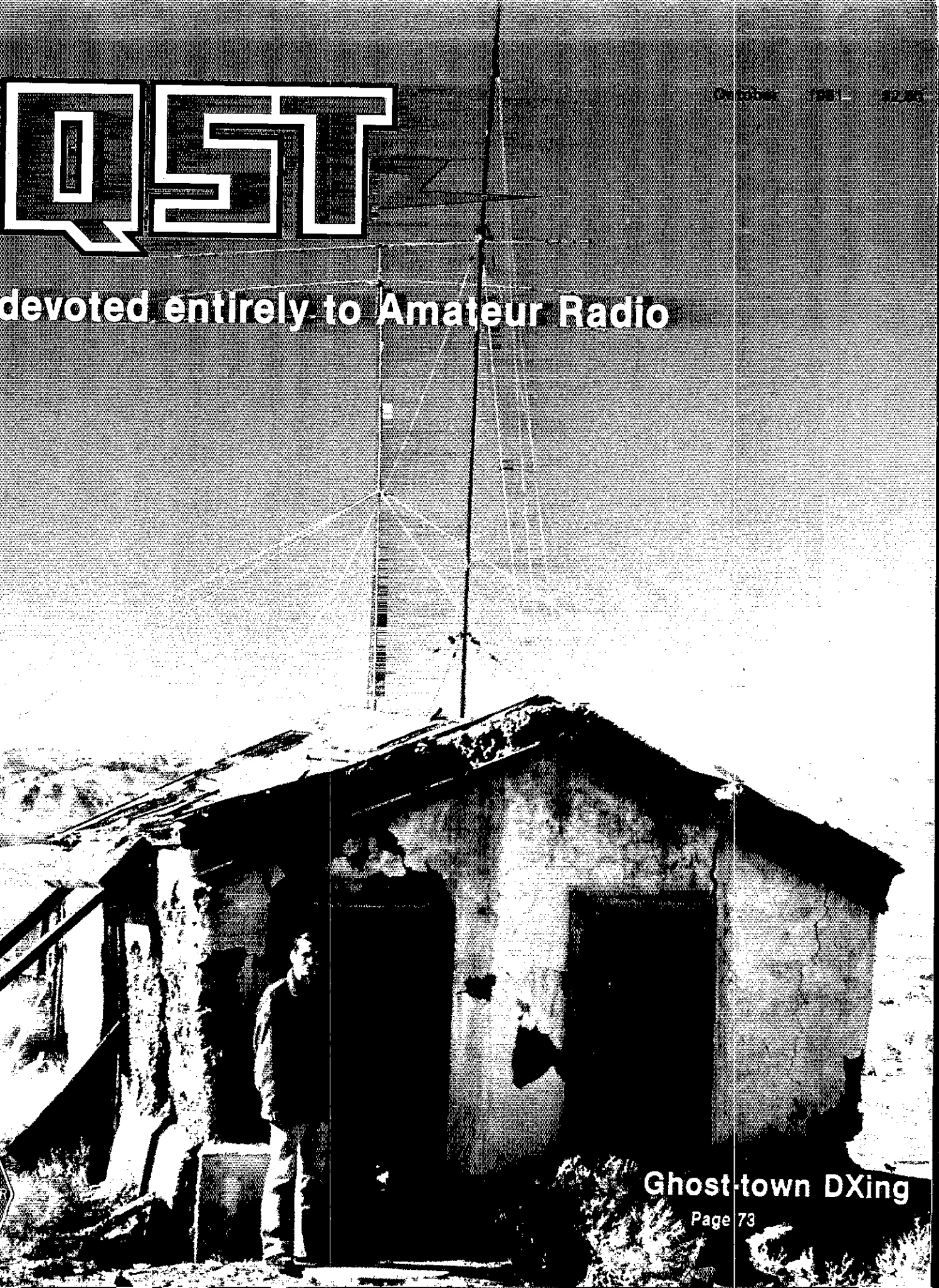
QST

October 1981 $2.00

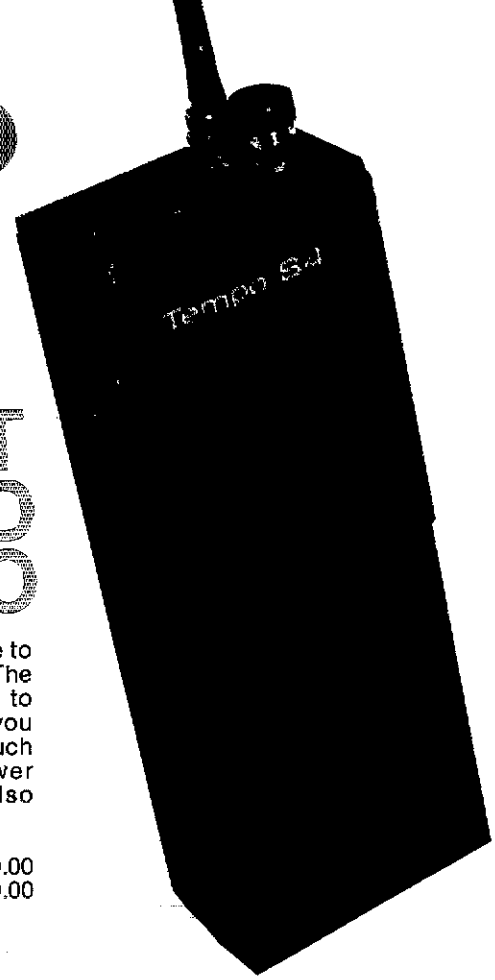
devoted entirely to Amateur Radio



Ghost-town DXing

Page 73

tempo does it again



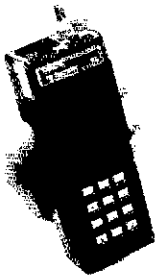
THE WORLD'S FIRST 440 MHz SYNTHESIZED HAND HELD RADIO

Tempo was the first with a synthesized hand held for amateur use, first with a 220 MHz synthesized hand held, first with a 5 watt output synthesized hand held...and once again first in the 440 MHz range with the S-4, a fully synthesized hand held radio. Not only does Tempo offer the broadest line of synthesized hand helds, but its standards of reliability are unsurpassed...reliability proven through millions of hours of operation. No other hand held has been so thoroughly field tested, is so simple to operate or offers so much value. The Tempo S-4 offers the opportunity to get on 440 MHz from where ever you may be. With the addition of a touch tone pad and matching power amplifier its versatility is also unsurpassed.

The S-4...$349.00
With 12 button touch tone pad...$399.00
With 16 button touch tone pad...$419.00
S-40 matching 40 watt output
13.8 VDC power amplifier...$149.00

Tempo S-1

The first and most thoroughly field tested hand held synthesized radio available today. Many thousands are now in use and the letters of praise still pour in. The S-1 is the most simple radio to operate and is built to provide years of dependable service. Despite its light weight and small size it is built to withstand rough handling and hard use. Its heavy duty battery pack allows more operating time between charges and its new lower price makes it even more affordable.



Tempo S-5

Offers the same field proven reliability, features and specifications as the S-1 except that the S-5 provides a big 5 watt output (or 1 watt low power operation). They both have external microphone capability and can be operated with matching solid state power amplifiers (30 watt or 80 watt output). Allows your hand held to double as a powerful mobile or base radio.

S-30...$89.00* S-80...$149.00*

*For use with S-1 and S-5

Tempo S-2

With an S-2 in your car or pocket you can use 220 MHz repeaters throughout the U.S. It offers all the advanced engineering, premium quality components and features of the S-1 and S-5. The S-2 offers 1000 channels in an extremely lightweight but rugged case.

If you're not on 220 this is the perfect way to get started. With the addition of the S-20 Tempo solid state amplifier it becomes a powerful mobile or base station. If you have a 220 MHz station, the S-2 will add tremendous versatility.

Price...$349.00 (With touch tone pad installed...$399.00)
S-20...$89.00

Specifications:
Frequency Coverage: 440 to 449.995 MHz
Channel Spacing: 25 KHz minimum
Power Requirements: 9.6 VDC
Current Drain: 17 ma-standby 400 ma-transmit (1 amp high power)
Antenna Impedance: 50 ohms
Sensitivity: Better than .5 microvolts nominal for 20 db
Supplied Accessories: Rubber flex antenna 450 ma ni-cad battery pack, charger and earphone
RF output Power: Nominal 3 watts high or 1 watt low power
Repeater Offset: ± 5 MHz

Optional Accessories for all models

12 button touch tone pad (not installed): $39 • 16 button touch tone pad (not installed): $48 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Leather holster: $20 • Cigarette lighter plug mobile charging unit: $6

TEMPO VHF & UHF SOLID STATE POWER AMPLIFIERS

Boost your signal. . . give it the range and clarity of a high powered base station. VHF (135 to 175 MHz)

Drive Power	Output	Model No.	Price
2W	130W	130A02	$209
10W	130W	130A10	$189
30W	130W	130A30	$199
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159
2W	50W	50A02	$129
2W	30W	30A02	$ 89

UHF (400 to 512 MHz) models, lower power and FCC type accepted mode also available.

53 YEARS OF SERVICE

Henry Radio

Please note, as of Dec. 1, 1980 we will occupy our new world headquarters building with a new Los Angeles address and phone number.

2050 S. Bundy Dr., Los Angeles, CA 90025 (213) 820-1234
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TOLL FREE ORDER NUMBER: (800) 421-6631
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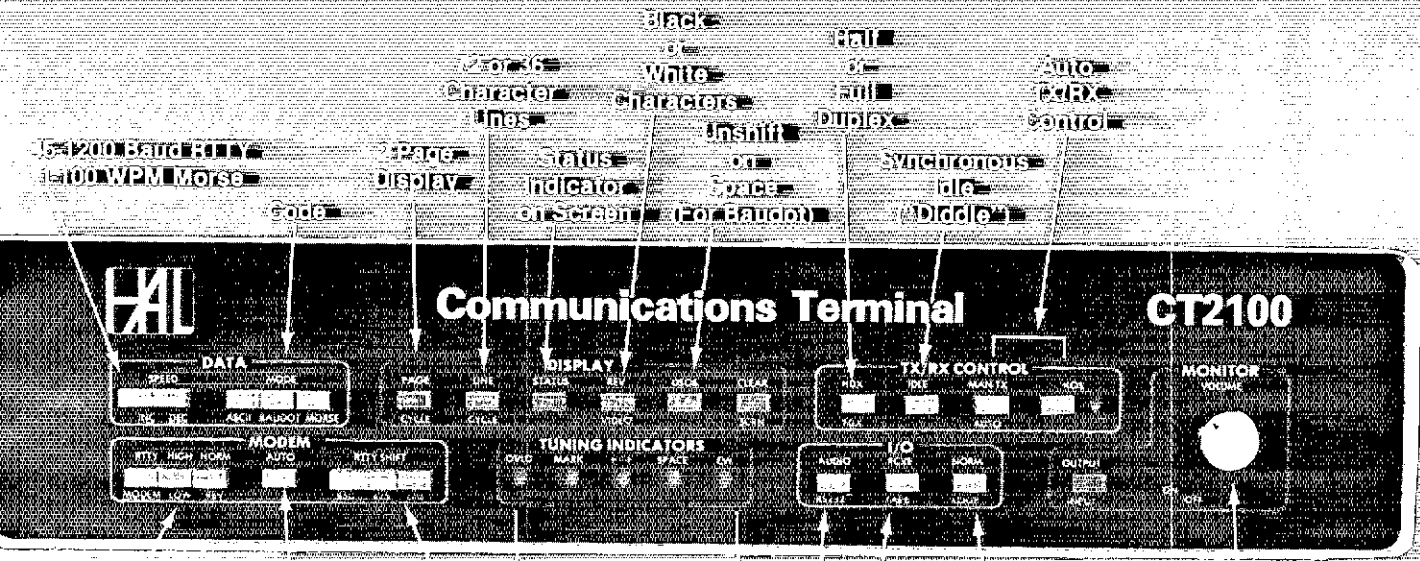
Calif. residents please call collect on our regular numbers.
Prices subject to change without notice.

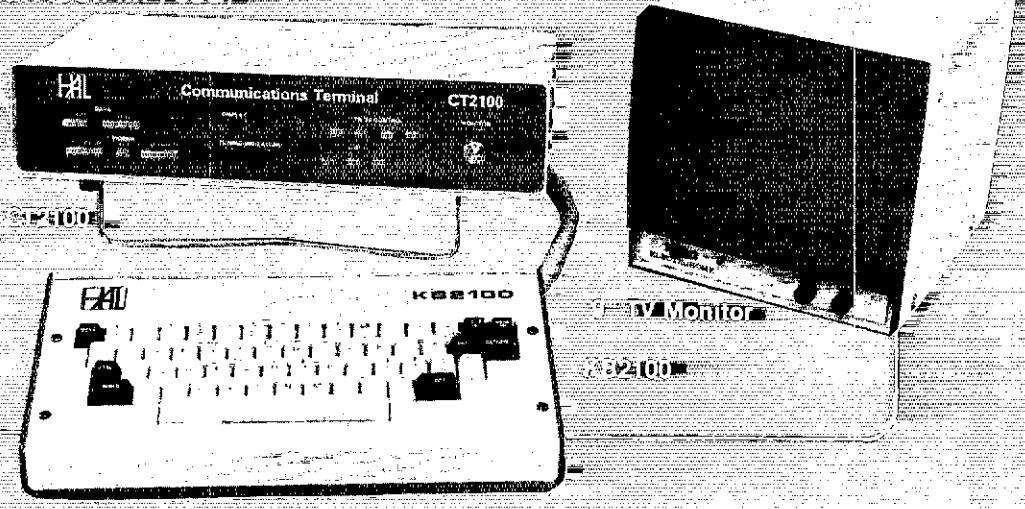
CT2100

HAL Puts MORE Behind The Buttons



CT2100 System

- CT2100 Communications Terminal
- KB2100 Keyboard
- Video Monitor
- Printer (300Bd Serial ASCII MPI 88G)
- RM2100 Rack Adapter
- MSG2100 2000 Character "Brain Tape" ROM



- 32 Line Display
- Pages of 72 Character Lines
- or
- Pages of 36 Character Lines
- Split Screen
- with KB2100

- CT2100
- TV Monitor
- KB2100

HAL COMMUNICATIONS CORP.
Box 365
Urbana, Illinois 61801
217-367-7373

Now HAL Equipment is in Stock at Leading Amateur Dealers. See page 76 for the location of your nearest dealer.

ICOM IC-730

ICOM's Go-Anywhere HF Rig for Everyone's Pocketbook

Compact.

Only 3.7 in (H) x 9.5 in (W) x 10.8 in (D) will fit into most mobile operations (compact car, airplane, boat, or suitcase)

Affordable.

Priced right to meet your budget as your main HF rig or as a second rig for mobile/portable operation.

Convenient.

- Unique tuning speed selection for quick and precise QSY, choice of 1 KHz, 100 Hz or 10 Hz tuning.
- Electronic dial lock, deactivates tuning knob for lock on, stay on frequency operation.
- One memory per band, for storage of your favorite frequency on each band.
- Dual VFO system built in standard at no extra cost.

Full Featured.

- 200W PEP input—powerful punch on SSB/CW (40 W ou on AM)
- Receiver preamp built-in • VOX built-in
- Noise blanker (selectable time constant) standard
- Large RIT knob for easy mobile operation
- Amateur band coverage 10-80M including the new WARC bands
- Speech processor—built-in, standard (no extra cost)
- IF shift slide tuning standard (pass band tuning optional)
- Fully solid state for lower current drain
- Automatic protection circuit for finals under high SWR conditions
- Digital readout • Receives WWV • Selectable AGC
- Up/down tuning from optional microphone
- Handheld microphone standard (no extra cost)
- Optional mobile mount available

ICOM

2112 116th Avenue N.E., Bellevue, WA 98004
3331 Towerwood Dr., Suite 307, Dallas TX 75234

October 1981 Volume LXV Number 10

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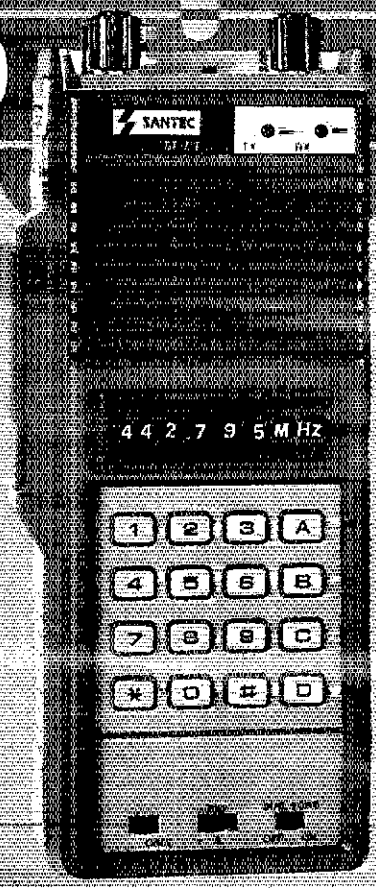
THE COVER

After placing Ballarat on the map last year, a group of enthusiastic California hams will do it again. Project Johannesburg will link the old mining town with its namesake in South Africa. Details are on pages 73 and 79. *(photo courtesy WA6NKL)*

Contents

SYNTHESIZED

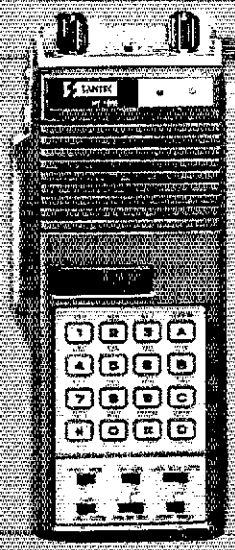


INTRODUCING SANTEC'S ST-7/T

SANTEC•NOLOGY breaks into the 440 band with style! The new ST-7/T synthesizes the entire band in 5 kHz steps, works both up and down repeater splits and does it all right from your hand, with versatile power options of 3 watts, 1 watt or even 50 milliwatts (all nominal), to reach out to where you want. The high power mode of 3 watts radiates on 440 like 5 watts on 2 meters ... and that's a handful!!

Tones? This one has them ... tones and subtones! The 16 button tone pad is a SANTEC Standard at no extra cost, and the ST-7/T's optional synthesized subtone encoder is controlled by the radio's front panel switch.

All the regular SANTEC accessories used with your HT-1200 fit the ST-7/T as well, meaning that you can enjoy both bands fully with a smaller cash investment. Grab the new SANTEC ST-7/T and join the fun on 440 MHz. See your SANTEC Dealer for delivery details*



HT-1200

SANTEC'S popular HT-1200 is the incomparable 2 meter leader. This little rig is handing over quality, power and features that you'd expect from something nearer the size of a bread box. SANTEC packs a 2 meter ham shack into the palm of your hand!

You can carry scan, search, 10 memories and fully synthesized key pad control around with you and still get out with a big 3.5 watts (nominal). Compare them apples to anything you want, and settle for nothing less.

STILL THE LEADER

*Sale of the ST-7/T is subject to FCC Certification.

SANTEC

The SANTEC HT-1200 is approved under FCC Part 15 and exceeds FCC regulations limiting spurious emissions.

2000 Avenue G, Suite 800, Plano, Texas 75074
Phone (214) 423-0024 • INTL TLX 203920 ENCOM UR

Encomm, Inc.
2000 Avenue G
Suite 800
Plano, TX 75074

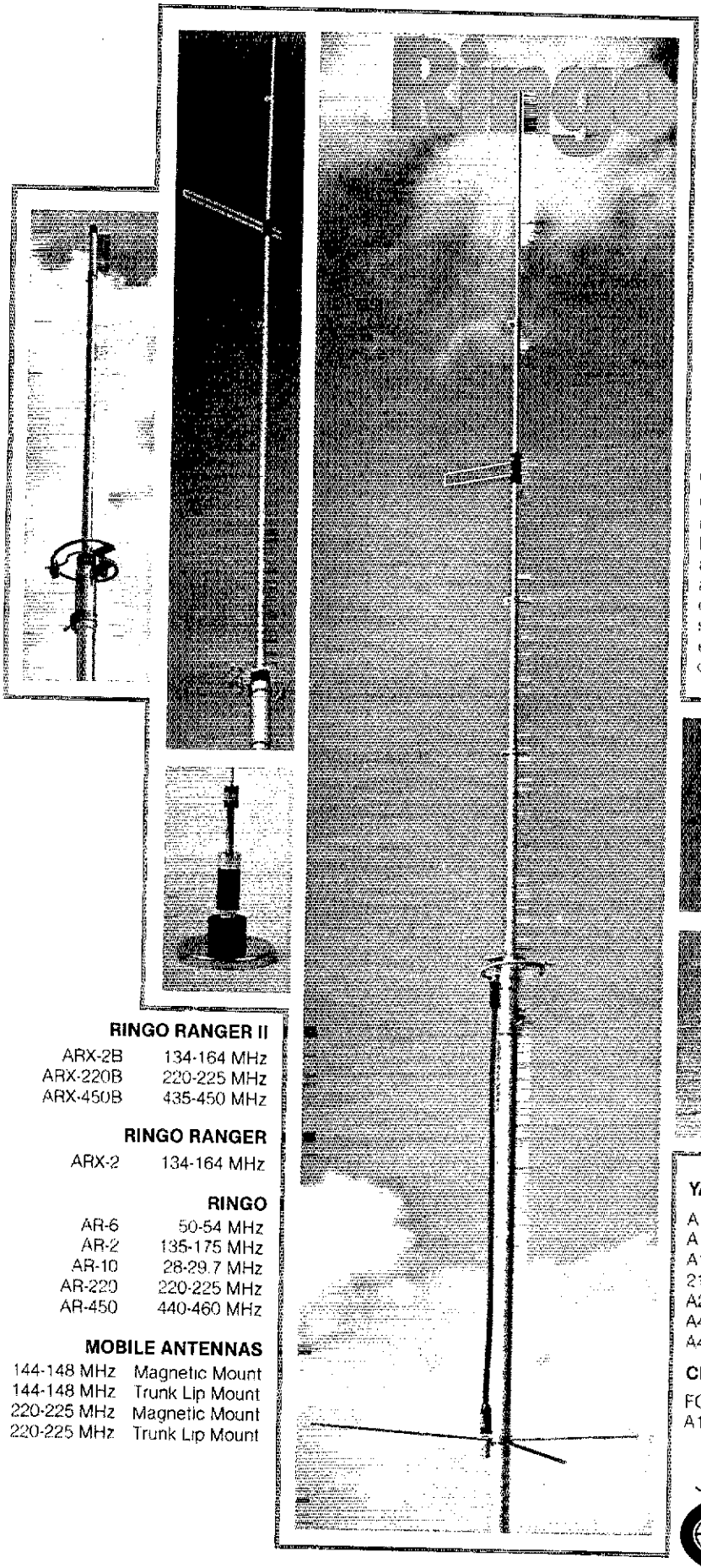
Please send me more information about.
[ ] SANTEC HT-1200
[ ] SANTEC ST-7/T
[ ] Authorized SANTEC Dealers

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

YOU MAY SEND A DUPLICATE OF THIS FORM.



