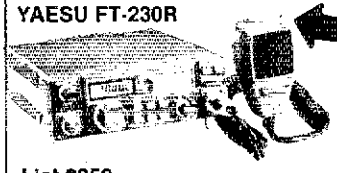
CWR6850 $849!



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

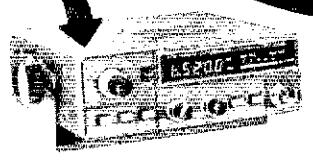


List $359
Call For Your Special Price

YAESU FT-726R

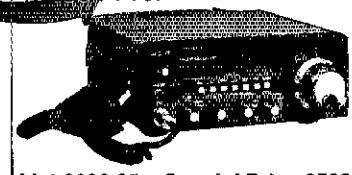
List TBA
Call For Your Special Price

KDK FM2030



SALE PRICE $269!

YAESU FT-707

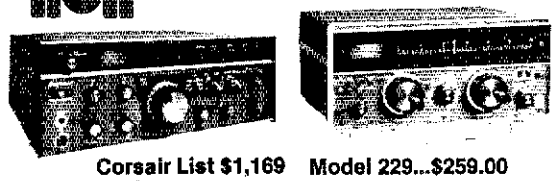


List $699.95 Special Price $589

R.L. DRAKE

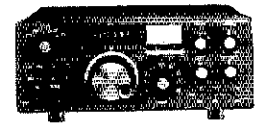
TR-7A Transceiver On Sale $1389!
Accessories In Stock - Call!
L7 HF Amplifier Only $969 (Less Tubes)
Eimac 3-500Z Tubes $199/pair

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!

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ST144μP Handie Talkie ON SALE! Only $279

IN STOCK FOR IMMEDIATE DELIVERY
- 142-149.995 MHz
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ST-440μP 440 MHz H.T.	$299
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ST-LC Leather Case	29
ST-6BC Base Charger	29
ST-50083 Ni-Cad Battery	29

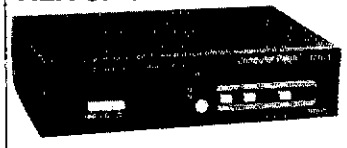
TOKYO HY-POWER LABS

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-200 440 MHz 1-3W In - 20W Out	99
HL-900 440 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
V350	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 $39!

QSA-5	$41	432PL	$63
PB-30	$21	PB144	$31
PB-50	$21	PB220	$31

DAIWA CN-620B $111!
160/2 mtrs
20/200/2000 wts

BENCHER PADDLE
BY-1 Blackface $30
BY-2 Chrome $40

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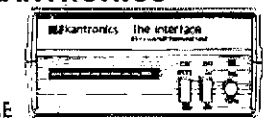
202B Noise Bridge	$54
250 2KW Dummy w/Oil	31
260 300W Dry Load	25
262 2KW Dry Load	59
422 Keyer w/Paddle	89
482 4 MSG Mem Keyer	89
484B 12 MSG Keyer	125
494 Keyboard	249
496 Keyboard	299
525B RF Processor	109
624 Phone Patch	59
901 300W Tuner	54
940B Tuner w/Meter	72
941C Tuner w/Mater	79
949B Deluxe Tuner	129
989 Deluxe 2KW Tuner	289

KANTRONICS



THE INTERFACE Reg. $169.95 SALE $149.00!

OTHER KANTRONICS ITEMS

Mini-Reader	$239	Hamtext VIC-20	99
Mini-Terminal	259	Hamtext Model-64	99
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VIC-20 Hamsoft	49	TRS 80C Hamsoft	59

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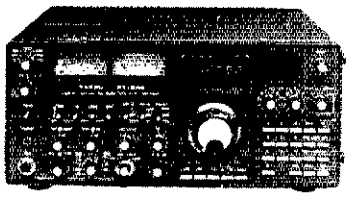

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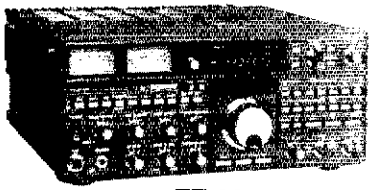
GENERAL COVERAGE—ALL MODE DELUXE SOLID STATE TRANSCEIVER

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

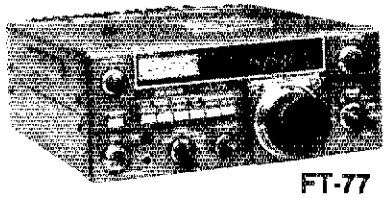
Computer Interface now in development—Own Tomorrow's HF Transceiver—Today!! Manufacturer's Suggested List Price $1499 Call For Your Special Price Today!!