Ranger II

Simply the best

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

Quick easy assembly and installation

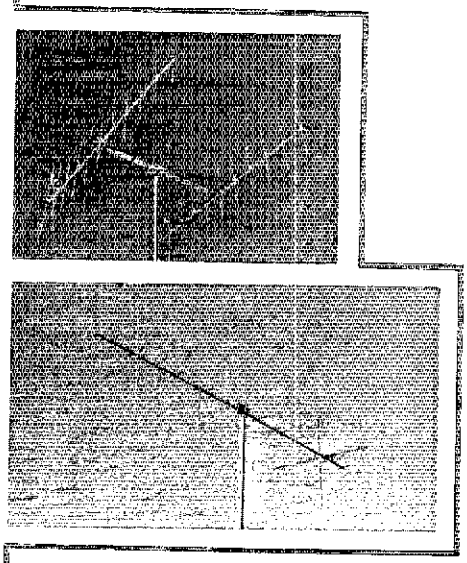
Mount anywhere with compact dimensions and neat appearance

Proven performance and durability in all environments

Complete FM band coverage

One year warranty

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



RINGO RANGER II

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

RINGO RANGER

ARX-2	134-164 MHz

RINGO

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

MOBILE ANTENNAS

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

YAGIS

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

CROSS YAGI

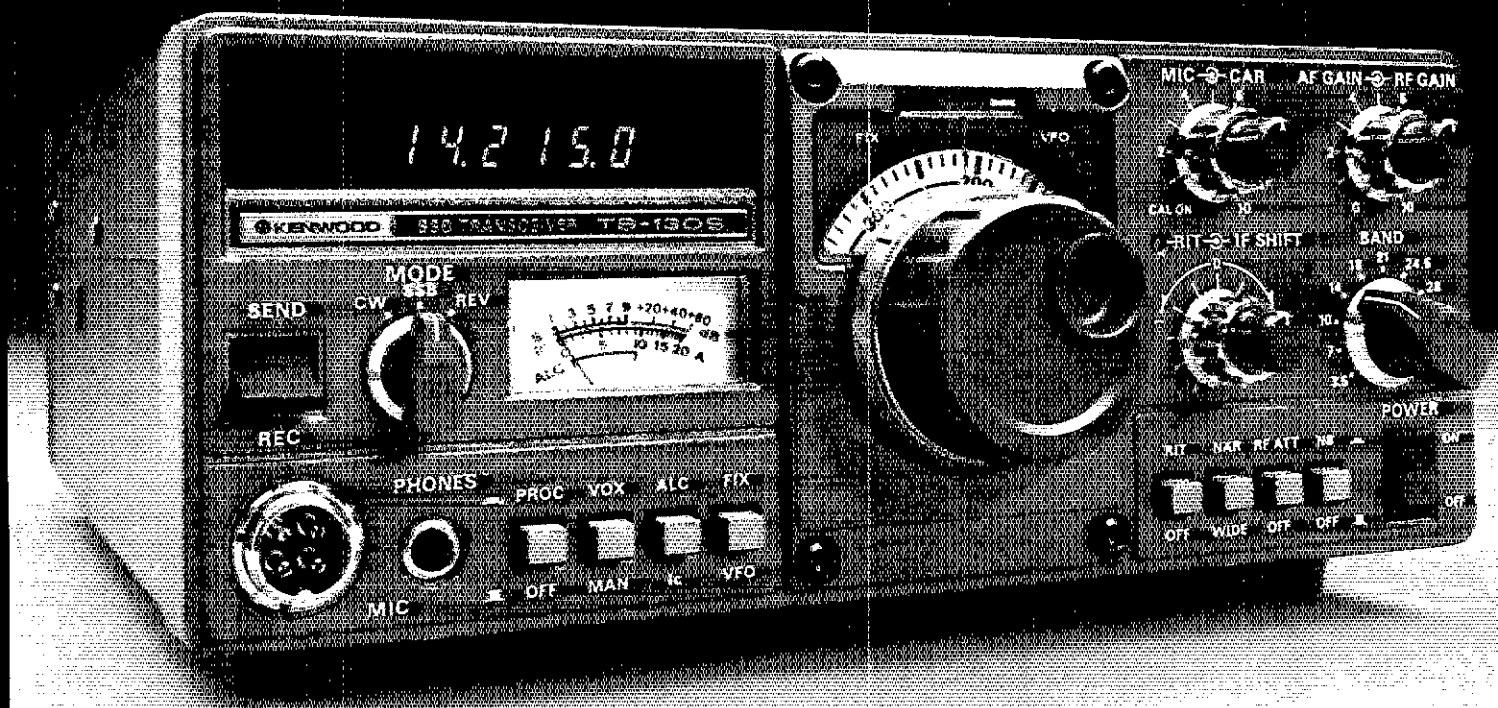
FOR CW/SSB and FM

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

cushcraft CORPORATION

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

Small wonder.



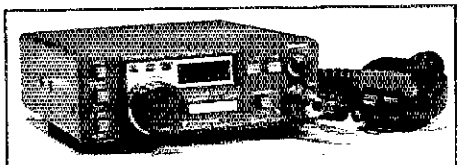
Processor, N/W switch, IF shift, DFC option

TS-130SV

An incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 29.7 MHz (including the three new Amateur bands!) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (on both SSB and CW), and optional DFC-230 digital frequency controller. The TS-130S runs high power and the TS-130V is a low-power version for QRP.

TS-130 SERIES FEATURES:

- **80-10 meters, including three new bands**
  Covers all Amateur bands from 3.5 to 29.7 MHz, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz. VFO covers more than 50 kHz above and below each 500-kHz band.
- **Two power versions... easy operation**
  TS-130S runs 200 W PEP/160 W DC input on 160-15 meters and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands. Solid-state, wideband final amplifier eliminates transmitter tuning, and receiver wideband RF amplifiers eliminate preselector peaking.
- **CW narrow/wide selection**
  "N-W" switch allows selection of wide and narrow bandwidths. Wide CW and SSB bandwidths are the same. Optional YK-88C (500 Hz) or YK-88CN (270 Hz) filter may be installed for narrow CW.
- **Built-in speech processor**
  Increases audio punch and average SSB output power, while suppressing sideband splatter.
- **SSB narrow selection**
  "N-W" switch allows selection of narrow SSB bandwidth to eliminate QRM, when optional YK-88SN (1.8 kHz) filter is installed. (CW filter may still be selected in CW mode.)
- **Sideband mode selected automatically**
  LSB is selected on 40 meters and below, and USB on 30 meters and above. SSB REVERSE position on MODE switch.
- **Built-in digital display**
  Six-digit green fluorescent tube display indicates actual operating frequency to 100 Hz. Also indicates external VFO or fixed-channel frequency, RIT shift, and CW transmit/receive shifts. Backed up by an analog subdial.
- **IF shift**
  Allows IF passband to be moved away from interfering signals and sideband splatter.
- **Built-in RF attenuator**
  For optimum rejection of intermodulation distortion.
- **Single-conversion PLL system**
  Improves stability as well as transmit and receive spurious characteristics.
- **Built-in VOX**
  For convenient SSB operation, as well as semibreak-in CW with sidetone.
- **Effective noise blanker**
  Eliminates pulse-type interference such as ignition noise.
- **Compact and lightweight**
  Measures only 3-3/4 inches high, 9-1/2 inches wide, and 11-9/16 inches deep, and weighs only 12.3 pounds.



Optional DFC-230 Digital Frequency Controller
Allows frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Includes four memories (handy for split-frequency operation) and digital display. Covers 100 kHz above and below each 500-kHz band. Very compact.

More information on the TS-130 Series is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

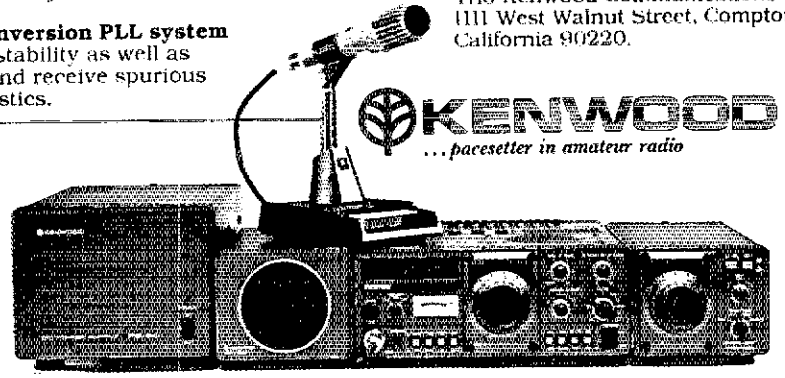
Matching accessories for fixed-station operation:

- PS-30 base-station power supply (remotely switchable on and off with TS-130S power switch).
- SP-120 external speaker
- VFO-120 remote VFO
- MC-50 50kΩ/500Ω desk microphone

Other accessories not shown:

- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters
- YK-88SN (1.8 kHz) narrow SSB filter
- AT-130 compact antenna tuner (80-10 m, including 3 new bands)
- MB-100 mobile mounting bracket
- MC-30S and MC-35S noise cancelling hand microphones
- PC-1 phone patch
- TL-922A linear amplifier
- HS-5 and HS-4 headphones
- HC-10 world digital clock
- PS-20 base-station power supply for TS-130V
- SP-40 compact mobile speaker
- VFO-230 digital VFO with five memories

KENWOOD
...pacesetter in amateur radio



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

40 W, 15 memories/offset recall, scan, priority, DTMF touch-pad

TR-7850

Kenwood's remarkable TR-7850 2-meter FM mobile transceiver provides all the features you could desire, including a powerful 40 watts RF output. Frequency selection is easier than ever, and the rig incorporates new memory developments for repeater shift, priority, and scan, and includes a built-in autopatch touch-pad (DTMF) encoder. A 25-watt output version, the TR-7800, is also available.

TR-7850 FEATURES:

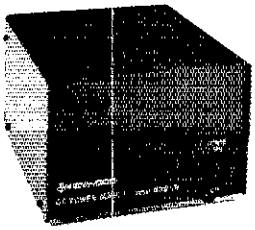
- **Powerful 40 watts power output**
  Selectable high or low power operation. High 40-watt output provides reliable signal for wide area coverage.
- **15 multifunction memory channels, easily selectable with a rotary control**
  M1-M13...memorize frequency and offset (±600 kHz or simplex). M14...memorize transmit and receive frequencies independently for nonstandard offset. M0...priority channel, with simplex, ±600 kHz, or nonstandard offset operation.
- **Internal battery backup for all memories**
  All memory channels (including transmit offset) are retained when four AA NiCd batteries (not Kenwood supplied) are installed in battery holder inside TR-7850. Batteries are automatically charged while transceiver is connected to 12-VDC source.
- **Extended frequency coverage**
  143.900-148.995 MHz, in switchable 5-kHz or 10-kHz steps.
- **Priority alert**
  M0 memory is priority channel. "Beep" alerts operator when signal appears on priority channel. Operation can be switched immediately to priority channel with the push of a switch.
- **Built-in autopatch touch-pad (DTMF) encoder**
  Front-panel touch pad generates all 12 telephone-compatible dual tones in transmit mode, plus four additional DTMF signaling tones (with simultaneous push of REV switch).
- **Front-panel keyboard**
  For frequency selection, transmit offset selection, memory programming, scan control, and selection of autopatch encoder tones.
- **Autoscan**
  Entire band (5-kHz or 10-kHz steps) and memories. Automatically locks on busy channel; scan resumes automatically after several seconds, unless CLEAR or mic PTT button is pressed to cancel scan.
- **Up/down manual scan**
  Entire band (5-kHz or 10-kHz steps) and memories, with UP/DOWN microphone (standard).
- **Repeater reverse switch**
  Handy for checking signals on the input of a repeater or for determining if a repeater is "upside down."
- **Separate digital readouts**
  To display frequency (both receive and transmit) and memory channel.
- **LED bar meter**
  For monitoring received signal level and RF output.
- **LED indicators**
  To show: +600 kHz, simplex, or -600 kHz transmitter offset; BUSY channel; ON AIR.
- **TONE switch**
  To actuate subaudible tone module (not Kenwood-supplied).
- **Compact size**
  Depth is reduced substantially.
- **Mobile mounting bracket**
  With quick-release levers.

More information on the TR-7850 is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

KENWOOD
...paceseller in amateur radio

Matching accessory for fixed-station operation:
- KPS-12 fixed-station power supply for TR-7850

Other accessories not shown:
- KPS-7 fixed-station power supply for TR-7800
- SP-40 compact mobile speaker



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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us . . ."

The Humanistic Challenge

Challenges are nothing new to the unique collection of individuals that is the amateur community. From the beginning, amateurs have often emerged at the forefront of the art, contributing in profound ways to the betterment of life. Now, a new challenge has presented itself — one that transcends the amateur's traditionally mechanistic role. It is the humanistic challenge put forth by the United Nations General Assembly when it proclaimed 1981 the International Year of Disabled Persons. This global call is for the establishment of goals and programs aimed at improving the lives of the 450 million disabled persons worldwide. The U.N. chose achievement of full participation by the disabled in society as the theme for the year. Enter, Amateur Radio.

This is the year to underscore Amateur Radio's unique and important appeal for the disabled individual and a time for amateurs to unleash that spirit of fellowship by helping the disabled get involved. Amateur Radio, as all of us know so well, is appealing. But for the individual who is limited in mobility, the appeal is inherently greater. For many, radio is the sole means of retreat from loneliness; a way in which they may communicate not only with their friends and neighbors outside of an institution room, but with individuals worldwide, a capability that most people don't have. Amateur Radio often proves that a disability need not always be a handicap.

The challenge lies in bringing radio to the disabled person who wants to improve his or her life through communication. The club is one vehicle by which this can be achieved — for many, a local ham club served as their "Elmer." Another way is through an organization such as the Courage HANDI-HAM System. An international group with headquarters in Minnesota, the HANDI-HAMs (members, student-members, and "verticals") provide special assistance to disabled persons working for their tickets, and to licensees studying for an upgrade. The System also provides a resource of special aids to facilitate station operation. For example, the renowned "Puff N' Sip" keyer allows the operator to send the code by, you guessed it, puffing and sipping. HANDI-HAM Director Bruce Humphrys, KØHR, recalls a contemporary case:

> One of the most interesting projects I've been involved with is getting Bill Savada, KA4DAA, back on the air. Bill developed a universal allergy (he's allergic to everything!) and has been living completely isolated in a porcelain and stainless steel mobile home in Texas. Bill had no way of getting on the air because of his allergy to his rig.
>
> We have designed an all-stainless steel, airtight container for the transceiver using shaft extensions donated by a ham in Missouri, and a "Puff N' Sip" keyer. This is an exciting project — especially when you consider that Bill has a lot more to gain by getting on the air than most of us.

The intrinsic value of Amateur Radio manifests itself in hundreds of cases similar to Bill Savada's in which hams are helping increase social opportunity. For others, the feeling of pride of accomplishment that accompanies personal progress and activity is of tantamount significance.

The ARRL, and IARU, recognize the important benefits of Amateur Radio to the disabled community. In fact, the Board of Directors formally stated on March 11 of this year that "Amateur Radio has long been recognized as a window on the world for the handicapped and . . . handicapped radio amateurs have used their time and talent in the public interest, convenience and necessity . . ." The Board called for continuation and enhancement of the staff's program for the disabled. ARRL heartily endorses the work of organizations such as the Courage HANDI-HAMs, the Hadley School for the Blind and others whose innovative programs promote participation by the disabled. Every year, a Hq. staff member is on hand at the invitation of the HANDI-HAM crew to represent the League at their Radio Camps (see December, 1980 *QST*). Recently, this writer served as a Radio Camp instructor at a Camp Courage, Minnesota, session.

The Humanistic Challenge is also a personal one — the opportunity is beckoning to increase the meaningfulness of Amateur Radio for you. Why not become involved in this International Year, and every year, by helping a disabled person discover Amateur Radio? — *Richard Palm, K1CE*

League Lines...

At press time, UoSAT, Great Britain's first Amateur Radio satellite, was scheduled for launch from Vandenberg, AFB, California, on September 20. The satellite, to be named UoSAT AMSAT OSCAR 9 after successful launch, is a secondary payload riding piggyback on a NASA mission. The primary payload, Mesosphere Explorer, carries instruments to measure the production and depletion of ozone in the earth's atmosphere on a global scale. Both satellites were to be launched by a McDonnell Douglas Delta 210 and be placed in a sun-synchronous, 336-mile-high orbit. We hope that by the time you read this the world Amateur Radio community will be celebrating the launch of another Amateur Satellite.

The U.S. State Department has advised League Hq. that the U.S. Embassy in Rome and the Italian Government have exchanged diplomatic notes establishing a reciprocal operating agreement. Hq. has not yet received information on the procedure for applications. Until this information is made available, please contact Associazione Radioamatori Italiani, Via D. Scarlatti 31, I-20124 Milano.

The FCC has released a 69-page "working paper" entitled "Deregulating Personal and Amateur Radio," which explores several ideas for improving the personal radio services. Some of the ideas considered by the paper are as follows: (1) a code-free vhf amateur license for technically qualified persons, (2) amateur operations on some CB frequencies, including the present 27-MHz band and the new, proposed 900-MHz band, (3) expansion of hf operating privileges for Technician class licensees, (4) a systematic study to find ways to encourage a more technically innovative Amateur Radio Service, and (5) elimination of certain regulations that restrict third-party traffic and repeater operations, and inhibit new technologies such as spread spectrum. The title page has a disclaimer that "The opinions expressed in this paper are the authors'. They do not necessarily reflect the policies or views of the Federal Communications Commission or any other organization or individual." A limited number of copies of the working paper are available from the FCC Office of Public Affairs, Room 207, 1919 M St., N.W., Washington, DC 20554.

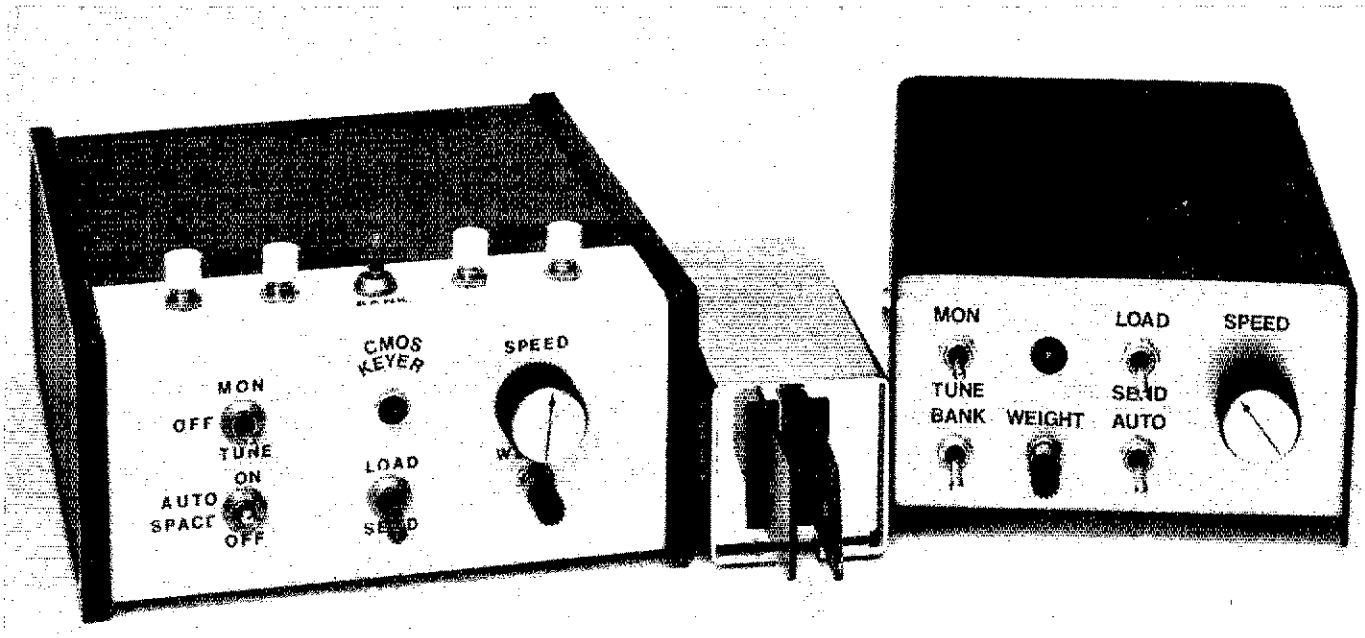
Pitcairn Island traffic. Pitcairn Island (VR6) is one of the most isolated communities in the world. There is, for instance, no commercial telegraph or radio service to the outside world. When there is an urgent need for communications, the island's one amateur station manned by Tom Christian must be used. Thus, since 1970 there has been an "informal and temporary" agreement between the United Kingdom and the United States permitting VR6TC and the U.S. amateurs to exchange messages concerning medical emergencies, urgent need for equipment or supplies, and private or personal matters of island residents. The agreement applies equally to phone patches and written traffic.

Attention repeater enthusiasts! The deadline for registering your repeater for the next edition of the ARRL Repeater Directory is November 1. Please register your repeater on form CD-240, available for an s.a.s.e., to ensure the accuracy of the new edition. Send all information to ARRL Communications Department, 225 Main Street, Newington, CT 06111. All repeaters must be registered each year if they are to be listed in the directory.

QEX: The ARRL Experimenters' Exchange, is a new League publication available by subscription. Its purpose is to provide a medium for the exchange of ideas and information among Amateur Radio experimenters, document advanced technical work in the Amateur Radio field, and to demonstrate the League's commitment to, and support for, efforts to advance the state of the Amateur Radio art. Details about QEX appear in August 1981 QST, page 48. Prospective contributors are invited to submit articles to Paul Rinaldo, W4RI, Editor, QEX, 1524 Springvale Ave., McLean, VA 22101. Please submit your technical contribution by October 25 to be considered for the debut issue.

According to an FCC report, the average routine processing time for an Amateur Radio license in July 1981 was 51 days. Included in this time are the number of days from receipt of the application to the time the completed license is mailed; however, the time required for postal service in either direction is not included.

The CMOS Super Keyer



Able to bridge tight pocket books with a single board, this keyer has a features/cost ratio that is hard to beat! It is designed for — and by — cw operators.

By Jeffrey D. Russell,* KCØQ, and Conway A. Southard,** NØII

Why should *you* build this keyer? Well, let's start by listing its prominent features, and see if you can resist its attraction: (1) Compact and inexpensive; (2) Has eight 50-character message memories; (3) Messages are loaded or aborted by paddle operation; (4) Transmitter not keyed during message loading; (5) Any message may be instantly restarted; (6) Includes a message loading indicator; (7) Incorporates iambic operation; (8) Employs both dot and dash memories; (9) Has switch-selectable, auto-character spacing; (10) Uses a gated clock for instantaneous asynchronous starting; (11) Has ultra-low power requirements; (12) Features continuous message retention; (13) Offers very friendly timing circuitry.

Not only will you have a keyer that you will be proud of, but those interested in logic design will find this presentation useful and interesting. Several novel features help to reduce the number of ICs used — only 12 readily available ICs are required. CMOS devices are employed, and with no quiescent current paths the keyer draws only 10 to 15 microamperes in standby. It has no ON/OFF switch! A state transition diagram is also included and, as far as we know, it is the first keyer so presented.

*2125 Linmar Dr. NE, Cedar Rapids, IA 52402
**2519 Meadowbrook Dr. SE, Cedar Rapids, IA 52403

Cost

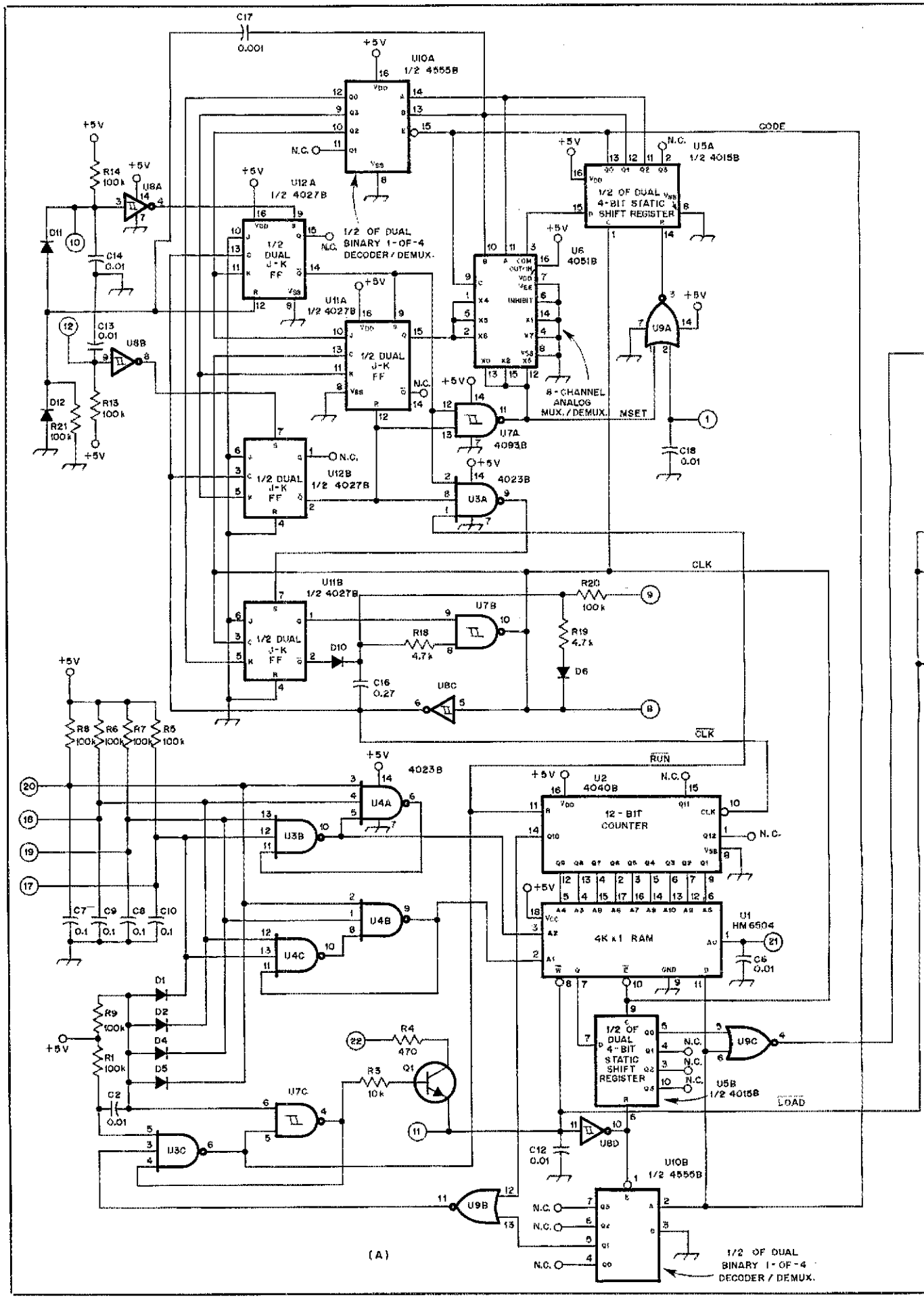
Certainly this is a factor of primary concern to amateurs. Total IC costs will be about $10, including an approximate cost of $7 for the RAM chip. If your junk box is helpful, a total cost of $20 or $25 can be expected. If you need to buy all the parts,[1] the keyer could cost $60 or so. Not bad in light of today's "smaller" dollar. Double-sided pc boards with plated-through holes are available from either author at a cost of $15 each (plus $1 shipping).[2] These boards measure 3.6 × 4.6 inches (91 × 117 mm).

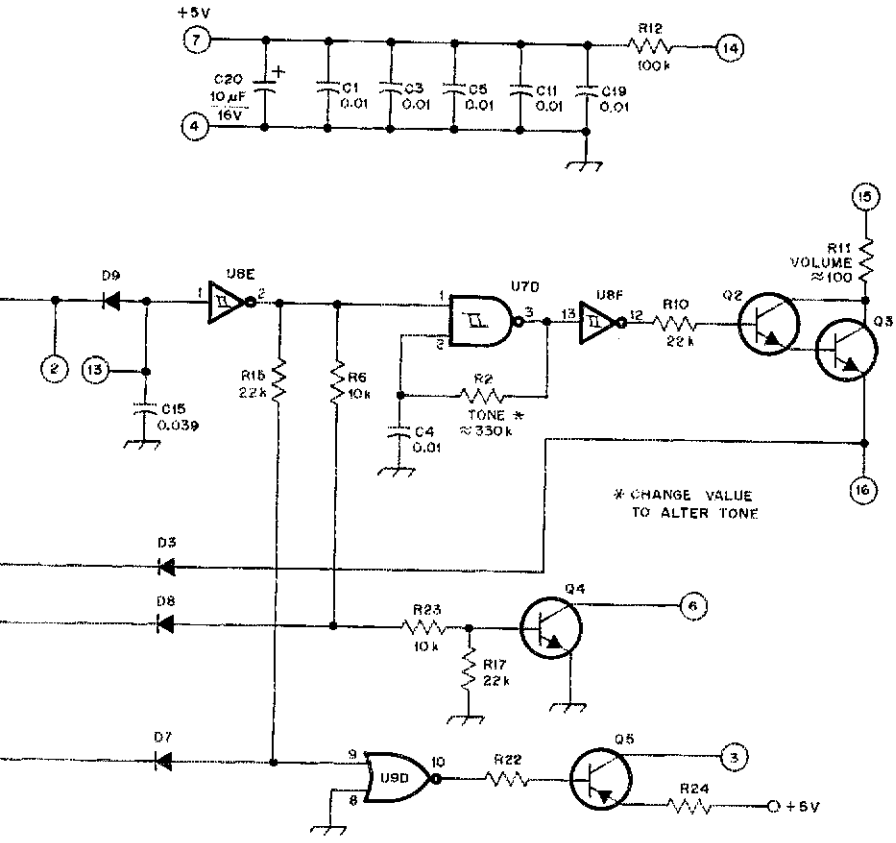
[1]Notes appear on page 17.

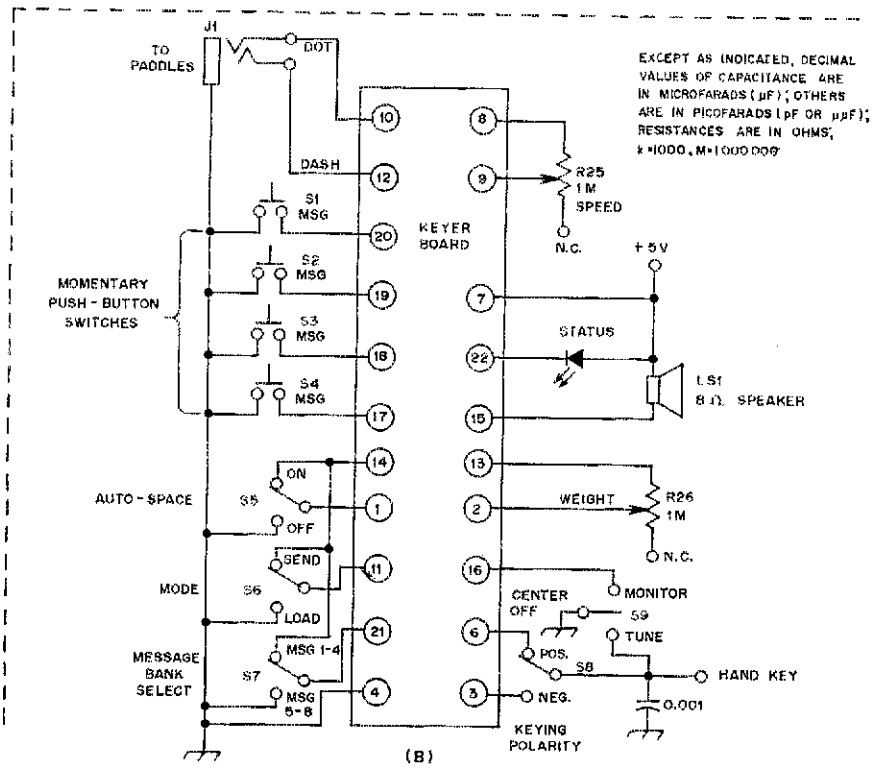
CMOS Design

The advantages of CMOS technology are apparent in this keyer: low cost, ultra-low power requirements, wide logic swings, "down-the-middle" transfer characteristics, high impedance inputs, lots of "fan out" drive capability and good noise immunity, to name a few. The 6504 RAM can store 4096 bits: that's eight messages of 512 bits each, or about 50 characters per message.

This circuit does not depend on how fast one IC is with respect to another. In some designs you are instructed to swap this or that IC if you have a problem, or R-C networks are added to the circuit to reduce "glitches" or race conditions. There are no R-C de-glitchers in this design. The read-in/read-out memory-


C17
0.001
+5V
U10A
1/2 4555B
CODE
U5A
1/2 4015B
1/2 OF DUAL
4-BIT STATIC
SHIFT REGISTER
U12A
1/2 4027B
1/2 DUAL
J-K
FF
1/2 OF DUAL
BINARY 1-OF-4
DECODER / DEMUX.
U6
4051B
8-CHANNEL
ANALOG
MUX. / DEMUX.
MSET
U8A
U8B
U9A
R14
100k
R13
100k
R21
100k
D11
D12
C14
0.01
C13
0.01
C18
0.01
U11A
1/2 4027B
U12B
1/2 4027B
U7A
4093B
U3A
4023B
N.C.
CLK
U11B
1/2 4027B
U7B
R18
4.7k
R19
4.7k
R20
100k
D6
D10
C16
0.27
U8C
R8
100k
R6
100k
R7
100k
R5
100k
RUN
U4A
U3B
U4B
U4C
U2
4040B
12-BIT
COUNTER
U1
HM 6504
4K x 1 RAM
C7
0.1
C9
0.1
C8
0.1
C10
0.1
C5
0.01
D1
D2
D4
D5
R9
100k
R1
100k
C2
0.01
R4
470
R3
10k
Q1
U7C
U3C
U9C
U5B
1/2 4015B
LOAD
U8D
C12
0.01
U10B
1/2 4555B
U9B
1/2 OF DUAL
BINARY 1-OF-4
DECODER / DEMUX.
(A)





address transitions are logically synchronized, and all transition states are provided for.

Functional Keyer Description

There are four basic areas of the keyer: The ASYNCHRONOUS paddle logic and oscillator, SYNCHRONOUS (state machine) section, MEMORY AND MEMORY CONTROL, and the WEIGHTING, OUTPUT and SIDETONE section (discussed under Wiring Options). We'll examine them one at a time.

Asynchronous Module

Almost all modern keyer designs have dot and dash memories, as does this one. However, many designs don't allow the full time between elements to get off the dash or dot paddle before another element is loaded. The result, for those keyers, is that you may have difficulty with extraneous elements (usually dots) creating, for example, an R for an A or an I for an E. This keyer design allows you the full interelement time to release the paddles, and a special dot reload circuit makes squeeze timing even less critical — it is a super-easy keyer to use.

The ASYNCHRONOUS module derives its name from the fact that paddle manipulation by the operator can be, and usually is, quite irregular and not in phase with any internal keyer clock. Refer to Fig. 1. U8A and U8B are inverters that isolate the dot and dash paddles. U12A and U12B comprise the dot and dash memory FFs (flip-flops). These FFs are set by the action of the paddles and are reset (as described later) by the state module or the SYNCHRONOUS section. U11A is the iambic FF that allows the keyer to provide alternate dots and dashes when both paddles are closed. (Iambic operation seems to be the design preferred by most

Fig. 1 — Schematic diagram of the keyer. One-eighth- or 1/4-watt carbon resistors should be used. Simplification of the keyer by elimination of features and by component selection is discussed in the text. The circled leads at A correspond to the board edge connector pads shown at B. With the exception of C15, C16 and C20, all capacitors are disc ceramic, 50-V units.
C15 — Mylar, 0.039 µF, 50 V.
C16 — Mylar, 0.27 µF, 50 V.
C20 — Electrolytic or tantalum, 10 µF, 16 V.
D1-D12, incl. — Silicon, fast-switching diode, 100 PIV, 75 mA, 4 ns, 1N4454, 1N914, 1N4148 or equiv.
Q1-Q3, incl. — Npn silicon low power, general-purpose amplifier, 500 mW, 2N2222 or equiv.
Q4, Q5 — See text.
U1 — CMOS 4k x 1 RAM, Harris HM6504-9.
U2 — CMOS 12-bit counter, 4040B.
U3, U4 — CMOS triple 3-input NAND gate, 4023B.
U5 — CMOS dual shift register, 4015B.
U6 — CMOS 8-to-1 multiplexer, 4051B.
U7 — CMOS quad Schmitt NAND gate, 4093B.
U8 — CMOS hex Schmitt inverter, 40106B, MC14584B.
U9 — CMOS quad 2-input NOR gate, 4001B.
U10 — CMOS dual 2-to-4 decoder, 4555B.
U11, U12 — CMOS dual J-K FF, 4027B.

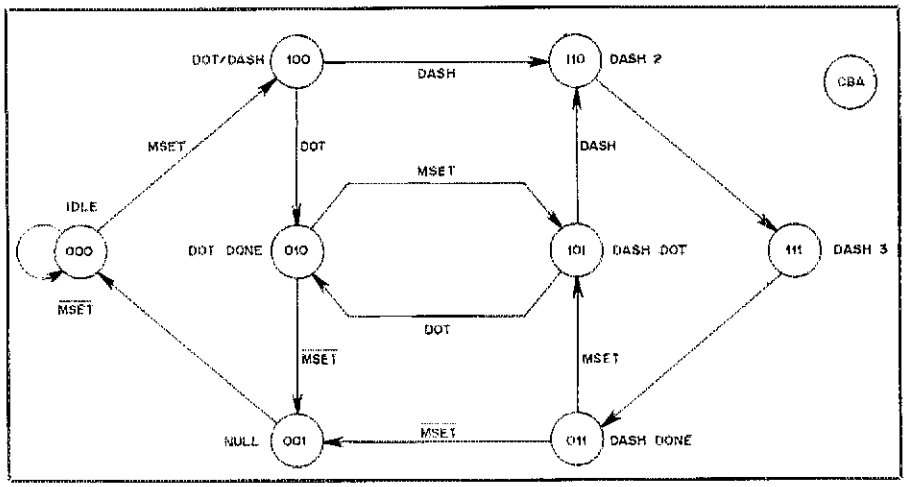


Fig. 2 — State transition diagram of the keyer. Dot = not dash, dash = current output of the iambic FF, MSET = 1 if either the dot or dash memory is set. At the completion of a dot, state 010 (dot done) is always entered. After dash completion, state 011 (dash done) is always entered. A mark is begun in either state 100 or 101. The clock produces short negative-going pulses, and all state transitions occur on the positive-going clock edge. An attempt is made to reset the dot memory on the negative clock pulse edge during the end of state 010 and to reset the dash memory on the negative clock edge during the end of state 011. Setting of the iambic FF to dash on the transition from state 010 to 101 and resetting to dot on transition from 011 to 101 is sought. If the dot reload timing change described in the text is used, a special dot reset pulse is generated at state 110, which tries to reset the dot FF.

Table 1

Edge Connector Signals

Pad Number	*Signal*
1	AUTO-SPACE
2	WEIGHT (1)
3	Negative keying output
4	Ground
5	Spare
6	Positive keying output
7	+5 V
8	SPEED (1)
9	SPEED (2)
10	Dot paddle input
11	LOAD switch
12	Dash paddle input
13	WEIGHT (2)
14	Positive high for pull-ups
15	Speaker
16	MONITOR switch
17	Message button 4
18	Message button 3
19	Message button 2
20	Message button 1
21	MESSAGE BANK SELECT switch
22	STATUS LED

operators.) FF U11B is set to turn on the gated oscillator and keeps the oscillator running until it is stopped intentionally.

The oscillator, U7B and U8C, is gated so that a character can start immediately when you close a paddle. Some designs with gated clocks have a first cycle that is not the same length as the succeeding ones. This problem may be solved by using a continuously running clock, but creates another problem: A character may be initiated only at some undetermined time after paddle closure, depending on where the oscillator may be in the cycle at the time. The oscillator in this keyer is gated, and, when stopped, its output (CLK) is high. Further, the duty cycle is purposely set with a very short negative pulse and a long positive pulse that eliminates the "first-cycle" syndrome. This is crucial to the overall operation of the keyer. D10 serves as a precharge path for the oscillator; it ensures that the oscillator returns quickly to the idle state at the end of the keying cycle.

The dot and dash FFs are set by the paddles, and their outputs are combined in gate U7A. U7A output is the signal called MSET (Memory SET) on the state transition diagram and is a 1 if either or both FFs are set. The MSET signal is an input to the state module. The output of iambic FF U11A is called DOT/DASH and will be a 1 for a dash or a 0 for a dot. The J-K FF used at 11A must have a defined state when both SET and RESET are active — not all FFs are acceptable here.

Dot and dash FFs U12A and U12B are reset by the CLK-NOT (the negative going edge of CLK) on leaving state 010 for a dot or 011 for a dash. These same signals are used to toggle the iambic FF, too.

Clock FF U11B is turned on by a dot paddle closure, a dash paddle closure or a RUN-NOT signal from the memory section. This FF is reset by a high on the K input, which occurs only at state 000, when the keyer has arrived at the idle condition. The oscillator (U7B/U8C) normally does not have a linear speed characteristic, but this is relieved by using a SPEED potentiometer with an inverse log taper. A regular log (audio) taper potentiometer may be used here, but should be wired to increase speed with a counterclockwise rotation of the control.

Synchronous Module

This is the heart of the keyer logic. A state transition diagram (shown in Fig. 2) will aid in explaining the sequencing of the keyer. Basically, the circuit operates as a clocked-state machine with eight states. These states are identified in binary code (CBA), and the circle nodes on the diagram are the binary description of the states. States are identified out of a shift register, which is always shifting to the right. For example, the state 000 is the idle state and when either paddle is closed, the state shifts right and a 1 is shifted into the first position (C) — hence the state 100. Keep in mind that whenever the C position is a 1, the keyer will be outputting a MARK. So on closure of either paddle, the keyer sequences to state 100, and a MARK is output.

On the next clock tick, the keyer can move to state 010 or 110, depending on which desired element (dot or dash) is being keyed. Note that the state is shifted right, and a dash will cause a 1 to shift into the register for state 110, or a not-dash (dot) will cause a 0 to produce a state 010.

In general, a state machine must have sufficient memory to determine its past history (to know what state it is in) that, when mixed with input signals (called qualifiers), will exactly determine the next state. The state history for this unit is kept in a 4-bit shift register, U5A. U5A is clocked (shifted right) by CLK, and the left-most bit is loaded into the D input from U6. The state of the keyer is determined by Q0, Q1 and Q2, and these outputs are the CBA node identifiers in the state diagram. The fourth bit of that shift register is ignored, as only three bits are needed to define the eight states of the keyer.

Assume the keyer is in state 000, and a clock pulse occurs. The signal at U6 input X0 (pin 13) will be output at pin 3 and will become the first bit shifted into the register. Since the clock pulse must occur because of a paddle closure, MSET at pin 13 will be a 1, and the shift register is now set at 100.

Because of this action, the keyer will go to state 100 from 000 with any paddle closure. However, the next state will either be 010 or 110 depending on the DASH input (refer to the state diagram in Fig. 1). Which inputs to U6 are coupled to the shift register are determined by the current state of the keyer and these inputs.

A single dot closure of the paddle produces the following states: 000 (idle), 100 (send dot/MARK), 010 (dot done), 001 (null) and back to 000 (idle). A dot in state 100 is sent, and then the keyer inserts three space elements — the AUTO-SPACE feature.

To produce a single dash, the states are: 000 (idle), 100 (send dash/MARK), 110

(send second MARK), 111 (send a third MARK), 011 (dash done), 001 (null) and 000 (idle) again. A dash is three elements long, followed by three spaces for AUTO-SPACING.

The dot-done (010) and dash-done (011) states test for the MSET line and controls the sequence and alternating requirements for iambic operation. MSET indicates that *either* the dot or dash memories have been loaded. The signals DOT and DASH just indicate whether the dot or dash memories have been set.

The state outputs of U5A are fed to U10A, an output decoder. U10A produces an output at pin 12 for state 000, which is used to attempt a reset of FF U11B and to turn off the clock. For state 010, an output at pin 10 attempts to reset the dot FF and/or toggle the iambic FF U11A. An output at pin 9 for state 011 attempts to reset the dash FF and/or toggle the iambic FF.