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

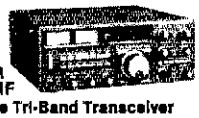
New 80-10mtr Compact HF Transceiver

- 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 $$

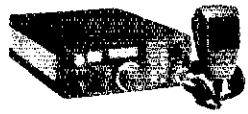
FT-230R 2mtr FM.....$359
FT-730R 440Mhz FM.....$399
- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory or Up/Down Scan

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

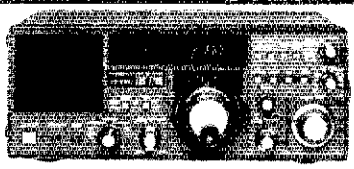
Please Call For Price & Delivery Information



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

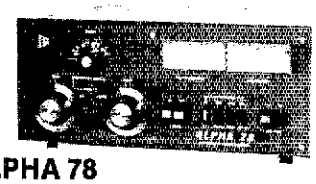
FT-708R 440Mhz HT....$319
RF Out: 200mw/1.0W
- LCD Display
- 10 Memories
- Up/Down and Memory Scanning
- Complete w/Nicad Battery, Charger and Rubber Duck Ant

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!!

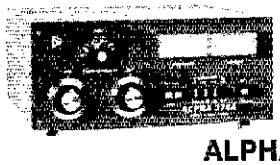
IMPORTANT — Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special Yaesu Sale Prices and Save $$$!!

ETO ALPHA

76PA $1699



ALPHA 78

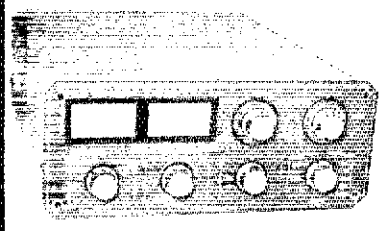


ALPHA 374A

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!!**



TOKYO HY-POWER HC-2000 Tuner

$339.95 List Price
SALE $289.00
- Heavy Duty 2 KW Construction
- 160-10 Meter Operation (including WARC Bands)
- Calibrated Vernier Dial
- Built-in SWR and Watt Meter
- Built-in 12 Position Antenna/By-pass Switch
- Built-in Balun for Balanced Feedline

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COLLINS KWS-1 and power supply-2,000 watts PEP, 80 thru 10 Collins 75A4 receiver. $1,000 for both (post-paid U.S.A.) J. O. Milam,4307 Tacoma, Shreveport, LA 71107. Ph. 318-425-5857.

WANTED Johnson coil 1000LCS80, 1000HCS80 or B&W equivalent. Box 10985, Caparra, P.R. 00922. KP4MP 809-782-5311 after 1900 UCT.

WACOM 2-meter Duplexer. You send certified check for $350 I will ship. Tom WA8URE 1-616-247-7519.

COLLINS 32S1 transmitter, 75S1 receiver, P.S./Spk and speech processor. Has all filters installed — mint condition. Stone KA6RDT. Phone: 408-238-7047. Price: $800.

FOR SALE: Hilltop QTH-Great DX location in village. 7 room redwood ranch-1600 sq. ft. w/full cellar. 1.4 acres w/new 2 car barn. Rochester, NY area on I-390. KC2GJ 716-658-3559 eves,.

COLLINS 75S3B/32S3/30L1, power supply, console, all cables, manuals, in factory cartons. Absolutely mint condition. No scratches or smoke stains. Never serviced. $2500. WA2ZIU 212-726-8088.

DRAKE TR4C, AC4, RV3 VFO, excellent condition $465. KB2AS 315-451-6472.