U9A supplies a reset signal to the shift register U5A. With the AUTO-SPACE on, a reset is never applied. With AUTO-SPACE off, a low on MSET will cause U5A to reset and return immediately to the idle state. This can only occur at dot-done (010) or dash-done (011) if no paddle is closed; the state module will be short circuited to idle through those two states. All other valid states will have an MSET signal except dot-done or dash-done. AUTO-SPACE OFF prevents the keyer from cycling through the three nulls.

Message Memory and Control

The inclusion of message memory is almost a requirement for cw operation. Therefore, message memory was designed as an integral element of the total design. This circuit includes the RAM (U1), a sequence counter (U2) and some control circuitry — a "which button has been pushed" latch and decoder (U4A, U3B, U4B and U4C), a cross-coupled FF and message-initiate circuit (U7C, U3C), U5B, U10B, and a couple of gates.

U4A/U3B and U4B/U4C are cross-coupled R-S FFs. Pushing a memory button will set these FFs into one of four states, and the outputs are directed to two address lines of the RAM. One address line from the RAM goes to the BANK SELECT switch, which accounts for three of the 12 address lines. The other nine lines come from the counter, which can then count up to 512 bits (about 50 characters) per message.

The tenth line out of the counter is used as an end-of-buffer signal, which resets FF U7C/U3C; this FF is a message-in-progress FF. Decoder U10B is wired so that if the LOAD/SEND switch is in the SEND position and a code element from the keyer arrives on the CODE line, U10B Q1 output will stop the memory. U9B ORs the stop conditions so that the messages terminate by counting up to 512 or when a paddle has been closed. FF U7C/U3C is set through the diode bank (D1, D2, D4, D5) if any button is pushed.

C2 has a special function. If the memory is already running, RUN-NOT will be low, and a pushed button actually forces FF U7C/U3C to a temporary one-shot condition. This provides a pulsed high on the RUN-NOT line and resets the counter to zero. Without this capacitor, restarting a message from the beginning would be impossible.

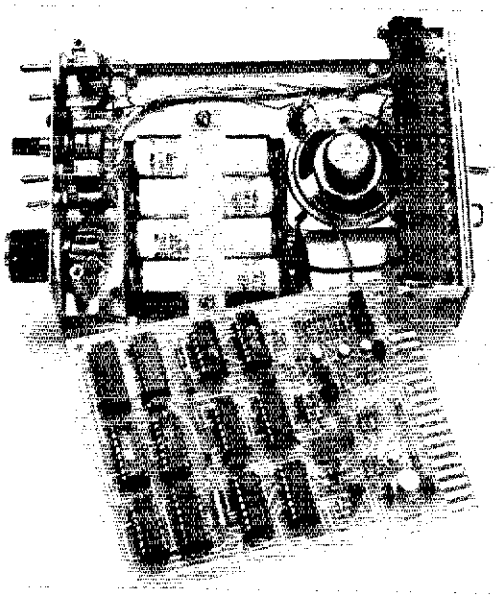
U5B has a unique function, too. It's clocked by the CLK line, which is the same signal that is used to enable the RAM. The rising edge of CLK loads U5B with the data read from memory and holds it for the whole cycle. This way, the RAM can return to standby, and any glitches that might occur in the output, as the address lines are changing, are effectively masked. The counter is incremented by the CLK-NOT signal and is therefore positioned and ready for the next read cycle.

Construction

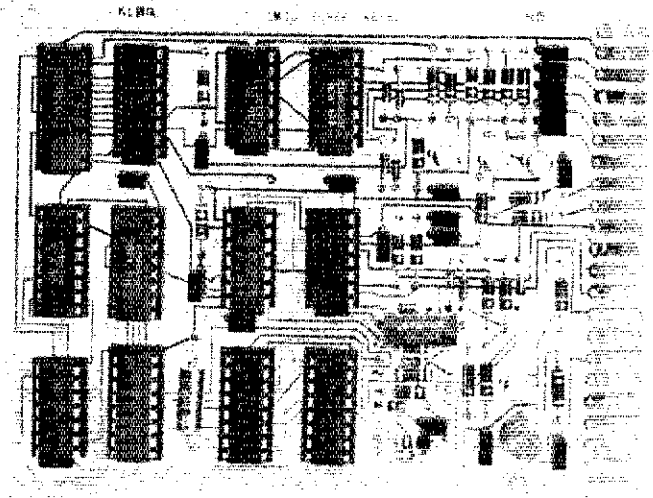
Point-to-point or wire-wrap methods can be used to construct the keyer, but a printed-circuit board is available. With the board, use sockets for the ICs and solder the components to the board while using a low-wattage soldering iron, employing a minimum of heat and solder. The board is laid out with the ICs all oriented in the same direction and with component numbers assigned for easy identification. There are leads between IC pins on the component side of the board, to reduce the physical size of the board. Be careful not to create solder bridges.

This board is designed for use with a standard 22-pin edge connector or solder pads for interconnection to off-board components. Two mounting holes are provided opposite the edge connector. If the edge connector is not used, a third mounting hole can be drilled between pads 4 (ground) and 5 (spare).

It is recommended that you remove the solder flux from the pc board after mounting the components. Radio Shack rosin flux remover (64-2324) is readily available for this purpose. CMOS has



An inside view of the KCØQ keyer. A 10-position switch and associated fixed-value resistors are used for the SPEED control. The 22-pin edge connector is secured to the rear panel by means of a homemade hinged bracket, allowing easy removal of the pc board.



A closeup of the component side of the double-sided pc board. All ICs are oriented in the same direction — a nice touch! If the use of an edge connector is not desired, interconnections may be made by use of holes already drilled at the inside edges of the edge connector pads.

high-impedance inputs. While new, dry solder flux is a good insulator, moisture and other contaminants may create problems later.

Wiring Options

Speed Control: Keyer speed increases as the resistance of R25 decreases. For best operational linearity, the SPEED potentiometer should be an inverse-log taper unit. If counterclockwise rotation of the control is acceptable when increasing speed, a log taper potentiometer will suffice. An alternative to using a potentiometer is the use of a multiposition rotary switch and selected fixed resistance values. Eight or 10 rates of speed are often adequate for normal operation. The resistor values must be chosen experimentally, because the speed is determined by the value of resistance used for R20, R25 and the value of C16; C16 may have a value different from the one marked.

Weight Control: Control of weighting is accomplished by means of D9, C15 and R26. A log taper potentiometer is recommended in order to obtain a finer degree of control at the low-resistance end of the range (as might be used at high keying speeds). The maximum amount of weighting obtainable is determined by C15; the value may be changed to suit your preference. If a weighting control is not desired, eliminate R26, C15 and D9, and install a jumper in place of D9.

Auto-Space Select: S5 may be eliminated if switch selection of the AUTO-SPACE feature is not desired. To disable AUTO-SPACE, don't use C18; install a jumper instead. To enable AUTO-SPACE continuously, disregard C18 and install a jumper between edge connector pads 1 and 14.

Message Bank Select: To limit the number of messages to a bank of four, leave out S7 and C6. Install a jumper in place of C6.

Monitor On While Loading: D3 provides a path to turn on the internal monitor automatically while loading messages. If this is not desired, eliminate D3.

Output Inhibit During Loading: D7 and D8 serve to inhibit keying output when the MODE switch (S6) is in the LOAD position. These diodes may be omitted to delete that function.

Monitor Tone and Volume: The monitor audio frequency can be adjusted by changing the value of R2. Decrease the value of R2 to increase the frequency. If you do not need the monitor, you may exclude LS1, R2, R10, R11, C4, Q2 and Q3, and install a jumper in place of C4.

Dot Reload Timing Change: The dot-memory timing can be altered if desired. D11, D12, C17 and R21 delay setting of the dot FF for one baud during the sending of a dash. In the iambic mode, this allows the operator a bit more time to release the dot lever before the dot memory FF is reloaded. If you wish to delete that function, remove the aforementioned components and install a jumper in place of R21 or D12.

Output Keying: Most applications do not require positive and negative keying outputs. Either one may be disabled. For negative keying output only, eliminate S8, D8, R16, R17, R23 and Q4. If positive keying only is desired, omit S8, D7, R15, R22, R24 and Q5, and install a jumper in place of R15.

In the positive keying line, R16, R23 and R17 have been chosen to accommodate a wide range of keying circuits. Q4 must be selected to handle the keying circuit voltage and current requirements demanded by the transmitter.

Negative Keying Considerations

If negative keying lines are encountered, use the following procedure. Measure the key-up voltage and key-down current of the transmitter keying line. Select a transistor (Q5) that will handle the voltage present (with some margin of safety) and determine the beta of the transistor. Then calculate the values of R22 and R24 using the following formulas:

$$R22 = \frac{0.3 \times \text{beta (Q5)}}{I} \qquad \text{(Eq. 1)}$$

$$R24 = \frac{3.5}{I} \qquad \text{(Eq. 2)}$$

where

I = key-down current in amperes.

With some values of R22 and R24, the negative keying line can actually be pulled above ground potential by a small amount. Most transmitters can handle this positive voltage with ease. If you wish, a protection diode may be added between board pad 3 and ground. This will limit the voltage to one diode drop. Orient the diode with the anode at pad 3 and the cathode to ground.

Troubleshooting

Barring construction problems, bad components or early component failure, few problems (if any) should develop during the life of the unit. An oscilloscope is a useful fault-finding aid, but an analog voltmeter will suffice in many instances. With the analog meter, use the lowest SPEED setting and turn the WEIGHT control off. Higher SPEED control settings are more desirable when using an oscilloscope.

Pay careful attention to which section of the keyer is inoperative. For example, if an output code is present at pin 2 of the edge connector, don't examine the state machine while troubleshooting a monitor problem. If you have troubles in the memory section, check to see that clock pulses are appearing at U1 pin 10, U5B pin 9, and so on. The RAM WRITE line (pin 8) should be high or low depending on the setting of the LOAD/SEND switch. FF U3C/U7C should be set (U3C pin 6 low) when any message button is pushed, and the memory address lines at U1 pins 2 and 3 should indicate which button has been pushed. Otherwise, examine U4A, U3B, U4B and U4C for difficulties.

Remember, most problems are caused by improper construction or faulty components. If sockets have been used for the ICs, substituting and/or swapping ICs may help in locating the difficulty. Constructing the unit so that you can get to both sides of the board readily will make debugging much easier.

Operational Considerations

When power is first applied to the keyer, a continuous mark may be sent. This occurs because the current memory state contains a mark. Place the MODE switch in the LOAD position and depress one of the message buttons to clear the condition. It is recommended that *all* message buffers be cleared initially by setting the SPEED control to maximum and loading spaces into each buffer position.

Message Organization

The 6504 CMOS memory IC has 4096 bit positions that can be used to store data. Because each character requires approximately 10 bits, there is room for about 400 characters. This memory is organized as eight messages of approximately 50 characters each. Instead of using eight message switches, there are four push-button switches and one MESSAGE BANK SELECT switch, S7. (One husband and wife team actually uses the BANK switch to separate his/her messages!)

Loading Messages

Position S7 to select the desired message bank. Place the MODE switch in the LOAD position and start entering data from the paddles after pressing the appropriate message button. The STATUS LED will stay on until the memory is full. It is essential that you allow the keyer to continue loading until the LED extinguishes, even if you are not inputting data. On occasion, you may have a message that is too long for the buffer, in which case you will lose part of the message. It is also possible to leave a mark in the very last buffer location, which will condition the keyer to send a continuous mark if that message is played to the end. The latter condition is rarely encountered, but indicates a message that is a trifle long; it should be re-entered. Note: During loading, the internal clock is running continuously, and the message entered will have long character/word spacing if that is the way it was entered.

Message Playback

To output a loaded message, ensure the

MODE switch is in the SEND position and press the appropriate message push-button. Message output will continue until one of the following conditions occurs: the message buffer empties, a paddle closure occurs, or the same or another message push-button is pressed. Any message may be replayed instantly.

Power-Supply Considerations

Battery operation is recommended for this keyer because it provides continuous memory retention. You'll never need to reload the memories until a change is desired, a feature highly valued by most cw operators. While some operators have used four series-connected alkaline or zinc-carbon batteries, a better choice is a similar combination of NiCads. Using 450 mAh (milliampere-hour) cells, the keyer should operate for many months. The NiCads should be recharged when the voltage drops to about 4.5, or once every six months, whichever comes first.

If ac operation is contemplated, the voltage presented to the keyer should be approximately 5, plus or minus 0.5 volt. The ripple content of the supply should be low. Note that because this keyer draws so little current during standby (10 μA or so), series-connected Zener regulators are difficult to use.

Other Controls

The TUNE/MONITOR/OFF switch (S9) allows the transmitter to be keyed continuously when placed in the TUNE position and selects operation with or without the internal monitor. Operating with the monitor enabled will demand more power from the batteries. Most operators prefer to use the transmitter sidetone instead.

When the AUTO-SPACE feature is enabled, the keyer will perform precision spacing for you. The end result will be more uniform cw.

The WEIGHT control increases the on-to-off time ratio of the generated characters as the control is advanced in a clockwise direction. In the fully counterclockwise position, 50% weighting is provided. The final setting of this control will depend on the keying circuit time constants of the transmitter used and on personal tastes.

Speed Determination

The method used to determine the operational speed of the keyer is based on the fact that the buffers are exactly 512 bauds in length. Here's how it's done. Locate an empty buffer (or one you wish to empty) and press the pushbutton while it is in the LOAD mode. Count the number of seconds it takes until the STATUS LED extinguishes and divide that number into the constant 614.4. That will provide you with the exact speed (in wpm) of the keyer.

Acknowledgments

The authors gratefully acknowledge the efforts of Tom Lindgren (WØWP) and Glenn Thorne (KDØQ) in developing the initial version of the pc board, Joe Gentle (NØBB) for critical evaluation of the keyer "feel," which led to improving it, Russ Lenth (AEØR) for suggesting the addition of D3, and the many hams who have built their own units and expressed satisfaction. We hope you'll join that happy group!

Notes

[1]Parts and kits may be obtained from The Partstore, 999 44th St., Marion, IA 52302. Harris HM6504-9 RAMs are also available from your nearest Schweber Electronics distributor. The HM6504-9 has a specified standby current drain of 10 μA (maximum), with 0.1 μA being typical. An HM6504-5 is specified at 500 μA (maximum) and should probably be avoided if battery operation is contemplated.

[2]A comprehensive instruction manual accompanies each bare board or keyer kit. The manual is available separately for $3 postpaid. Please include an s.a.s.e. when requesting information. The ARRL and *QST* in no way warrant this offer.

Strays

TA PROFILES

☐ RFI/TVI headaches? Yes, indeed! Many radio amateurs are confronted with this annoying situation. For this reason, we are pleased to have ARRL Technical Advisor Harold R. Richman, W4CIZ, join our official family. His area of TA expertise is RFI/TVI.

A member of the ARRL since 1931, Hal received his first Amateur Radio license in 1930 and now holds an Extra Class license. He also has Commercial Radiotelephone, First Class and Radiotelegraph Second Class licenses. Active on the high-frequency and 144-MHz bands from his station in Annandale, Virginia, Hal has held appointments as Emergency Coordinator and Official Phone and Relay Stations. He has presented numerous papers on RFI and TVI correction at club meetings, seminars and technical symposiums, and has had many articles published on this subject in *QST* (see May 1981 *QST*) and other journals. He compiled and edited the WTVIC TVI Aids posters and pamphlets for publication.

W4CIZ is a member of the ARRL RFI Task Group, North Virginia Chapter QCWA, OTC, Vienna Wireless Association and is a Life/Senior member of the IEEE, now serving as director of Northern Virginia Section and as advertising manager for the *NOVA Bulletin*.

Before retiring in 1974, Hal served as Engineer in Charge of the 24th District Office of the FCC, active in inspections, examinations, enforcement, investigative and other responsibilities of a field officer. He was the recipient of three efficiency awards granted by the FCC: a Sustained Superior Accomplishment award, a Superior Accomplishment award and a Special Acts and Services award. Hal holds a Cinematographer rating in the Washington Society of Cinematographers, and he now serves as Director/Historian. He is also active in the American Theatre Organ Society, and has memberships in the National Capital Trolley Museum and the Yogie Magic Club of Baltimore. — *Marian Anderson, WB1FSB*

TA Hal, W4CIZ (right), proud recipient of the ARRL Roanoke Division Service Award, presented by Vic Clark, W4KFC.

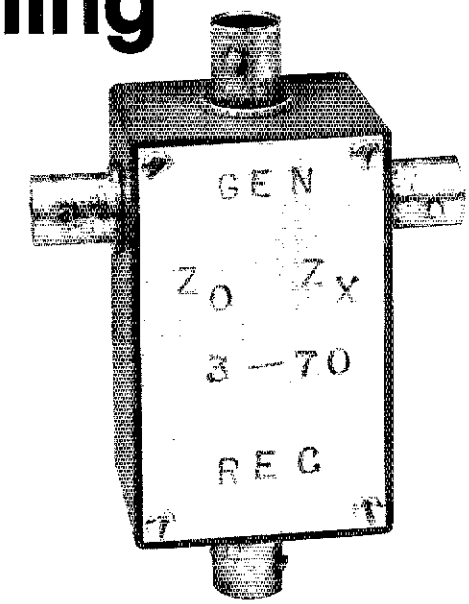
HOW-TOs FOR K2BSA/4 QSL

☐ For those of you who contacted K2BSA/4 and wish to receive the commemorative QSL card, send your card and an s.a.s.e. to: K2BSA/4, c/o ARRL, 225 Main St., Newington, CT 06111. And, introduce a local Scout to Amateur Radio. — *Steve Place, WB1EYI*

I would like to get in touch with . . .

☐ Travel agents interested in forming a net. Art Lyon, KC4OM, P. O. Box 353, Ocala, FL 32678.

A Reflection-Coefficient Bridge — Impedance-Matching Measurements the Easy Way



Need to measure the VSWR of your antenna system? How about the loss in your feed line, or the input VSWR of that new 2-meter preamp? The RCB will do it!

By Jack Priedigkeit,* W6ZGN

The reflection-coefficient bridge is basically a Wheatstone bridge that has been adapted for rf use. Unlike the Wheatstone bridge, however, the component values in the reflection-coefficient bridge are fixed: The unbalance voltage is used as a measure of the reflection coefficient of the unknown impedance. See the Appendix for a detailed analysis.

A reflection-coefficient bridge is easier to construct than is a good VSWR meter of comparable accuracy. It has excellent low-power sensitivity and, as will be discussed later, can be used for matching impedances and coaxial cable lengths. It is also handy for measuring coaxial-cable attenuation. Reflection coefficient can be expressed as a return loss in decibels, or related to an equivalent VSWR.[1]

This instrument uses a radio receiver for the bridge detector, enabling it to operate at power levels of −60 dBm or less. This minimizes QRM when you are performing antenna measurements and makes it possible to measure very sensitive circuits, such as the input to a receiver, or a balanced mixer. This low power level also allows you to measure an antenna system, including harmonic filters, at frequencies outside the amateur bands when pursuing RFI problems.

Construction

As shown in Fig. 1, the reflection-coefficient bridge consists of four resistor arms that are similar to those of the Wheatstone bridge. Instead of using a galvanometer to detect the bridge unbalance, however, an rf balun is employed to connect the rf unbalance voltage to a sensitive radio receiver. The balun is necessary because the unbalance voltage is not referenced to ground, but rather to the opposite arms of the bridge.

Fig. 2 shows a reflection-coefficient bridge built by the author. It is housed in a 2-1/2 × 1-1/8 × 1-3/8 inch (mm = in. × 25.4) diecast aluminum box (Pomona Electronics, Inc., Model 2417). The four UG-1094/U BNC connectors are located for electrical symmetry and minimum lead length. The bridge resistors, R1 through R4, are 51.1-Ω, 1/2-watt, 1% tolerance units, while R5 is a 100-Ω, 1/2-watt, 5% tolerance component.[2] R1, R2 and R5 are soldered directly to the terminals of the BNC connectors marked GEN, Z_o and Z_x. R3 and R4 are mounted in type UG-88/U BNC connectors and are used as rf terminations for the bridge connectors marked Z_o and Z_x.[3] The reason for this type of construction will be apparent when the testing and use of the bridge is discussed.

The rf balun for a 3- to 70-MHz bridge that can also be used in the 2-meter band consists of a bifilar winding on a stack of four Amidon T44-1 powdered-iron toroidal cores. Two no. 30 enameled wires are twisted together, about 10 turns per inch, and 30 turns of the twisted pair are wound on the stack of cores. Take care to ensure that adjacent turns do not overlap, and leave a gap between the start and finish of the winding.

Testing the Bridge

The performance of the reflection-coefficient bridge can be evaluated with a sensitive radio receiver and a signal generator that has a calibrated output level. One figure of merit for the bridge is the null depth that can be achieved when the bridge is balanced. This is measured easily by first placing an open circuit at Z_x, to unbalance the bridge, and by terminating Z_o with R3. Adjust the signal-generator output to establish a reference level on the S meter of the receiver for the open-circuit reflection coefficient of 1.0 (or 100% reflection). Now terminate Z_x with R4, and increase the signal-generator output to bring the S-meter reading up to the reference level for 100% reflection. The decibel increase in signal-generator level is the null depth. Fig. 3 is a plot of the null depth as a function of frequency. The null depth represents the maximum return loss and minimum reflection coefficient that can be measured with the bridge. As is shown, the null depth is 30 dB or more from 3 to 70 MHz and is also good across the 2-meter band.

The measured accuracy is typically better than ±1 dB for a return loss up to 15 dB, better than ±2 dB for a return loss between 15 and 25 dB, and better than ±5 dB for a return loss of 25 dB or more.

[1]Notes appear on page 20.
*441 Sherwood Way, Menlo Park, CA 94025

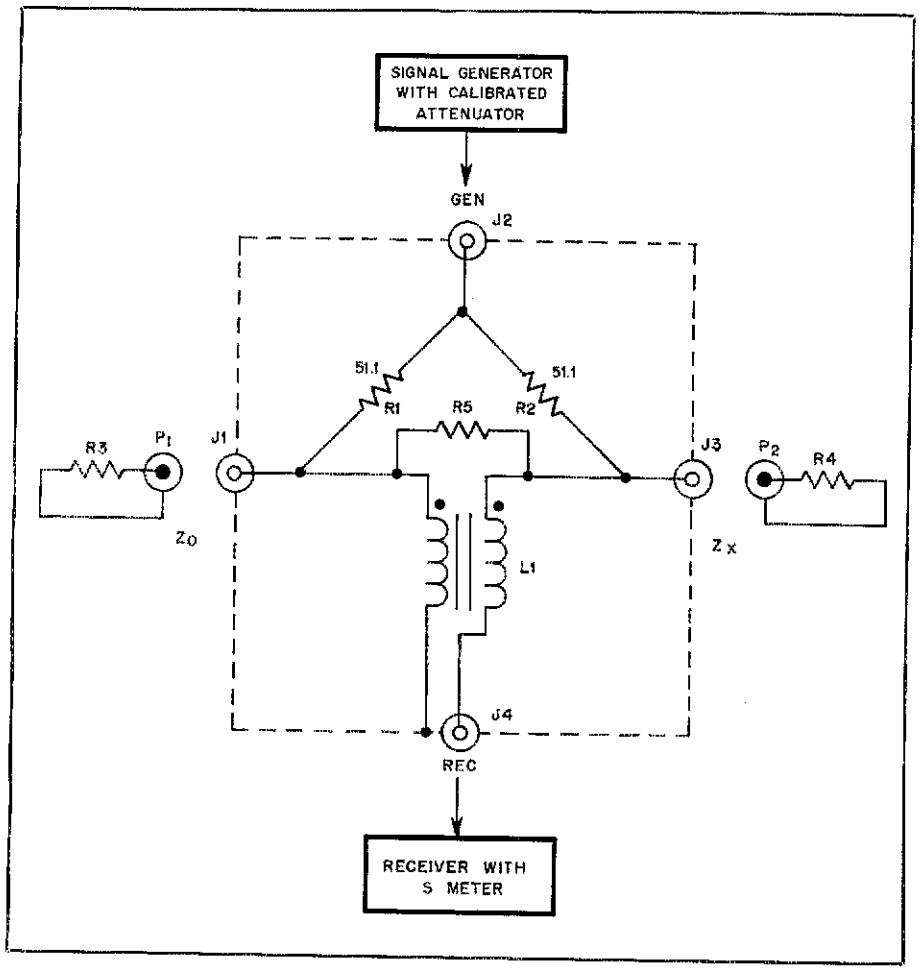


Fig. 1 — Schematic diagram of the reflection-coefficient bridge. The coaxial connectors are single-hole mounting BNC jacks (UG-1094/U or equiv.).
R1, R2 — 51.1 Ω, 1/2 watt, ±1% carbon.
R3, R4 — 51.1, 1/2 watt, ±1% carbon mounted in UG-88/U connector.
R5 — 100 Ω, 1/2 watt, ±5% carbon.
L1 — 30 bifilar turns of no. 30 enamel on four T44-1 cores (see text).

is the ratio of the unbalanced voltage for open- and short-circuit conditions at Z_x with Z_0 terminated. Both open and short circuits have a reflection coefficient of 1.0. Thus, the S-meter reading should not change when Z_x is open or shorted. The open-short circuit ratio can be measured by noting the decibel increase or decrease in the signal-generator level necessary to return the S meter to the reference level. The open-short circuit ratio depends on the detector (receiver) impedance connected between the two arms of the bridge, and in this case should be 50 Ω to achieve an open-short circuit ratio of 1.0.[3] The measured open-short circuit ratio, without R5 of Fig. 1, was found to vary a little less than ±1 dB over the 3- to 70-MHz frequency range. The addition of R5 reduced this variation to less than ±0.3 dB.

Use of the Reflection-Coefficient Bridge

The bridge can be used to calculate both the VSWR and the return loss of an unknown impedance connected to the Z_x port. Return loss is the ratio of the incident power to the reflected power and is expressed in decibels. A voltage reflection coefficient of 1.0 (100% reflection) corresponds to a 0-dB return loss (i.e., the returned power is the same as the incident power, or no loss). A reflection coefficient of 0.1 corresponds to a return loss of 20 dB. Table 1 shows the relationship between reflection coefficient, return loss and VSWR.

The bridge, with Z_0 terminated, can be used to measure the reflection coefficient of any impedance connected to the Z_x port. The procedure is first to open circuit Z_x to establish a reference level on the S meter for 100% reflection. Second, connect the unknown impedance to Z_x, and increase the signal-generator level to bring the S-meter reading back to the reference point. The decibel increase in signal-generator output is the return loss of the unknown impedance. The reflection coefficient and equivalent VSWR, referred to 50 Ω, may be found from Table 1.

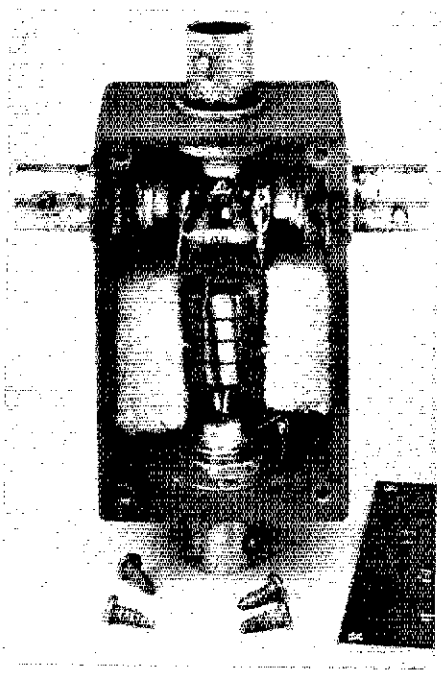


Fig. 2 — Parts placement, as shown in this RCB constructed by the author, should be planned for minimum lead length and maximum symmetry of the bridge components.

The return-loss accuracy was verified with a 1-dB step attenuator and a shorted coaxial connector.[4] The attenuator, with the output shorted, was connected to Z_x, and the return loss measured as a function of the attenuator setting. The return loss is twice the attenuator setting.

A second figure of merit for this bridge

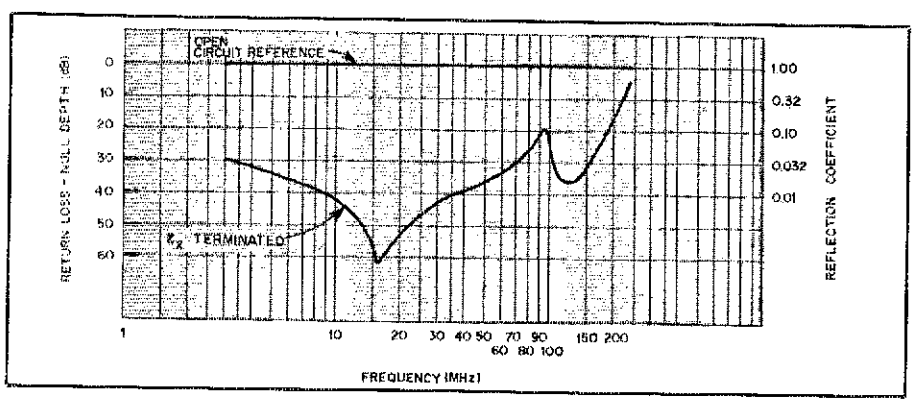


Fig. 3 — The null depth versus frequency characteristics of the reflection-coefficient bridge constructed by the author. The top line of the graph is the 100% reflection reference level. The lower line is the indicated return loss (or reflection coefficient) when Z_0 and Z_x are both terminated in 50 Ω.

Table 1

Reflection Coefficient and VSWR Versus Return Loss

Reflection Coefficient	*VSWR*	*Return Loss, dB*
1.00	∞	0
0.89	17.4	1
0.79	8.7	2
0.71	5.9	3
0.62	4.4	4
0.57	3.6	5
0.50	3.0	6
0.44	2.6	7
0.39	2.3	8
0.35	2.1	9
0.32	1.92	10
0.28	1.78	11
0.25	1.67	12
0.22	1.58	13
0.20	1.50	14
0.18	1.43	15
0.16	1.38	16
0.14	1.33	17
0.13	1.30	18
0.11	1.25	19
0.10	1.22	20
0.079	1.17	22
0.063	1.13	24
0.050	1.11	26
0.040	1.08	28
0.032	1.06	30
0.025	1.05	32
0.020	1.04	34
0.016	1.03	36
0.013	1.03	38
0.010	1.02	40

An antenna or the tap on a tuned coil connected to Z_X may be matched to a 50-Ω line by simply adjusting the antenna or the tap and coil tuning for minimum S-meter reading. The VSWR can be found by measuring the return loss as described in the foregoing text.

The reflection-coefficient bridge can also be used to match impedances at other than the 50-Ω level. In this case, the reference impedance (resistor, capacitor, coil or network) is connected to Z_0. The impedance to be matched is connected to Z_X and is adjusted for minimum S-meter reading. Note that the bridge does not measure the reflection coefficient under these conditions.

The above procedure can also be used to match lengths of coaxial cable. The reference cable is connected to Z_0. The cable to be matched is connected to Z_X and is then trimmed for minimum S-meter reading. *CAUTION — The phase of the reflection coefficient repeats every wavelength on the transmission line.* Be sure that after the cables have been matched, the physical lengths do not differ by one wavelength. The difference in cable length caused by the addition of one UG-914/U adapter to one of two 25-foot RG-58/U cables can easily be detected at vhf when the bridge is near balance.

Cable attenuation can be calculated from the return loss of a length of cable that is shorted or open at the far end. For this measurement, connect the cable to Z_X and terminate Z_0. As an example, the return loss of a length of RG-58/U cable was measured as 4.2 dB. Since the reflected signal has traveled twice the length of the cable, the one-way attenuation is 2.1 dB. The physical length of the cable was 39 feet. The attenuation per 100 feet is 2.1 dB × (100/39) or 5.4 dB. This is a neat way to estimate the loss of an antenna feed cable of unknown length. Simply disconnect or short the antenna, and measure the return loss in the ham shack. This can be done at low power and with minimum QRM.

Final Comments

Except for the effects of cable loss, the reflection coefficient, return loss and VSWR do not change with cable length. Thus, the length of cable connecting the bridge and the unknown impedance is not critical. However, cable attenuation will always reduce the reflection coefficient, reduce the VSWR and increase the return loss. Long lengths of lossy cable are to be avoided because they will make the unknown impedance appear to be more nearly matched.

Occasionally, measurements of coaxial cable made with the reflection-coefficient bridge may not be consistent with the operator's casual concept of the situation. For example, three unequal lengths of RG-58/U cable, each with RG-88/U connectors on both ends, were connected in series using two RG-914/U adapters. The return loss, measured at 146 MHz for each of the six possible series combinations of these cables, was found to range from 9.5 dB to 12.0 dB. This appears to be inconsistent, since the length of the cable is constant. However, note that the Z_0 of each of the three cables can be 50 ±2.5 and that there are eight BNC connectors in the system. Consider also that the reflection coefficient seen by the bridge is the vector sum of the reflections from each impedance mismatch in the system. Since the phase of each reflection coefficient depends on the cable length to the reflection point, the resulting reflection coefficient seen by the bridge will change as the unequal lengths of cable are interchanged. From Table 1 it can be seen that a change in the magnitude of the reflection coefficient of only 0.08 will account for the 2.5-dB spread in the return loss observed. Thus a word of caution — use one length of cable, and keep the number of connectors to a minimum when measuring coaxial cable attenuation.

Appendix

Neglecting stray capacitance and lead inductance, the reflection-coefficient bridge shown in Fig. 1 can be drawn as shown in Fig. 4. The unbalance voltage, e_o, is the difference between the voltage developed across R3 and R4. When R4 is replaced by the unknown impedance Z_X, this voltage is:

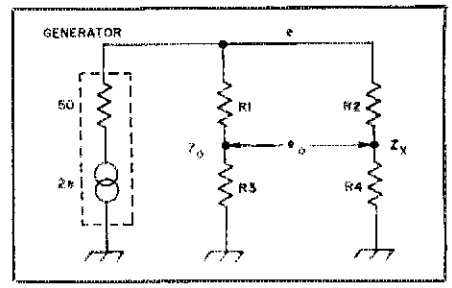


Fig. 4 — Circuit of the RCB, which has been drawn to show the significant electrical features discussed in the text.

$$e_o = e\left[\frac{Z_X}{R2 + Z_X} - \frac{R3}{R1 + R3}\right] \quad \text{(Eq. 1)}$$

If R1 = R3 and R2 = Z_0:

$$e_o = \frac{e}{2}\left[\frac{2Z_X}{Z_0 + Z_X} - 1\right] = \frac{e}{2}\left[\frac{Z_X - Z_0}{Z_X + Z_0}\right] \quad \text{(Eq. 2)}$$

The definition of the reflection coefficient ρ is:[6]

$$\rho = \frac{Z_X - Z_0}{Z_X + Z_0} \quad \text{(Eq. 3)}$$

The bridge receiver responds to the magnitude of the unbalance voltage, e_o; thus the S-meter reading is proportional to the magnitude of the reflection coefficient, $|\rho|$.

The VSWR can be calculated from the expression:[7]

$$\text{VSWR} = \frac{1 + |\rho|}{1 - |\rho|} \quad \text{(Eq. 4)}$$

and the return loss, RL, is defined as:[8]

$$\text{RL} = 20\log_{10}\left|\frac{Z_X + Z_0}{Z_X - Z_0}\right| = -20\log_{10}|\rho| \quad \text{(Eq. 5)}$$

Notes

[1]Editor's Note: The reflection-coefficient bridge is also known as the return-loss bridge. Additional information about the construction and use of the return-loss bridge can be found in recent editions of *The Radio Amateur's Handbook* and in *Solid State Design for the Radio Amateur.* Both are available from ARRL.

[2]50.0-Ω resistors are preferred, since this is a standard coaxial-cable impedance. However, 51.1 Ω is within the 5% manufacturing tolerance of most coaxial cables.

[3]Commercially made 50-Ω terminations, such as Texscan Model TF-50 or equiv., may also be used.

[4]Hewlett-Packard Model 355A or equiv.

[5]Editor's Note: The open-short circuit ratio also depends on the generator output impedance. See W. Hayward and D. DeMaw, *Solid State Design for the Radio Amateur* (Newington: The American Radio Relay League, Inc., 1977), p. 154.

[6]*Reference Data for Radio Engineers* (Indianapolis: H. W. Sams & Co.), 22-6.

[7]See note 6, p. 22-7.

[8]See note 6, p. 30-2.

A BASIC Approach to Calculating Cascaded Intercept Points and Noise Figure

This circuit-design information you won't want to miss. The computer program offered here makes things easier, too!

By William Sabin,* WØIYH

With cascaded stages of a signal-processing system, it is often important to know the distortion products generated by an equal-amplitude, two-tone input signal at each point in the chain. Refer to the example in Fig. 1. In one situation, the individual distortion sources to the *right* of point X are referred coherently to point X, producing a composite *input* intercept.[1] As well, distortion sources to the *left* of X produce a composite *output* intercept at X. The distortion products of interest are usually third-order, but second-order product information is often needed, too. Another item of interest is the composite noise figure, looking to the right from point X.

In addition to the distortion and noise generated by the individual stages, blocks or circuit elements, the ultimate load may be noisy and produce distortion, or it may be completely passive. Some of the blocks may also be passive, in which case their available power gains (decibels) are negative, their noise figures (dB) are equal in magnitude to the gain values and the production of distortion is absent. Other elements, such as diode mixers, have negative gain (loss) and noise figures nearly equal to the gain value, but they produce distortion. Here, any stage that produces distortion is considered to be an *active* stage.

The distortion specification for an individual block may be given in dBm as an input intercept point (IIP) or an output intercept point (OIP). All gain values are specified in terms of available power gain, as explained in Fig. 2. The determination of available power gain can be tricky in practice, because it involves the measurement or calculation of open-circuit output voltage and the real part of the output impedance. (Consult other references for further information regarding these techniques.)[2,3,4] Available gain also needs to be known for cascaded noise-figure measurements. So the usefulness of the techniques described here depends on the ability to make the gain, noise figure and input/output intercept measurements for each stage. Also, circuit elements having

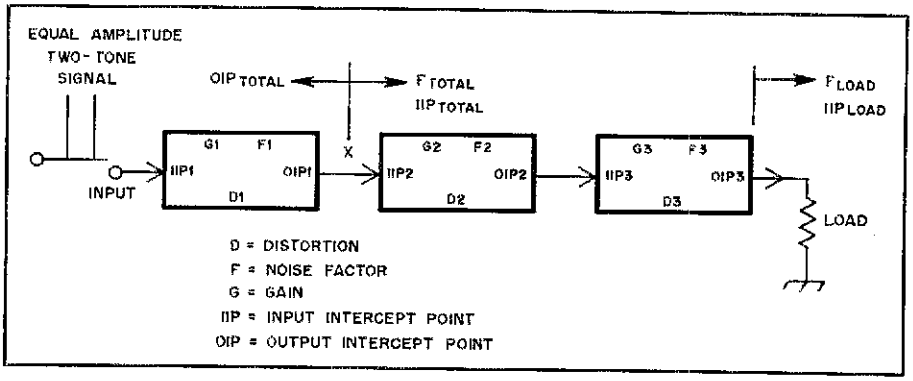


Fig. 1 — A typical signal-processing chain.

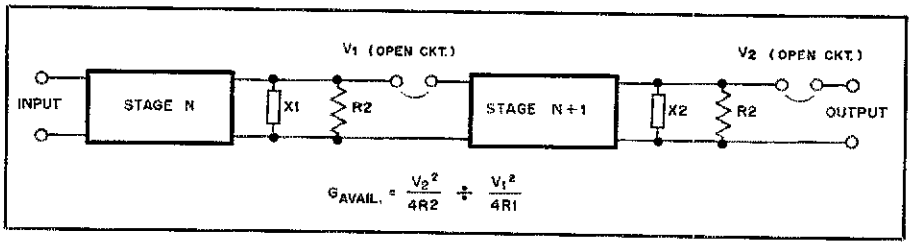


Fig. 2 — Factors involved in the determination of available power gain are discussed in the text. Only the real part of the output impedance (R1, R2) is involved.

[1]Notes appear on page 24.

*Rockwell International, Collins Telecommunications Product Div., Cedar Rapids, IA 52498

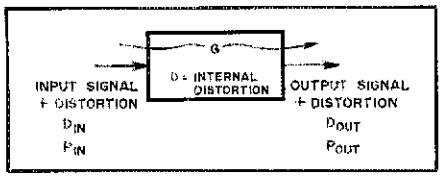


Fig. 3 — An active stage in a signal path contributes to the overall distortion at the output of the stage, as shown here.

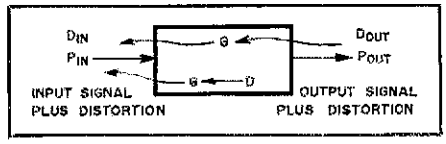


Fig. 4 — Determining the input intercept of a stage is done by working backward from the output to the input. Signal and distortion from the following stages and distortion from this stage are referred to the stage input.

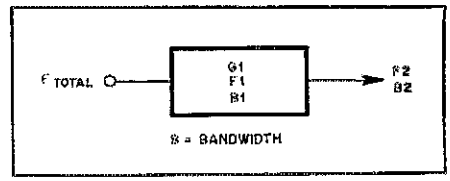


Fig. 5 — The discussed noise figure is that value measured at the signal input port. Bandwidth of each stage must be considered.

intercepts that are sensitive to signal level must be dealt with carefully,[3] ensuring that the measurements are made at the expected signal level.

Analysis of the Method

Shown in Fig. 3 is a circuit element with an input power (P_{in}) and output power (P_{out}) that generates within itself a distortion power, D. The input signal is also contaminated with distortion (D_{in}) from previous stages. These distortion components combine at the output in ways that are sometimes difficult to predict. They can add or subtract partially or be unrelated. The correlation factor (C) is a measure of this relatedness.

Output distortion is given by:

$$D_{out} = D_{in}G + 2C\sqrt{D_{in}GD} + D \qquad \text{(Eq. 1)}$$

Table 1

Intercept Point and Noise Figure Program

```
0010 HOME
0020 REM INTERCEPT AND NOISE FIGURE PROGRAM "INTRCP"
0030 REM W. SABIN  SEP. , 1980
0040 DIM F(21), I1(21), O1(21), G(20), CF(21)
0050 DIM I2(20), O2(20), P(21), D(21), C(20), BR(20)
0060 PRINT "CASCADE IP(3) OR IP(2)"
0070 PRINT "CASCADE NOISE FIGURE"
0080 INPUT "NUMBER OF STAGES=";N
0090 PRINT "TYPE 1 IF LOAD PASSIVE, 2 IF ACTIVE"
0100 INPUT E: IF E=2 GO TO 140
0110 LET CF(N+1)=0: I1(N+1)=500
0120 PRINT "PASSIVE LOAD"
0130 GOTO 160
0140 INPUT "N. F. (DB) OF LOAD";CF(N+1)
0150 INPUT "I. P.  (DBM) OF LOAD";I1(N+1)
0160 PRINT "TYPE 3 FOR THIRD ORDER I. P. "
0170 PRINT "TYPE 2 FOR SECOND ORDER I. P. "
0180 INPUT X
0190 LET P(N+1)=30
0200 FOR I=N TO 1 STEP -1
0210 PRINT : PRINT"STAGE NUMBER "; I
0220 PRINT "TYPE 1 IF STAGE IS ACTIVE"
0230 PRINT "TYPE 2 IF STAGE IS PASSIVE"
0240 INPUT K
0250 ON K GO TO 320, 260
0260 INPUT "INSERTION LOSS (DB)";G(I)
0270 INPUT "BANDWIDTH RATIO=";BR(I)
0280 IF BR(I)<1 THEN BR(I)=1
0290 LET I1(I)=500: O1(I)=500: C(I)=1
0300 LET F(I)=G(I): G(I)=-G(I)
0310 GOTO 490
0320 INPUT "AVAILABLE GAIN(DB)";G(I)
0330 INPUT "STAGE NOISE FIG. ";F(I)
0340 INPUT "BANDWIDTH RATIO=";BR(I)
0350 IF BR(I)<1 THEN BR(I)=1
0360 PRINT "TYPE 1 IF INPUT I. P.  IS SPECIFIED"
0370 PRINT "TYPE 2 IF OUTPUT I. P.  IS SPECIFIED"
0380 INPUT Y
0390 ON Y GO TO 450, 400
0400 INPUT "OUTPUT I. P. (DBM) ";O1(I)
0410 LET I1(I)=O1(I)-G(I)
0420 PRINT "INPUT I. P. =";I1(I)
0430 INPUT "CORRELATION FACTOR";C(I)
0440 GOTO 490
0450 INPUT "INPUT I. P. (DBM)";I1(I)
0460 LET O1(I)=I1(I)+G(I)
0470 PRINT "OUTPUT I. P. =";O1(I)
0480 INPUT "CORRELATION FACTOR";C(I)
0490 LET P(I)=P(I+1)-G(I)
0500 IF X=3 THEN D(I)=3*P(I)-2*I1(I)
0510 IF X=2 THEN D(I)=2*P(I)-I1(I)
0520 LET D(I)=.001*10^(D(I)/10)
0530 LET U=10^(F(I)/10)
0540 LET V=10^(CF(I+1)/10)
0550 LET V=V*BR(I)
0560 LET W=10^(G(I)/10)
0570 LET CF(I)=U+(V-1)/W
0580 IF CF(I)<1E-37 THENCF(I)=1E-37
0590 LET CF(I)=4.3429*LOG(CF(I))
0600 NEXT I
0610 IF X=3 THEN D(N+1)=3*P(N+1)-2*I1(N+1)
0620 IF X=2 THEN D(N+1)=2*P(N+1)-I1(N+1)
0630 LET D(N+1)=.001*10^(D(N+1)/10)
0640 FOR I=N TO 1 STEP-1
0650 LET B=D(I+1)/(10^(G(I)/10))
0660 LET D(I)=D(I)+2*C(I)*SQR(D(I))*SQR(B)+B
0670 NEXT I
0680 PRINT "INTERCEPTS, N. F. "
0690 PRINT "STAGE          INPUT I. P.          N. F. "
0700 PRINT
0710 FOR I =1 TO N
0720 IF D(I)<1E-37 THEN D(I)=1E-37
0730 LET D(I)=4.3429*LOG(D(I)/.001)
0740 IF X=3 THEN I2(I)=1.5*P(I)-.5*D(I)
0750 IF X=2 THEN I2(I)=2*P(I)-D(I)
0760 NEXT I
0770 FOR I=1 TO N
0780 LET I2(I)=INT(I2(I)*100+.5)/100
0790 LET CF(I)=INT(CF(I)*100+.5)/100
0800 PRINT I, I2(I), CF(I)
0810 NEXT I
0820 PRINT : PRINT
0830 PRINT "TYPE X TO CONTINUE"
0840 GET A$
0850 PRINT "STAGE", "OUTPUT I. P. ": PRINT
0860 LET D(1)=-500
0870 FOR I=2 TO N+1
0880 IF X=3 THEN D(I)=3*P(I)-2*O1(I-1)
0890 IF X=2 THEN D(I)=2*P(I)-O1(I-1)
0900 LET D(I)=.001*10^(D(I)/10)
0910 LET D(I-1)=.001*10^(D(I-1)/10)
0920 LET B=D(I-1)*10^(G(I-1)/10)
0930 LET D(I)=D(I)+2*C(I)*SQR(D(I))*SQR(B)+B
0940 IF D(I)<1E-37 THEN D(I)=1E-37
0950 LET D(I)=4.3429*LOG(D(I)/.001)
0960 IF X=3 THEN O2(I)=1.5*P(I)-.5*D(I)
0970 IF X=2 THEN O2(I)=2*P(I)-D(I)
0980 IF D(I-1)<1E-37 THEN D(I-1)=1E-37
0990 LET D(I-1)=4.3429*LOG(D(I-1)/.001)
1000 LET O2(I)=INT(O2(I)*100+.5)/100
1010 PRINT I-1, O2(I)
1020 NEXT I
1030 END
```

where the powers are given in watts per tone (not dBm per tone).