IBM-PC RTTY. Comp Rtty is a comprehensive new RTTY communications program for the IBM-PC. Features include: all standard ASCII and BAUDOT speeds up to 300 Baud, selectable parity, split screen display with status, hardcopy, diskcopy, key-string detect for autostart/autostop, file transfer, auto logging, 12 programmable messages, 2000 character type-ahead. Requires 96K, disk, serial port, PC-DOS 1.1 or 2.0, and a modulator/demodulator. $65. David A. Rice, KC2HO, 7373 Jessica Dr., N. Syracuse, NY 13212.

TAG SALE: Moving, must unload 20+ years accumulation of Ham Radio/electronic parts and gear. Boxes of parts-capacitors, resistors, tubes, motors, transformers, sockets, meters, relays, etc. Test equipment-Signal Generators, Power Supplies, Meters, Scopes, etc. Two-way gear-base, mobile and portable gear and base station antennas. You have never seen a collection like this before. Giveaway prices-one day only-Saturday, October 15, 1983 from 9:00 AM to 5:00 PM. Sale at Payne Blvd. in Portland, Conn. (off Rt. 66 at Woodings Farm). Tel. 203-342-1356.

WANTED: Collins round emblem, Alpha amplifier. Roderick, Box 1463, Little Rock, AR 72203. Phone 501-988-2527.

SELL: Henry 2K-4, mint, used very little, has 10 meters, $700, you ship. Drake R4-A, mint, $200. Neither unit modified in any way. WB2GZU, R.D. #1, Little Falls, N.Y. 13365.

COAX: Low-Loss 50Ω (1/2, 3/4, 7/8, 1 5/8, 3 1/8) inches. Specifications S.A.S.E. Link, 1081 Aron St., Cocoa, FL 32922.

WANT Transistorized mobile power supply for SBE 33. Callbook address or 619-244-5380. K6MQT.

ROSS $$$$ New October Bargains: Robot #RB-800C $799, RB-800CK $150, RB-450C $799.90, RB-400CK $460, SANTEC # ST-144UP $269.90, ST-1200 $209.90, ST-220UP $264.90, ST-440UP $279.90, KDK #FM-2030 $258.50, Icom # IC-751 $1,254.65, IC-451A $729.90, IC-551D $569.90, IC-471 $799.90. IC-R70 $569.90, Kenwood # TS-430S $779.90, TS-830S $799.90, TS-130SE $539.90, TM-201A $319.90, Yaesu # FT-708 $259.90, FT-726R $709.90, FT-980 $1,299.90, All major lines stocked, Used Kenwood TS-130S $499.90, TS-120S $449.90, TS-520 $429.90. L.T.O. mention ad. Send S.A.S.E. & Call Letters for used list and current specials. Prices Cash, FOB Preston. Closed Monday at 2:00. Ross Distributing Company, 78 South State, Preston, ID 83263. 208-852-0830.

LOGBOOK-V2 A complete log program consisting of seven modules to handle all phases of logging. Features Multi-key and Multi-level searching of thousands of records in seconds and full feature editing. Prints station logs, contest logs, contest dupe sheets, QSL cards, WAS lists, DXCC lists, 6-Band WAS lists. For TRS-80 Models I, Model III, & Model IV. Price $39. Supplied on 5 1/4" DOSplus formatted disk with complete documentation. Specify model of Computer when ordering. WB8YUO, 6333 Willowdale Ct., Columbus, OH 43229, 614-895-1130.

NCG 10/160M $849; 15M $239. Azden PCS-300 $287; PCS-4000 $297; PCS-4300 $357; PCS-4500 $297; PCS-4800 $287. MC-VISA. S.A.S.E. for info. Drakes, 17808, 2nd South, Seattle, WA 98148. 206-244-1729.