The circuit element of Fig. 3 has an internal output intercept point (OIP). For third-order products:

$$OIP^3\ (dBm) = 1.5\ P_{out}\ (dBm) - 0.5D\ (dBm) \quad \text{(Eq. 2)}$$

For second-order products:

$$OIP^2\ (dBm) = 2\ P_{out}\ (dBm) - D\ (dBm) \quad \text{(Eq. 3)}$$

Also, there is a composite intercept point that combines internal distortion and fed-through distortion (Figs. 1 and 3):

$$OIP^3_{total}\ (dBm) = 1.5\ P_{out}\ (dBm) - 0.5D_{out}\ (dBm) \quad \text{(Eq. 4)}$$

$$OIP^2_{total}\ (dBm) = 2\ P_{out}\ (dBm) - D_{out}\ (dBm) \quad \text{(Eq. 5)}$$

Starting with a distortionless generator, the signal power and the accumulated distortion power are calculated stage by stage. At each stage a composite output intercept point is calculated, using equations 1 through 5, and the signal and distortion levels from the previous stage as inputs.

Similar to the method shown in Fig. 3, one can start at the output of a stage and work backward, as shown in Fig. 4. Here, the distortion generated in stages to the right is referred (reflected) to the input by dividing it by the stage gain, G. The internal distortion of the stage itself is also reflected. By proceeding stage by stage and by working toward the generator, all of the internal distortions are lumped together coherently. Net distortion at the input of each stage is used to compute the input intercept point at that input, using Eq. 4 and 5. The output load can have an input intercept point, too, and the program allows this to be considered.

Noise factor is calculated using the equation:

$$F_{total} = F1 + \frac{F2 - 1}{G1} \quad \text{(Eq. 6)}$$

where F is the noise factor and G is the available power gain, neither being expressed in decibels. An example is shown in Fig. 5. The program applies Eq. 6 recursively, starting at the load (which may have a noise figure) and working backward, one stage at a time. Sometimes, the noise bandwidth (B) increases as the signal moves to the right (B2 > B1). In this case, Eq. 6 becomes:

$$F_{total} = F1 + \frac{F2(B2/B1) - 1}{G1} \quad \text{(Eq. 7)}$$

In this discussion, noise figure refers to the value that is measured at the signal input port using a noise generator.

The bandwidth ratio for each stage is requested by the program. This value is the bandwidth of the stage under examination, N, divided into the narrowest bandwidth that occurs after stage N. If that ratio is less than one, the program assigns the correct value of one. To ignore this feature, input all ones.

Discussion of the Program

The program shown in Table 1 is written for the Apple II computer with Applesoft. An example problem involving a four-stage circuit is given in Fig. 6 to demonstrate how the program works. Table 2 lists the program output for the example; the large output intercept point (OIP) for stage one (204) should be ignored. The load at the output is assumed to have a 3-dB noise figure and a 30-dBm input intercept point (IIP). (An output power of 30 dBm is assigned in line 190). Any stage that generates distortion is an active stage, even though it may not be active in the usual sense. A correlation factor, C (I) is assigned for each stage and is usually given a value of +1 for a worst-case analysis. The intercept point for each stage may be known either as an input or output intercept, and the program prompts the designer for this information.

Each input power level, the internal distortion generated in each stage, composite distortion and the input or output intercept points are calculated working right to left or left to right. Cumulative noise figure is also calculated using the output load noise figure and the gain and noise figure values for each stage. A maximum of 20 stages can be analyzed with the dimensioning given.

Note that this analysis assumes that the two equal test tones are completely inside the passband of any filters in the signal path. We are looking at in-band performance. In reality, the tones may be on the skirts of the passband and therefore not equal in amplitude. This program does not cover that situation, which will be discussed later.

Improving the Design

Suppose that the results listed in Table 2 that were obtained from the example circuit are not satisfactory. How might the design be improved? By an assumptive and iterative process, it is possible to improve the in-band performance or to arrive at economic trade-offs. If we assume the rf amplifier has a noise figure of 6 dB and an IIP of 25 dBm, a composite noise figure of 9.4 dB and an IIP of 13.7 dBm results. Therefore, the time spent improving the noise figure was worthwhile, but the IIP was not affected very much. Next, let the load noise figure be 6 dB instead of 3 dB. The overall noise figure (NF) increases to 9.8 dB, so the time spent getting a 3-dB noise figure at the output was probably not worthwhile. This improvement process can proceed up to the point where measurement accuracy and values of improvement reach a practical limit.

Table 2

Program Output

```
CASCADE IP (3) OR IP (2)
CASCADE NOISE FIGURE
NUMBER OF STAGES = ? 4
TYPE 1 IF LOAD PASSIVE; 2 IF ACTIVE
? 2
N.F. (DB) OF LOAD ? 3
I.P. (DBM) OF LOAD ? 20
TYPE 3 FOR THIRD ORDER I.P.
TYPE 2 FOR SECOND ORDER I.P.
? 3
STAGE NUMBER 4
TYPE 1 IF STAGE ACTIVE
TYPE 2 IF STAGE PASSIVE
? 2
INSERTION LOSS (DB) ? 6
BANDWIDTH RATIO ? 1
STAGE NUMBER 3
TYPE 1 IF STAGE ACTIVE
TYPE 2 IF STAGE PASSIVE
? 1
AVAILABLE GAIN (DB) ? - 7
STAGE NOISE FIGURE ? 7.5
TYPE 1 IF INPUT I.P. IS SPECIFIED
TYPE 2 IF OUTPUT I.P. IS SPECIFIED
? 2
OUTPUT I.P. (DBM) ? 28
INPUT I.P. (DBM) = 35
CORRELATION FACTOR ? 1
BANDWIDTH RATIO ? 1
STAGE NUMBER 2
TYPE 1 IF STAGE ACTIVE
TYPE 2 IF STAGE PASSIVE
? 1
AVAILABLE GAIN (DB) ? 20
STAGE NOISE FIGURE ? 8
TYPE 1 IF INPUT I.P. IS SPECIFIED
TYPE 2 IF OUTPUT I.P. IS SPECIFIED
? 1
INPUT I.P. (DBM) ? 20
OUTPUT I.P. (DBM) = 40
CORRELATION FACTOR ? 1
BANDWIDTH RATIO ? 1
STAGE NUMBER 1
TYPE 1 IF STAGE ACTIVE
TYPE 2 IF STAGE PASSIVE
? 2
INSERTION LOSS (DB) ? 3
BANDWIDTH RATIO ? 1

STAGE        INPUT I.P.      N.F.
1            13.37           11.26
2            10.37            8.26
3            30.88           16.07
4            36               9

TYPE X TO CONTINUE

STAGE        OUTPUT I.P.
1            204.5
2             40
3             26.81
4             20.81
```

Precautions

The Applesoft-equipped Apple II will produce an error when trying to find the log of a number smaller than about 10^{-37}. This can vary with different machines. Program lines 580, 720 and 940 contain the necessary remedial steps. Also, if output data is presented to the screen, it may scroll off the top and be partially lost. Such action is prevented by program lines 830 and 840; different machines may

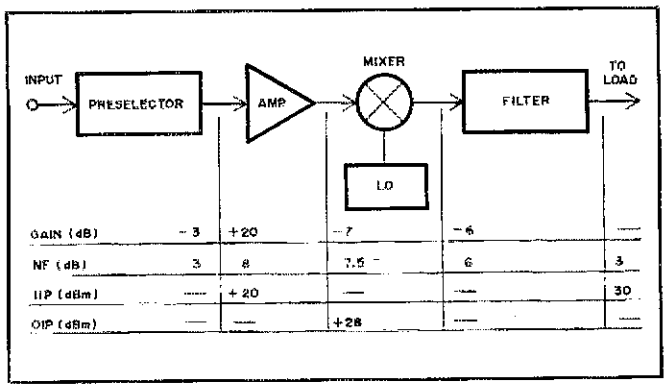


Fig. 6 — A design example. These data are entered into the computer. The corresponding results are given in Table 1.

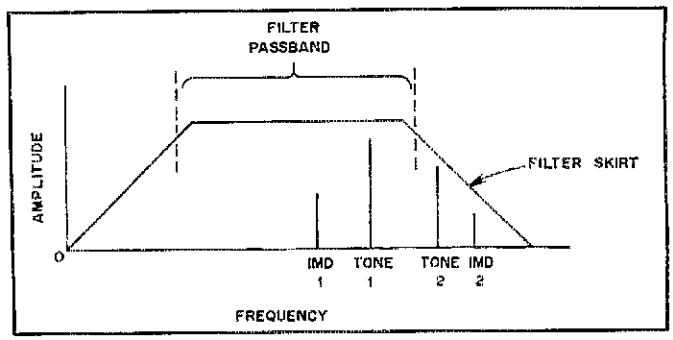


Fig. 7 — A filter response curve showing tone 2 and IMD 2 out of the passband of the filter. The skirt attenuation may be compensated for to calculate correctly the amplitude of the in-band IMD product as described in the text.

require a different procedure.

Unequal Tones

As shown in Fig. 7, one tone and one IMD product are on the skirt of the filter passband, while the other tone and IMD product are inside the passband. The in-band IMD product generated by each stage after the filter will be reduced 1 dB for each dB of skirt attenuation for both the second- and third-order IMD products. When calculating the intercept point, this information can be used in the following manner: Let the third-order (second-order) IIP or OIP of each individual stage after the filter (as well as the IIP of the output load) be rated 1 dBm higher for each 2 dB (1 dB) of skirt-tone attenuation. This is fictitious, of course, but nevertheless the effect of the skirt attenuation is correctly accounted for in calculating the amplitude of the in-band IMD product. Composite input intercept points for locations to the left of the filter involved will have the correct values. The partially-out-of-band problem is fairly important in practice, and is worth the extra effort to calculate. Quite often, gain distribution and filter shape-factor changes can produce worthwhile improvements.

Dynamic Range

Some designers like to use the dynamic-range concept. For more information about this subject, refer to Hayward's article.[6] The input noise figure and input intercept point can be used to make this calculation, if the bandwidth is specified.

Notes

[1]W. Hayward and D. DeMaw, *Solid State Design For the Radio Amateur* (Newington: American Radio Relay League, Inc., 1977), ch. 6.
[2]R. F. Shea, *Amplifier Handbook* (New York: McGraw-Hill, 1969), ch. 24.
[3]J. G. Linville and J. F. Gibbons, *Transistors and Active Circuits* (New York: McGraw-Hill, 1961), chs. 10 and 12.
[4]H. Goldberg, "Some Notes On Noise Figure," *Proceedings of I.R.E.*, Oct. 1948.
[5]E. W. Pappenfus et al., *Single Sideband Principles and Circuits* (New York: McGraw-Hill, 1964), ch. 12.
[6]W. Hayward, "Defining and Measuring Receiver Dynamic Range," *QST*, July 1975.

New Products

TRI-EX TOWER CORPORATION ROTATING TOWER

☐ Looking to "get there fustest with the mostest"? If so, this late release by the Tri-Ex Tower Corporation ought to attract your attention! The RT-120(37) is a 120-ft (37-m) guyed, *rotating tower*. According to the manufacturer, though this tower is usually turned by means of an internal, base-mounted rotator, it may be easily turned by hand. The rotating mechanism uses no exposed chain drives or gears, which could be a safety hazard to people who may enter the tower area.

Ball-bearing type guy-attachment rings are set at the 30, 70 and 110-ft (9, 21, and 34-m) levels. The rotating tower allows antennas to be mounted on the sides of the tower and yet permits them to be turned to any desired direction. A mast may also be inserted at the top of the tower to provide support for additional antennas, which could then be rotated independently of the tower rotation and the side-mounted antennas.

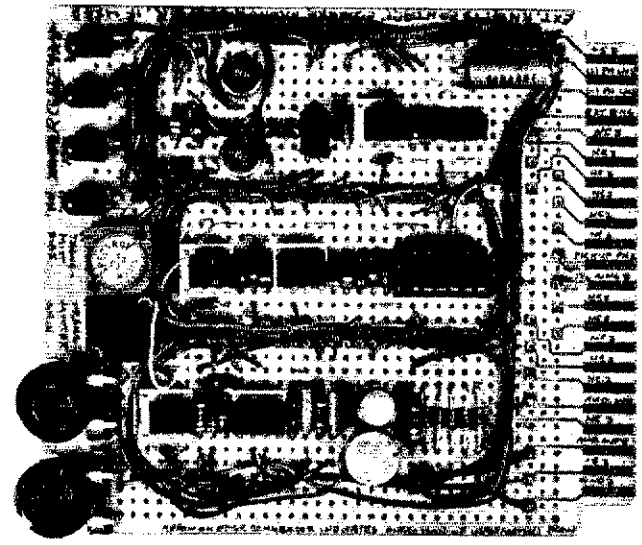
If this doesn't prove to be the "ticket" to snag that long-sought-for DX station, I can't imagine what you'd do next! For further information, contact Tri-Ex Tower Corp., 7182 Rasmussen Ave., Visalia, CA 93291. — *Paul K. Pagel, N1FB*

SILICONIX FET DESIGN KIT

☐ Siliconix is offering a new FET designer's kit that consists of a copy of *Designing With Field-Effect Transistors*. Written by Siliconix personnel and published by McGraw-Hill in February 1981, this book has a retail value of $24.50. It covers the theory and practical applications of FETs and a brief introduction to power MOSFETs; a copy of the *Siliconix FET Design Catalog*, published in July 1981, that includes data sheets and application notes for their entire FET product line; 10 sample FETs — N-channel, P-channel, amplifiers, switches, amplifier/switch combinations, low-leakage FETs and high-frequency FETs and design tips on how to use them.

This kit, which has a retail value of $42.50, is being offered for $28 through the end of 1981. To order, send your check and request to: Siliconix Inc., P.O. Box 4777, Santa Clara, CA 95054. — *Paul K. Pagel, N1FB*

Phone-Line Interface — Do it Solid-State Style



Go modern! Build this compact, active-circuit interface module for connecting the phone line to your repeater. This device is also excellent for standard phone patching at home.

By Scott Mazar,* WBØOOD, and Noel J. Petit,** WBØBGI

How about a solid-state, phone-line interface for repeater or phone-patch use? Our repeater at the University of Minnesota (WØYC/R) required a phone line for repeater control and autopatch. We found that traditional phone interfaces were too bulky to be used in the small cabinet that contains our repeater. Thus, we designed an active electronic interface unit that is superior to most and fits on a single 4 × 5-in. (mm = in. × 25.4) circuit board.

The basic telephone company requirements for interface equipment are given in Table 1. The telephone company requires that phone lines be isolated from voltages in the user's system; this is to prevent unwanted noise and voltages on their equipment. Therefore, any equipment connected to the phone line must be dc isolated. Isolation normally requires transformers and relays in a phone interface circuit. In our unit the transformers and relays are replaced by solid-state optical isolators: Each traditional isolation device is traded for a small six-pin IC.

Fig. 1 contains the schematic diagram of the Monsanto MCT-2 Optoisolator. Internally, the optoisolator is an infrared emitting diode that illuminates an infrared-sensitive phototransistor. The diode is similar to the light-emitting diode (LED) in calculators, except that this diode emits long-wavelength photons (heat) rather than visible light. This is a simple and reliable device that completely isolates the input diode from the phototransistor. Only light couples the input to the output of the optoisolator.

Table 1

Frequency Range	*Voice-Energy Levels*
DC	0.5 mA
Voice Range (300 to 3000 Hz)	−3 dBm*
2450 to 2750 Hz	Should be minimized if long-distance calls are to be made.
3995 to 4005 Hz	18 dB below voice level
4.0 to 10.0 kHz	−16 dBm
10.0 to 25.0 kHz	−24 dBm
25.0 to 40.0 kHz	−36 dBm
above 40.0 kHz	−50 dBm

*dBm is relative to 1 mW across 600 ohms.

Loop Signals

On Hook — minimum 30 kΩ, line to line.
Off Hook — maximum 200 Ω, line to line.

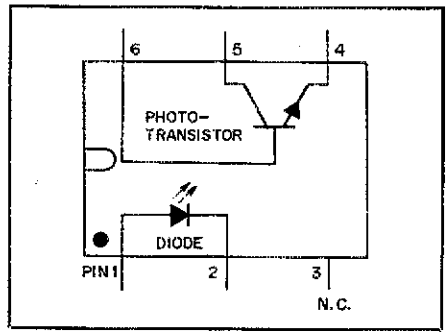


Fig. 1 — Circuit of the Monsanto MCT-2 optoisolator. An etched and drilled circuit board is available from the authors.

Circuit Operation

The circuit in Fig. 2 has three basic sections: ring/connect, transmit and receive. The ring-detector circuit indicates whether the phone line is ringing. This signal is a distorted sinusoidal waveform at about 20 Hz and 90 to 200 volts, peak-to-peak. The detector consists of optoisolator 1 (U4) and the associated rectifier. The ringing waveform passes through C1 (used to block the dc on the phone line) and is rectified by the diode bridge (D1 through D4). Direct current passes through light-emitting diode 1 (DS1), to indicate ring voltage on the line, and the diode of U4, for external electrical sensing. The bridge rectifier is necessary because the LED and diode of U4 cannot withstand reverse voltages in excess of about 3 before they break down; thus the full-wave rectifier ensures that reverse voltage is not applied to these diodes. A half-wave rectifier would not work in place of the bridge rectifier because C1 would charge fully within the first few cycles and remain charged long after the ringing stopped, rendering the detector useless.

When the diode of U4 turns on, the

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**725 E. 51st St., Minneapolis, MN 55417

associated photo-transistor conducts, discharging C2, bringing the inputs to TTL inverters U1A and U1B low. These inverters electrically indicate the presence of a ring signal on the phone line. The combination of R2 and C2 on the inputs of the inverters provides a long time constant for the ring signal. DS3 on the output of U1B visually confirms the electrical ring signal. The output of U1A is the digital ring signal sent to the external equipment.

The disconnected phone line is normally provided with 45 volts of dc. When the phone is picked up (that is, connected) the dc resistance drops from greater than 30 kΩ to less than 200 Ω. This allows about 20 mA of direct current to flow through the phone line. The interface connection is accomplished by applying a high logic level to the "pick up the phone" input, energizing the diodes of U5, U6 and DS4. The LED visually confirms the input signal. U5 and U6 are connected in series to prevent breakdown of the phototransistors when the ring voltage is present (typical $BV_{CER} \approx 100$ V for one transistor). The optoisolator transistors then conduct, causing Q1 to conduct. This turns on Q2, which then has about 20 mA flowing through it. This connects the phone interface to the telephone system.

Audio Receiver

The second basic section of the interface is the audio receiver. U7 conducts most of the line current through its diode, lighting it to a constant brilliancy. Audio from the telephone system is the modula-

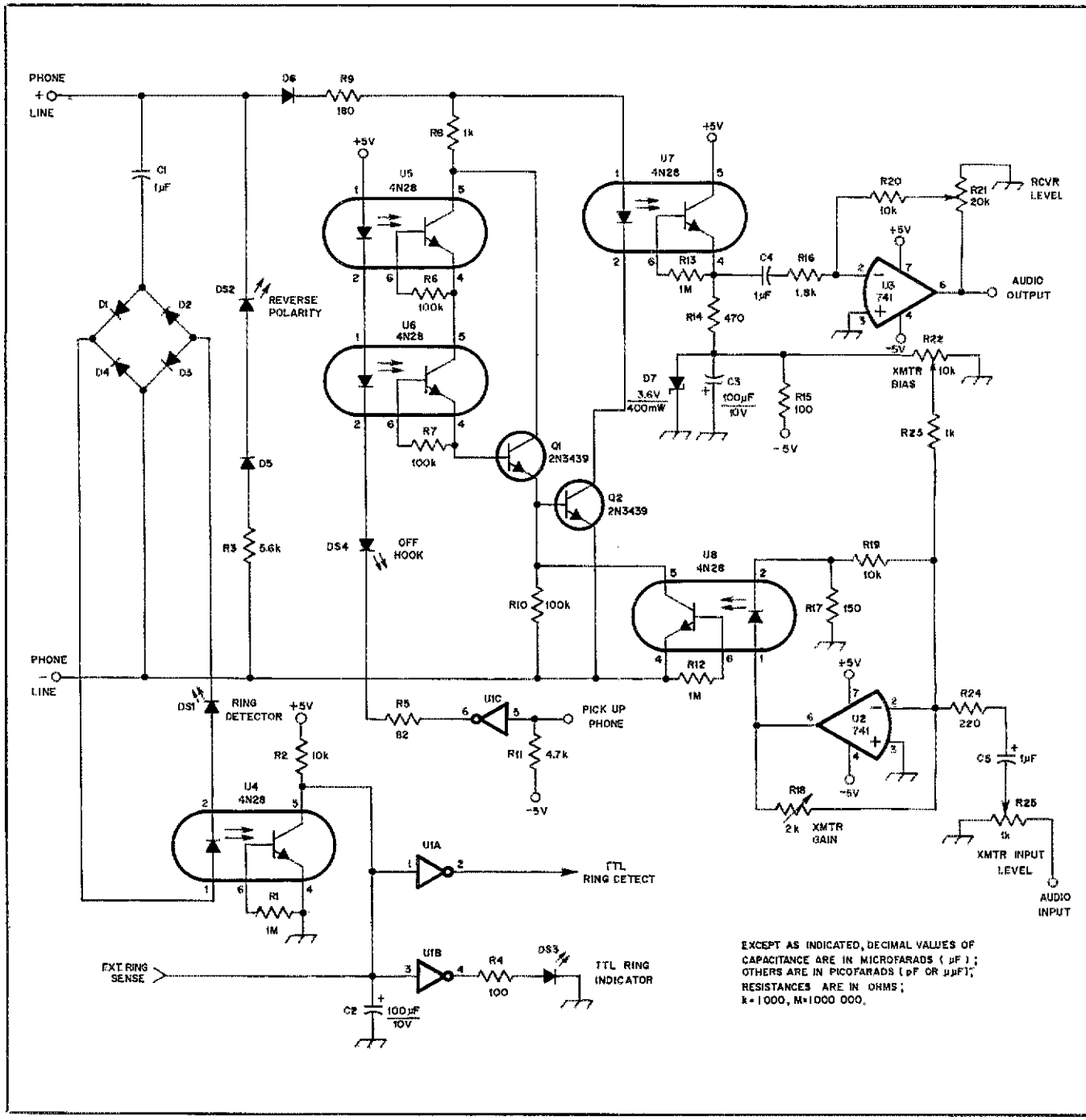


Fig. 2 — Schematic diagram of the phone-line interface circuit. Fixed-value resistors are 1/4-watt metal film or carbon types. Variable resistors are 1/4-watt trimmer units. C1, C4 and C5 are metalized polyester capacitors. C2 and C3 are electrolytic, 10 V or greater. DS1-DS4, incl., are red 10-mA LEDs. U4-U8, incl., are Monsanto MCT2 (4N28) optoisolators. U1 is a 7404 hex inverter.

tion of the dc loop current. This modulates the intensity of the infrared emission from the diode of U7. This, in turn, modulates the collector current of the phototransistor, and this current modulation is then amplified to a useful level by means of op amp U3. Note that no electrical contact is made to the phone line: All coupling is done with light. U3 amplifies the signal to provide a standard 0-dBm audio signal to the repeater. R20 sets the received-audio level, which depends upon the particular phone line being used.

Audio Transmitter

The final section is the audio transmitter. To inject audio back into the phone line, the loop current is modulated by the audio from the repeater. Since Q2 is in series with the 20-mA current loop, perturbing its base current (by shunting some of this base current to ground through the U8 phototransistor) will modulate the loop current. The collector current of Q2 is proportional to the transistor base current. The circuit driving the diode of U8 is a constant-current source to ensure linear transmission of the audio. Typically, the voltage variation at the phone line terminals is less than 0.5, peak-to-peak, for transmitted and received audio. This low level is insufficient to trigger the ring-detection circuit, which requires about 3 volts to fire.

Other Features

The circuit has two additional noteworthy features. The reverse polarity LED is to inform you that the line is connected to the wrong polarity (this LED may also light during ringing). Also, the diode and capacitor regulator (D7 and C3) isolate the hash on the −5 volt dc supply to provide a noise-free signal to the input of U2 and U3. This is especially important if the negative supply is used for other computer components.

Construction Notes

As shown in the title page photograph, the prototype interface is constructed on a single 4- × 5-in. perforated circuit board, using point-to-point wiring. All connections to external circuits are made through the 22-pin edge connector. Component placement is not critical. The LEDs are lined up along the front edge of the circuit board for easy viewing. The control signals are all at standard TTL levels, but can be interfaced to any digital circuit. In the WØYC repeater, the pick-up and ring-detect signals connect to the C port of an Intel 8255 parallel peripheral interface (PPI), which is controlled by an 8080-based microcomputer. Thus, the phone-interface signals can be sensed and controlled with simple microprocessor input and output instructions.

In our case, long distance calls cannot be made from the repeater phone line. Hence, we need not filter the 2600-Hz disconnect tone (see Table 1). Additionally, the receiver filters audio frequencies above 3000 Hz, so no filters are needed in the interface unit. Other systems may require additional filtering to meet phone company specifications.

Adjustment

Once constructed, the circuit should be tested on the phone line to be used in the final application, since the impedance and audio levels of various phone lines differ somewhat. The ring-detect, pick up-the-phone and reverse-polarity indicator sections require no adjustment, but they should be checked before proceeding to the adjustment of the audio levels.

Connect the interface receiver audio output to the audio input of the radio transmitter, apply a pick-up phone signal and use the dial tone to set the proper level into the transmitter. Next, connect the radio receiver to the interface transmitter audio input connection. Hang up the interface (remove the pick-up signal), and dial the phone line from another phone. Apply the pick-up signal, and set the interface input level to 0 dBm. Check the audio level on the phone line, and adjust the transmitter gain and bias until clear, loud audio is heard, with about 20 mA of loop current; the two adjustments will interact. Once the interface transmitter is adjusted, recheck the audio reproduction of the receiver. Its output level may have changed if the magnitude of the loop current has changed.

Conclusion

This interface is currently in use on the WØYC repeater. The microprocessor control system checks the ring-detect output each quarter second. If a ring signal is sensed, the repeater branches to a subroutine that allows external control of the computer. A signal from the repeater receiver initiates the autopatch function. The computer picks up the phone and passes the dial signals and voice audio to the phone interface during the autopatch.

There are other applications for this interface. The circuit can be used as a phone patch for hf rigs. Similarly, it could provide the connection of a microcomputer system to the phone line, with the addition of a serial-data modulator/demodulator (modem).

The optoisolator can provide a compact, simple replacement for bulky transformers and relays; and as in this application, optoisolators are ideal links between computer-based control systems and the outside world.

Strays

HAPPY ENDING FOR STUDENTS

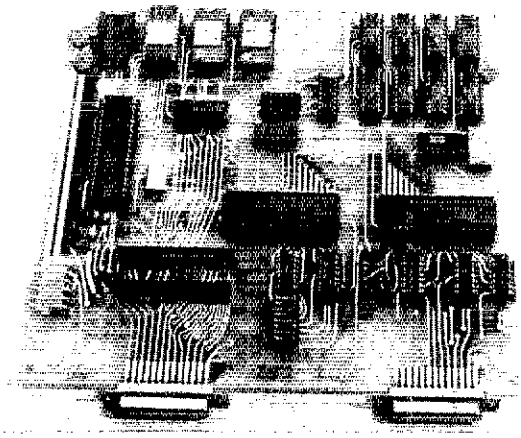
☐ In September 1980, the New York City school system accepted my proposal to teach an Amateur Radio course as a regular part of the Junior High School curriculum. The course was a success, and 120 students were learning about ham radio as part of their everyday program, just like science and math . . . until May 20. On that day our gear was stolen, effectively putting us all off the air. Not ones to give up easily, the students contacted hams they had worked and local clubs to collect money for another station. Thanks to the generosity of these individuals and clubs, my students at JHS 22 and I will be back on the air this fall. — *Joseph J. Fairclough, WB2JKJ*

HAND-KEY SENDING RECORD

☐ Harry A. Turner, W9YZE, of Alton, Illinois, appears to own the legitimate hand-key code-sending record. Listed in the *Guiness Book of World Records,* W9YZE sent 175 characters per minute (35 words per minute), the top speed Army machines at that time could send back. This was accomplished with a hand key in November 1942 at the U.S. Army Signal Corps School at Camp Crowder, Missouri. Still pounding brass, Harry has been at it for over 65 years! — *Egyptian Radio Club, Granite City, Illinois*

Fore! Shown working some of the many contacts made during their special-event operation at the 40th Bing Crosby Pro-Am golf tournament are (l-r) W6OII, N6ALS and N6LLR. The sporting event captured the imagination of the Naval Postgraduate School (Monterey, California) ARC, who overcame natural and legal obstacles to get on the air. *(photo courtesy Bill Webb, WD6COR)*

The Making of an Amateur Packet-Radio Network



U.S. and Canadian Radio Amateurs are experimenting with packet radio. Plans are underway for an amateur packet-switched network to be built over the next few years.

By David W. Borden,* K8MMO,
and Paul L. Rinaldo,** W4RI

October 16, 1981, is the date set for the ARRL conference on Amateur Radio Computer Networking at the National Bureau of Standards, Gaithersburg, Maryland.[1] This will be the setting for a get-together by North American radio amateurs who are eager to build a packet-switched network.

Store-and-forward packet-switching techniques date back to a 1964 study by the RAND Corporation. The term "packet" was coined in 1965 by D. W. Davies of the British National Physical Laboratory. In that year, the U.S. Advanced Research Projects Agency (DARPA) started working on time-sharing concepts that would lead to the activation of ARPANET in 1969. Since then, a whole new science of packet communications technology has matured, and numerous government and commercial packet-switched networks have emerged. This history and an excellent treatment of packet technology is covered in a recent book edited by Kuo.[2]

Amateur Radio packet experimentation got its start in Canada on September 15, 1978, when the Department of Communications (DOC) announced rules for the Amateur Digital Radio Operator's Certificate.[3] The DOC also established regulations for packet-radio transmissions and designated certain vhf and uhf subbands for packet emission. This kicked off packet activity in Ottawa, Montreal, Vancouver and elsewhere.

In 1975, the availability of microprocessors and inexpensive microcomputer kits gave personal computing a big send-off. Because ASCII was not at that time permitted in the ham bands, the choices for data communications were to convert to Baudot or to use the telephone lines. Couple this with the fact that many computerists do not have ham licenses, and you can see why telephone data communications became popular. In 1978, the Computerized Bulletin Board System (CBBS) was developed by Christensen and Suess.[4] There are now around 200 active CBBS systems in the U.S. and Canada. This picture was changed by FCC action, effective March 17, 1980, that legalized ASCII over the U.S. ham bands. This set in motion some experimentation with serial (start-stop) transmission of ASCII; i.e., just hook up the computer to your ham radio equipment through a modem, and let 'er rip! As only a short time passed, it became clear that packet transmission of ASCII offered some advantages. So, a handful of U.S. experimenters set out to catch up with the 18-month lead enjoyed by their Canadian counterparts.

Pardon Me, But . . .

What is a packet? A packet is a group of ASCII characters (information) surrounded by control signals and error-detection features. The control signals help recognize the presence of a packet and tell any intervening switching equipment where the packet should be sent. The error-detection feature works so well as virtually to guarantee that bad information will not be observed by the destination station. Table 1 illustrates a typical packet.

As may be seen, a packet is similar to a message format. In fact, it's a lot shorter than the average Amateur Radio or MARS message. Besides carrying smaller payload, the header and trailer components are designed to be read by computer, not by human operators. The computer, in this case, can be either a home computer programmed to perform this function or a packet controller — a single-purpose microcomputer board dedicated

Table 1

Format for a Typical Packet

Time →

SYNC	FLAG	ADR	CTL	DATA	FCS	FLAG

← *Direction of BIT Transmission*

SYNC — First packet in a group of packets contains 16 bits of alternating zeros and ones.
FLAG — 8 bits, always 01111110 (7E hex).
ADR — Address of the sending station, either assigned dynamically by the Station Node at sign-on or hard-coded into the Terminal Interface Program (8 bits).
CTL — 8 bits containing control information for handling the packet.
DATA — From 0 (supervisory packet) to 255 bytes of data in ASCII.
FCS — Frame Check Sequence — 16 bits, computed by the sending station and checked by the receiving station.
FLAG — 8 bits, always 01111110 (7E hex).

[1]Notes appear on page 30.
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to this task. There are advantages to the packet-controller board approach, such as (a) taking advantage of packet-controller chips on the market, (b) keeping the hardware costs low by not tying up the personal computer and (c) avoiding the necessity of generating new software for every type of computer as changes are made.

Following this philosophy, a typical vhf Amateur Radio packet station would look like that in Fig. 1. The terminal in this case could be either a cathode-ray tube (CRT) or printer and could operate in either ASCII or Baudot code. The Terminal Node Controller (TNC) of the type designed by Doug Lockhart, VE7APU, can be programmed by means of programmable read-only memories (PROMs) to handle serial or parallel communication with a wide variety of terminals, including computers. The other side of the TNC manages the line — sending and receiving packets in High-Level Data Link Control (HDLC) format.

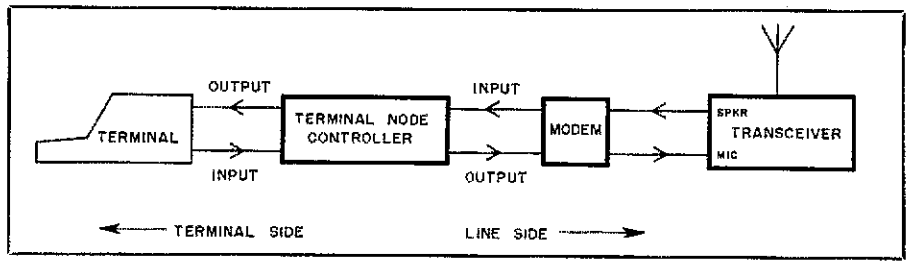

Fig. 1 — Block diagram showing a typical vhf packet-radio station. The arrows indicate the direction of data flow.

Example Packet Transmissions

Assume that the source station wishes to send a two-page message to a destination station using packets. The transmission might be broken up into 48 packets, each containing the address of the source and destination, an information (data) field containing a part of the total message and a frame check sequence (FCS) for error detection. The source station would enter his message into a computer terminal attached to a Terminal Node Controller. The TNC would accept the message as input, break it up into packets, send the packets over the transmission medium (radio, in this case) and receive an acknowledgment of correct reception from the destination station for each packet sent. The destination station would also employ a TNC to receive the packets, acknowledge correctly received packets (ASCII ACK) or request retransmission of any bad packets (ASCII NAK or negative acknowledgment). Bad packets are detected using the FCS. An FCS is appended to each packet by the transmitting station. The receiving station computes what the FCS should be and compares that with the FCS supplied with the packet. If the two agree, the chances are very great that the packet is error free. If the two answers disagree, the destination station knows that the packet is bad and requests retransmission of that packet only.

We have yet to observe the benefits of packet radio. First, a channel can be utilized by a number of users through a time-sharing arrangement known as time-division multiplexing. These different conversations can take place on the same channel, apparently at the same time. In fact, each pair of users believes that the channel is theirs exclusively. Unless a station deliberately tells its TNC to monitor everything on the channel, the station will recognize only those transmissions meant for it.

You might ask, "What happens when two users transmit at the same instant?" In ham radio, it's QRM. In packet terminology, it is called a "collision." There are all sorts of so-called contention schemes to avoid collisions, but they happen even in the best packet networks. In this case, the TNC performs a carrier-sense check (to see if anyone is using the channel). Just to reduce the possibility of two TNC boards hearing nothing and bursting packets at exactly the same time, a variable time delay is built in. Because the time delay at each TNC (user) is changing, repeated collisions between the same pair of users should not occur.

Local Repeaters

In packet terminology, Local Area Network (LAN) is used to designate a number of terminals within a small geographical area that are able to talk to one another through a common channel. That may be coaxial cable or radio. It is difficult for some people to feel comfortable with the term "packet repeater," because this type of repeater may be quite different from the usual ham 2-meter fm variety. Because local area network packet repeaters are still highly experimental, those now operating or in the construction stage in the U.S. and Canada represent different approaches. As examples of two implementations of local area networks using the same Vancouver TNC boards and HDLC protocol, let us look briefly at San Francisco and Washington, DC.

The KA6M/R local area network packet repeater was activated on December 10, 1980.[3] It is a single-frequency repeater that accepts packets, performs an error check on them and retransmits them when the packets contain no errors. The repeater itself uses a Z-80 microprocessor driving a custom-built board containing a Western Digital 1933 HDLC chip. Bell 202 1200-baud modems are used both at the repeater and by members of the net. Individual stations are using Vancouver TNC boards.

The WD4IWG/R repeater is a straightforward 2-meter fm voice repeater, which is also used by local AMRAD (Amateur Radio Research and Development Corp.) members for data communications. So, what comes in is repeated on the output frequency at the same time. This approach has the advantages of (1) using an existing repeater and (2) being able to sense the repeater output for presence of carrier before transmitting, avoiding collisions when the other station cannot be heard directly. Like those local networks in Vancouver, San Francisco and Hamilton, Ontario, the Washington, DC group is using the Vancouver TNC boards.

The local area network packet repeater scene is continuing to evolve with new compromises between doing it "right" and making do with what is available.

The Wider Network

The eventual goal is to tie these and many other local areas together to form a larger packet network. The focus, at the moment, is on interconnecting the various groups in Canada and the U.S. We are using the acronym AMNET to designate this wider network, which may go much beyond North America. Basic approaches, and possibly some tentative standards, for this network are the topic of the October 16 conference in Gaithersburg, Maryland.

There is general agreement that the bulk of the network traffic will be handled by the vhf or uhf packet repeaters deployed across North America. The spread of these repeaters could be as rapid as seen in past years with fm repeaters, but that depends upon enthusiasm and agreement of how to proceed. One view, perhaps the prevailing one, is that the intercity packet repeaters should be separate from the local area network packet repeaters. Also, it seems that the place for them is 220 MHz, and that they should operate at high signaling rates in the range of 1200 to 48,000 bits per second. The idea is to have the speed as high as practical in order to ensure that there is sufficient capacity to handle all intercity traffic. The higher speeds, however, require both wider bandwidths and greater power. So, the trade-offs are being studied. The lower speed (1200) would be necessary if, for some reason, we are unable to obtain an FCC rules change or waiver.

There is also a preference for the use of satellites for the long-haul circuits needed to "leapfrog" the vhf/uhf terrestrial network. Data communications channels are

A Glossary of Packet-Radio Terms

Address — Element(s) of a packet frame that identify the source and/or destination stations by means of an agreed bit pattern.

CCITT — Consultative Committee for International Telegraph and Telephone, a part of the International Telecommunication Union (ITU).

CSMA — Carrier sense multiple access, a contention scheme in which stations listen for the presence of a carrier on the channel before sending a packet.

HDLC — High-Level Data Link Control, a packet transmission protocol developed by the International Standards Organization (ISO). It was derived from IBM's Synchronous Data Link Control (SDLC).

Flow control — The method used to regulate the rate of data exchange between the end users of the packet network in order to prevent system overloading. In general, the input is slowed down or stopped until the network handles the previous input.

Packet — (CCITT definition) A group of binary digits, including data and call control signals, that is switched as a composite whole. The data, call control signals and possibly error-control information are arranged in a specific format.

Packet switching — (CCITT definition) The transmission of data by means of addressed packets, whereby a transmission channel is occupied for the duration of transmission of the packet only. The channel is then available for use by packets being transferred between different data terminal equipment.

Protocol — A format and set of procedures for achieving communications.

Protocol layering — The International Standards Organization (ISO) has divided protocols into seven layers, from the lowest through the highest levels, as follows: Physical, Link, Network, Transport, Session, Presentation and Application. RS-232-C is an example of a Physical level protocol, HDLC a Link level.

Routing — A sequence of passing packets through various store-and-forward packet switches in a network to the desired destination.

Terminal Node — As used by the Vancouver Amateur Digital Communications Group, a user station in the packet network consisting of a Terminal Node Controller board, a data terminal (or computer), a modem and radio equipment.

assigned to AMSAT Phase III and later satellites in the planning stages. Hank Magnuski, KA6M, is the chairman for the AMSAT International Computer Network (AMICON) system architecture design group.

High-frequency (hf) packet circuits will be needed to fill in the gaps while the satellite capability is still not operational. Also, some hf capability should be maintained as a back-up system. An experimental hf packet circuit is being tested between AMRAD (WD4IWG) in Washington and ARRL (W1AW) in Newington to determine both equipment and software requirements for an operational circuit. Hf propagation restricts practical speeds to the general range of 75 to 600 baud, although 300 baud is the top speed presently permitted by FCC rules. The speeds of 300, 600 and 1200 baud are possible over ionospheric paths within the limitations of multipath distortion. Generally speaking, a radio signal that is operating on the maximum usable frequency (muf) has only one path, thus no multipath. However, lower frequencies (than the muf) can follow several paths within the same ionospheric layer, and suffer multipath distortion at higher speeds. This is a complex effect that varies by path distance and operating frequency, relative to the muf. The worst circuit distances for multipath are the shortest ones, e.g., under 300 miles — that between Newington and Washington. The best path distance is around 1000 to 1600 miles.

Getting Started

First, you need to do some reading. In addition to the references at the end of this article, you will find a number of books and magazine articles in many technical libraries. More to the point, you may wish to join one or all three of the following Amateur Radio groups that regularly publish newsletters with substantial packet information:

1) Amateur Radio Research and Development Corp. (AMRAD), monthly *AMRAD Newsletter* ($12). Gerald Adkins, N4GA, 1206 Livingston St. North, Arlington, VA 22205.

2) Vancouver Amateur Digital Communications Group (VADCG), *The Packet* ($10). Don Oliver, VE7AOG, 818 Rondeau St., Coquitlam, BC V3J 5Z3.

3) Hamilton and Area Packet Network (HAPN), *I-Frame de VE3PKT* ($10). Stu Beal, VE3MWM, 2391 Arnold Cres., Burlington, ON L7P 4J2.