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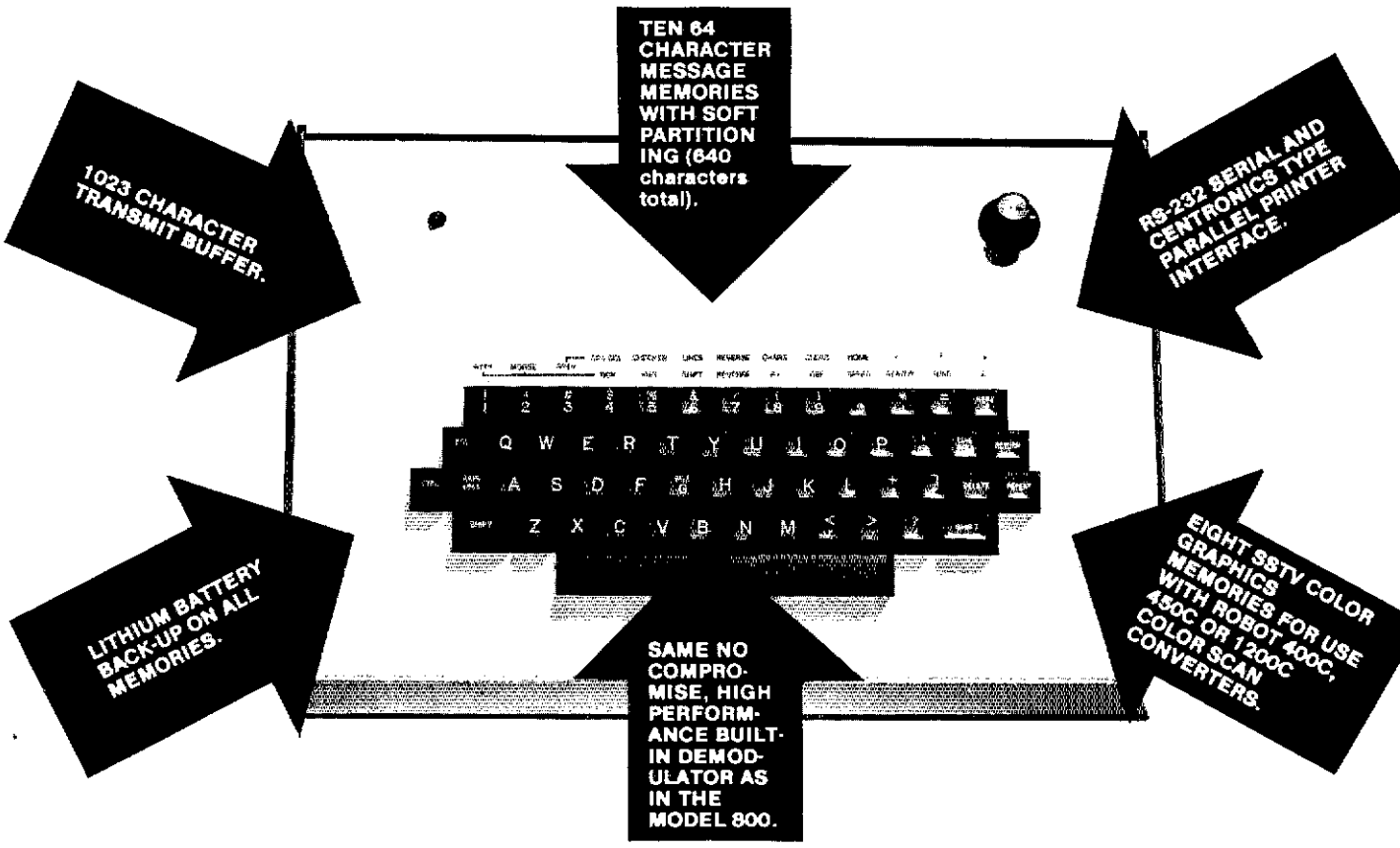
Index of Advertisers

THE NEW ROBOT MODEL 800C SUPER TERMINAL!



The new Model 800C offers the same fine quality construction, high performance, and outstanding features as the popular Model 800, plus the many new operating features shown above. It is a complete specialty mode communications terminal offering unmatched ease of operation. The 800C is designed expressly for amateur radio and nothing else! By focusing our attention on this simple concept we are able to provide a product that works better, costs less and is easier to operate than systems that try to do "everything" and do nothing very well.

OUTSTANDING BUILT-IN DEMODULATOR

The Model 800C has the same high quality demodulator acclaimed by thousands of users of the Robot Model 800 in daily use world wide, with its ability to copy those weak signals that you usually give up on. The demodulator employs separate active two-tone discriminator filters for optimum demodulation of RTTY signals. It is available with the IARU standard "low tone" frequencies or "high tones" for use on VHF-FM.

BAUDOT/ASCII OPERATION

Split screen display. Autostart. Programmable WRU and SELCAL. On-screen status line and tuning indicator. Programmable narrow shift CW ID.

MORSE CODE OPERATION

Autotrack on receive. Side tone oscillator. Morse code trainer. On-screen speed indication.

SSTV OPERATION

Full color SSTV graphics capability when used with Robot's new color scan converters plus stand alone black and white SSTV graphics transmission. Eight color graphics memories available for CQ, QTH and special messages.*

ATTENTION ROBOT MODEL 800 OWNERS: All of the "new" features found in the Model 800C are available by adding the Model 800C Update Kit to your unit. All necessary parts and hardware are included for an easy single evening installation.

For complete information on all the Robot 800C's features write for literature or visit your Robot dealer.

*The Model 800C does not receive SSTV pictures. A scan converter is necessary for this.

ROBOT

ROBOT RESEARCH, INC.
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World Leaders in SSTV, Phone Line TV and Image Processing Systems.

YAESU FT-726R TRIBANDER

NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

TELLITES!! **SCATTER!!**

!! **EME!!**

The New Yaesu FT-726R Tribander is the world's first multiband, multimode Amateur transceiver capable of full duplex operation. Whether you're interested in OSCAR, moonbounce, or terrestrial repeaters, you owe yourself a look at this one-of-a-kind technological wonder!

Multiband Capability

Factory equipped for 2 meter operation, the FT-726R is a three-band unit capable of operation on 10 meters, 6 meters, and/or two segments of the 70 cm band (430-440 or 440-450 MHz), using optional modules. The appropriate repeater shift is automatically programmed for each module. Other bands pending.

Advanced Microprocessor Control

Powered by an 8-bit Central Processing Unit, the ten-channel memory of the FT-726R stores both frequency and mode, with pushbutton transfer capability to either of two VFO registers. The synthesized VFO tunes in 20 Hz steps on SSB/CW, with selectable steps on FM. Scanning of the band or memories is provided.

Full Duplex Option

The optional SU-726 module provides a second, parallel IF strip, thereby allowing full duplex crossband satellite work. Either the transmit or receive frequency may be varied during transmission, for quick zero-beat on another station or for tracking Doppler shift.

High Performance Features

Borrowing heavily from Yaesu's HF transceiver experience, the FT-726R comes equipped with a speech processor, variable receiver bandwidth, IF shift, all-mode squelch, receiver audio tone control, and an IF noise blanker. When the optional XF-455MC CW filter is installed, CW Wide/Narrow selection is provided. Convenient rear panel connections allow quick interface to your station audio, linear amplifier, and control lines.

Leading the way into the space age of Ham communications, Yaesu's FT-726R is the first VHF/UHF base station built around modern-day requirements. If you're tired of piecing together converters, transmitter strips, and relays, ask your Authorized Yaesu Dealer for a demonstration of the exciting new FT-726R, the rig that will expand your DX horizons!

Price And Specifications Subject To Change Without Notice Or Obligation

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The radio.

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YAESU ELECTRONICS CORPORATION 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007
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"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.
Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz-30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC bands, on SSB, CW, FSK, and AM. Features 150 kHz-30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch in 1-MHz steps. A new, innovative, quadruple "UP" conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 50-kHz spacing, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuits with cooling fan, SWR/Power meter built-in.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for smooth, quiet operation. Switchable to semi-break-in.
- **Automatic antenna tuner, built-in.**
  Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection. HIGH/LOW cut control rotation not affected by selecting USB or LSB modes.
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100 kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Six digit readout to 100 Hz (10 Hz modifiable), plus digitalized sub-scale with 20-kHz steps. Separate two digit indication of RIT frequency shift. In CW mode, display indicates the actual carrier frequency of received as well as transmitted signals.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power," improved intelligibility.
- **One year limited warranty on parts and labor.**

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz) plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- SO-1 commercial stability TCXO (temperature compensated crystal oscillator). Requires modifications.
- MC-60A deluxe desk microphone with UP/DOWN switch, pre-amplifier, 8-pin plug.
- TL-922A linear amplifier (not for CW QSK).
- SM-220 station monitor (not for pan-adapter).
- HS-6, HS-5, HS-4, headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

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