If you decide to start with the Vancouver TNC board, you can order them from VE7AOG. The price is $30 for a bare board and all documentation. You will need to populate it with integrated circuits, resistors, capacitors and the switches required. You then plug in PROM chips containing the appropriate program and begin communicating. The total cost of the TNC is about $250 when you add up the costs of the board and parts.

Next, you will need a Bell 202 modem. These may be available as surplus at hamfests, but several manufacturers are now making them at affordable prices. If you contemplate only hf operation, your existing RTTY modem (AFSK keyer/demodulator) may be used at the slower speeds of 75 and 150 baud, possibly with some modification.

Some Cautious Conclusions

Amateur packet radio experimental activity is well under way. Local area networks have been set up in a number of places in Canada and the U.S. Network standards and protocols are beginning to take shape.

You can get involved by starting a local area network with just two (or more) hams within range of each other. One or more of the groups mentioned in this article can help you get started.

Notes

[1]"Call for Papers on Packet Radio and Computer Networking," *QST*, July 1981, p. 32.

[2]Kuo, *Protocol & Techniques for Data Communication Networks* (Englewood Cliffs, NJ: Prentice-Hall, 1981).

[3]R. Hesler, "Canadian Newsfronts: DOC Creates New Amateur License Class," *QST*, Dec. 1978, p. 61.

[4]Christensen and Suess, "Hobbyist Computerized Bulletin Board," *Byte*, Nov. 1978, p. 150.

[5]H. Magnuski and P. O'Dell, "First Packet Repeater Operational in U.S.," *QST*, April 1981, p. 27.

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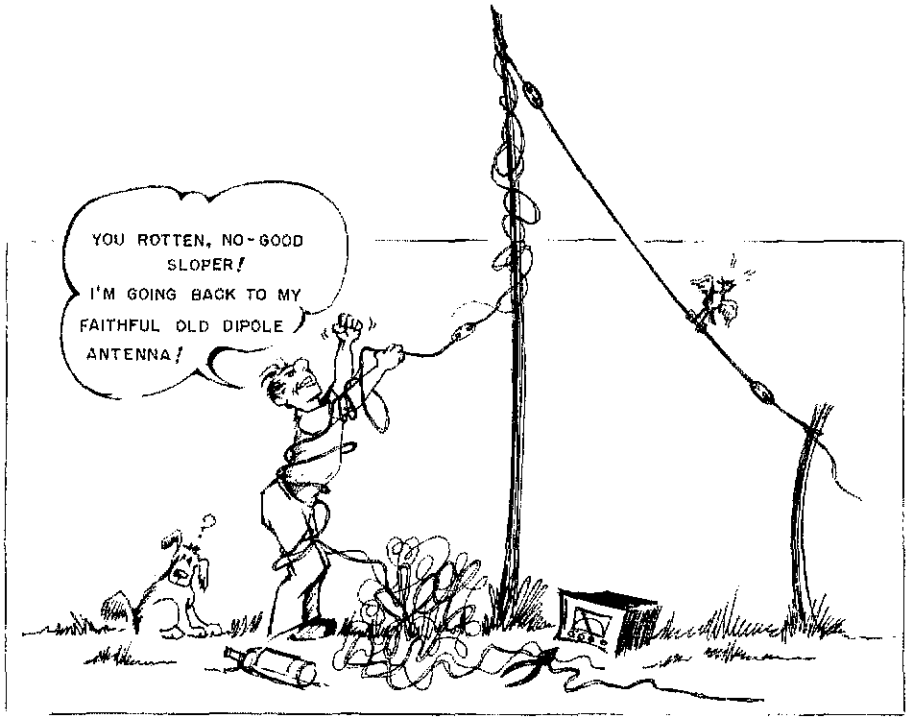
More Thoughts on the "Confounded" Half-Sloper

Half-sloper antennas don't function well for some amateurs, but others laud the performance. If you've tried them and experienced problems, these practical observations will be of interest.

By Doug DeMaw,* W1FB



"I read the *QST* articles[1] on half-slopers, built one, then found out it was no good!" We've actually received a couple of letters to this effect at Hq. But we've also had correspondence that said, "Thanks for publishing the half-sloper data. I erected one and have picked up 22 new countries on 80 meters with it!" Conflicting reports about performance have trickled in for many months, so we decided to do some testing that might reveal what had gone wrong with those slopers that performed poorly. A number of interesting observations were made, and numerous experiments were conducted at W1FB. This article will outline some of the more significant aspects of the tests that were conducted over an eight-month period.

What is a Half-Sloper?

The half-sloper is known also as the quarter-wave sloper. It differs from a full-sloper mainly by being half as long. The full-sloper is a half-wave dipole fed at the center with coaxial cable. Conversely, a half-sloper consists of a quarter-wavelength wire conductor, which is operated *in combination with* the metal mast or tower that supports it. Indeed, the tower is an electrical part of the sloper, which means that the height of the support and whatever else is attached to it play a significant role in antenna adjustment and performance (more on that later). The half-sloper is fed with 50-ohm coaxial cable at the point of attachment to the tower, as shown in Fig. 1. The center conductor of the cable connects to the slope wire, and the shield braid is attached to the tower leg or the mast. An enclosed angle of approximately 45° is used between the tower and the slope wire.

Half-Sloper Virtues

Inverted-V, full-sloper and half-sloper antennas require but one supporting structure. That's a plus factor. Unlike the full-sloper, the quarter-wave version has the current part of the antenna high above ground (desirable). The feed line can be taped to a tower leg, thereby preventing it from dangling across the property, as would be the case when using a full-sloper.

The half-sloper exhibits directivity (not gain) in the direction of the slope. This can be useful for favoring a particular DX region. In all tests at W1FB the sloper was a quieter antenna than the 55-foot (m = ft × 0.3048) vertical against which it was compared. That is, it was less responsive during receive periods to man-made and atmospheric noise than was the vertical.

Misconceptions

In reading our mail concerning the sometimes dismal performance of half-slopers, we have found that a misunderstanding of basic antenna principles caused much of the difficulty. Some amateurs used a tree or wooden mast to support the antenna. In such cases there was no place to connect the coax-cable braid, so it was left unattached at the feed point! The half-sloper requires a grounded metal mast or tower as a support, since the support is an electrical part of the system. In the most general of terms we can equate the sloper and tower to the two legs of an inverted-V dipole. The current and voltage distribution are not the same, however.

Others said that the VSWR was high, no matter how much pruning of the wire length was done. We'll address this matter

[1]See D. Atchley, W1CF, "Putting the Quarter-Wave Sloper to Work on 160," *QST*, July 1979; J. Belrose, VE2CV (ARRL TA), "The Half-Sloper — Successful Deployment is an Enigma," *QST*, May 1980; and D. DeMaw, W1FB, "Additional Notes on the Half-Sloper," *QST*, July 1979.

*Senior *QST* Technical Editor

later in the text. Some said that an SWR of 1:1 was easily obtained, but the antenna was very ineffective compared to a horizontal dipole at modest height above ground. It turned out that the tower in those examples was merely set in concrete without an effective ground system. The operators didn't think an earth ground was essential for this style of antenna.

Initial Investigations

The letters suggesting "black magic" concerning half-slopers arrived as winter was setting in on the East Coast. This ruled out any comprehensive outdoor evaluation of various half-sloper configurations. The practical solution seemed to be in scaling the W1FB tower, triband Yagi and sloper to 144 MHz. This would permit reasonable indoor tests during the bad-weather months. Then, the full-scale tests could be based on 2-meter results when spring arrived. Fig. 2 shows the setup used on 144 MHz to learn which factors affected the tune-up and performance of the antenna in question. Copper tubing was substituted for the Rohn-25 tower. Brazing rod was used to make the scaled-down hf Yagi, and sheet aluminum was extended 1/4 wavelength beyond the base of the short tower to simulate the buried radial system at W1FB, which consists of only 16 wires that range in length from 60 to 110 feet in rather swampy ground. No. 28 enameled wire was employed as the half-sloper wire. The scaling was not precise, but it was close enough to optimum, thereby yielding satisfactory results. A diode type of field-strength meter (calibrated in decibels) provided the instrumentation needed for pattern checks. The SWR was monitored by means of a Bird wattmeter. A Kenwood TS-700 all-mode 2-meter transceiver served as a signal source and was used in the receive mode to observe relative directivity of the half-sloper system while monitoring various repeaters in the area.

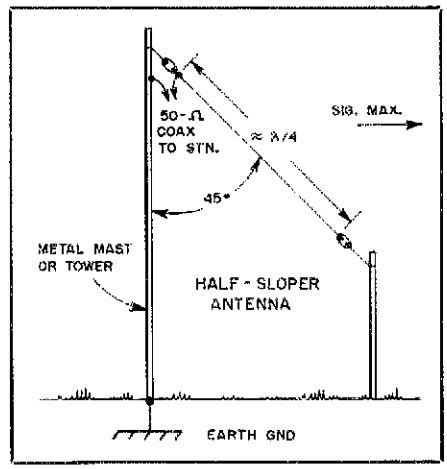


Fig. 1 — Basic half-sloper antenna attached to a metal supporting structure. The feed point is at the top of the wire. Coaxial cable is used for the transmission line, with the center conductor made common to the slope wire. The shield braid is connected to the mast or tower leg. The mast or tower must be grounded at the base. A buried radial system is preferred.

This technique is within the technical and financial means of any amateur, and is highly recommended for scaling one's tower, guy wires and beams when evaluating shunt-fed towers, slopers and other antennas that in some way depend on the tower.

Test Results

It was not too great a surprise to learn that the data gathered on 2 meters was repeatable at scale, with an accuracy of approximately 10%, the following spring. Similar results were obtained during earlier scaling tests of 80- and 160-meter shunt-fed towers. The system at that time was scaled to 10 meters. W1VD performed similar tests of his 80-foot tower (scaling to 28 MHz), and had results at scale that were accurate within 10%.

These are the significant factors that affect the SWR of a half-sloper.

1) *Height of attachment point on the tower.* The best results were had when this point was approximately 1/4 wavelength above ground.

2) *Enclosed angle of the tower/wire combination.* Varying the angle had a marked effect on the SWR, irrespective of the height of the attachment point.

3) *Other conductors connected to the tower.* The triband Yagi had a large effect on the SWR: Removing it changed the SWR from 1:1 to 4:1, indicating that the beam was related electrically to the overall system. Guy wires and other sloping antennas had a similar effect. An array (4)

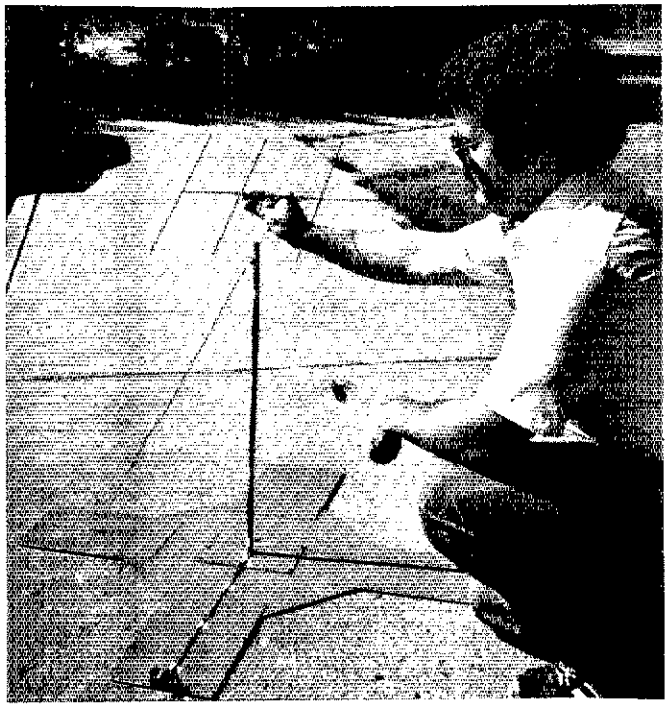


Fig. 2 — Photograph of ARRL technical staffer AK4L with the 2-meter scale model used to gather test data for the 40-meter half-sloper at W1FB. The Yagi has an alligator clip soldered to it for easy removal during tests. Aluminum sheeting serves as a ground system (see text).

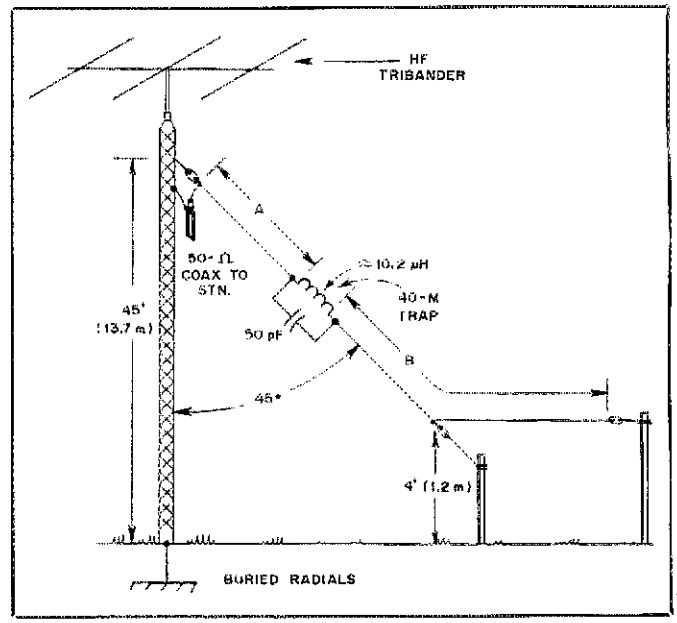


Fig. 3 — Practical circuit for the W1FB 40/80-meter, coax-fed half-sloper antenna. Owing to insufficient tower height, the lower part of the 80-meter extension is bent and routed horizontal to the ground. The feed line should be taped to a tower leg (likewise with rotator cable and other feed lines) at regular intervals, then routed to ground level. This will decouple the cables and prevent unwanted rf energy from entering the shack. The cables can be laid on the ground and brought to the shack, or they can be buried in the soil.

of half-slopers for the same band (spaced at 90° increments) made it impossible to obtain an SWR of less than 5:1 with any given sloper. This interaction was severe with only two half-slopers on the tower. Guy wires had to be broken up at nonresonant intervals and had to be insulated from the tower to eliminate SWR problems and preserve the radiation pattern of the antenna.

4) *Ground system under the tower.* The quality of the ground system (buried radials, on-ground radials or ground rods) affects not only the SWR, but also the effectiveness of the half-sloper. Removal of one half the aluminum-sheet ground system at 2 meters changed the SWR and reduced the field strength off the slope of the antenna.

An SWR of 1:1 could be obtained under most of the foregoing conditions by varying the height of the attachment point and the enclosed angle of the antenna. In all of the tests it was learned that the half-sloper needed to be slightly longer than the computed length obtained from l(feet) = 234/f(MHz). The antenna is not resonant at the operating frequency. Rather, the length is varied until the feed point exhibits a 50-ohm characteristic.

All scaling was done for a 40-meter sloper system. Extrapolation of the bandwidth from 2 meters to 40 meters indicated that the 40-meter bandwidth between the 2:1 SWR points would be approximately 150 kHz. Later tests at scale confirmed that number. As a matter of casual interest, the 2-meter half-sloper turned out to be a very effective fm/repeater antenna. From inside the W1FB QTH (antenna 4 feet above ground level) it was possible to access repeaters as far away as 40 miles when orienting the sloper toward the repeater. Power output from the TS-700 was 10 watts.

The directivity of the antenna produces a lobe that is approximately 5 dB stronger than the points along the otherwise omnidirectional pattern of the antenna. The radiated wave is essentially vertical in polarization.

A Practical Half-Sloper

Following verification of the scale-model tests in February of 1981, and after many local and DX contacts were made on 40 meters, a two-band version of the half-sloper was tested. It was designed for use on 80 and 40 meters by using a 40-meter trap in the slope wire. The system is illustrated in Fig. 3. The length of the wire A is the same as for a 40-meter single-band half-sloper. Wire sections A and B constitute the 80-meter half-sloper, with the 40-meter trap becoming part of the system. Owing to the loading effect of the trap, sections A and B combined are somewhat shorter than would be the case of a single-band 80-meter half-sloper. There was insufficient tower height at W1FB to permit a continuous slope of the wire. Therefore, the last 10 feet of the wire was run off at an angle, as shown in Fig. 3.

To permit operation at 1 kW, the trap contains a section of large-diameter Miniductor stock. A surplus ARC-5 50-pF vacuum capacitor was chosen for the trap capacitor. Transmitting ceramic capacitors can be substituted for the trap capacitor specified, but will change value when large changes in outdoor temperature occur. This effect will be noticed especially in regions where severe winters are common. The trap should have a high Q and can be tuned with a dip meter for the center of the chosen operating range before installation. Do not put the vacuum capacitor inside the coil because the metal parts of the capacitor will detune the trap and lower the Q significantly.

A compromise was made when selecting the attachment point of the antenna on the tower. It is somewhat higher than 1/4 wavelength at 7.025 MHz to permit ample height for the overall wire in the two-band format.

The SWR on 40 meters is 1.3:1 at 7025 kHz. Owing to the bent format on 80 meters, plus the less-than-prescribed height of the attachment point, a low value of SWR was not attainable. The best SWR turned out to be 2:1 at 3510 kHz. Line losses are of no consequence at 80 meters, since only 60 feet of RG-8/U is used in the system. The SB-221 amplifier loaded into the system just fine, despite the 2:1 SWR. Phone-band operation is possible by using a Transmatch (at the transmitter) for either band.

Some Precautions

The continuity of the tower sections is important to good performance, since the tower is part of the antenna system. Similarly, the tower-to-mast continuity should be ensured. This can be achieved by placing short lengths of shield braid across the joints between tower sections. A long, flexible conductor can be used between the mast and tower to provide continuity in that part of the system. If intermittents are present (especially when there is a breeze), the SWR will ramp up and down in an alarming manner! Some operators have solved the problem by merely running a continuous length of heavy conductor from the mast to the base of the tower.

On-the-Air Results

A shunt-feed arm was attached to the tower to permit using it as an 80-meter vertical. The tower was resonant at 3.8 MHz with the tribander atop it, so getting a match to 50 ohms was not difficult. The tower was rigged in this manner to permit comparisons between it and the 80-meter half-sloper during DX QSOs. A coax switch was used at the operating position to facilitate fast comparisons. It should be acknowledged that there is significant interaction between the half-sloper and tower. In an ideal situation the two antenna should be well separated from one another. Despite this condition, however, some interesting results were obtained in the spring of 1981.

During a 1-1/2 month period of casual DX chasing, 72 countries were worked by W1FB with the two antennas. The sloper was arranged for maximum directivity to the south because of property limitations. It showed a consistent 8- to 10-dB advantage over the vertical out to approximately 1500 miles in all directions. It was similarly superior to the vertical when working stations in the West Indies and South America. During QSOs with European stations, the sloper and vertical were often neck and neck, but the vertical was predominantly 5 to 6 dB better than the sloper. Had the wire been sloped to the northeast, the sloper would probably have equaled the vertical in performance, and may have exceeded it on occasion.

Since the half-sloper was the quieter of the two antennas, it often provided an advantage in weak-signal reception, even though the received signals were not as strong as when using the vertical.

Recommendations and Summary

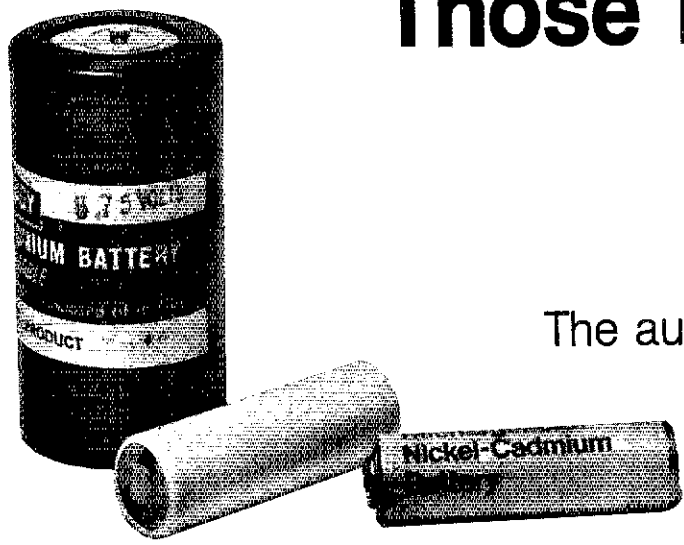
Some amateurs have reported success when using an 80-meter half-sloper on 160 meters. This was done by placing a loading coil and capacitance hat at the lower end of the wire. An 80-meter trap was inserted between the end of the wire and the loading coil. This same technique might be applied to the antenna of Fig. 3 to make it a three-band half-sloper.

The operator should make an effort to install a ground-radial system when using a half-sloper. A practical rule of thumb is to put as much wire in the ground as possible, but not to worry if an elaborate, classical ground system isn't practical. During tune-up, experiment with the attachment point and the enclosed angle of the antenna. If an SWR of 1:1 can't be obtained, don't worry about it. The system will provide good results as long as the transmitter will load into it. If it doesn't, use a Transmatch at the rig.

A multiband sloper can be erected by using open-wire or TV-style 300-ohm line. This was tried at W1FB by cutting the slope wire for 40 meters and by using a Transmatch in the shack. Excellent results were had from 40 through 10 meters, with the sloper at times providing reports as good as those obtained with the tribander out to 1000 miles or more. The 40-meter version with tuned feeders also did a pretty good job on 80 meters.

If you have tried this antenna and found out it was "no good," perhaps you didn't experiment enough. We hope this article will give you some hints toward making your half-sloper do a proper job for you!

Those NiCad Batteries and How to Charge Them!



The author explains the nature of NiCad batteries. He also shows how to charge them sensibly with a home-built charger that works better than store-bought units.

By David W. Potter,* W2GZD

Nickel cadmium batteries (NiCads) are remarkable devices! They have been in use for more than 50 years. They can be used and recharged hundreds of times. The internal resistance of NiCad batteries is low and remains low until the end of the discharge cycle, and the output voltage remains fairly constant during the discharge period. Typical voltage is 1.3 for a freshly charged cell. It decreases to about one volt at the end of the discharge cycle. If the discharge continues, the output voltage falls rapidly from this point. Higher-voltage batteries or power packs are realized by connecting one or more cells in series.

Sealed cylindrical cells and batteries that are most commonly found in Amateur Radio equipment are made something like a capacitor. Thin, sintered electrodes of sheet nickel hydroxide and cadmium hydroxide are isolated from each other by a porous separator sheet. A limited amount of potassium hydroxide serves as the electrolyte. The three sheets and the electrolyte are rolled together, then placed in the cylindrical steel case. An insulating seal ring separates the positive cover from the negative case.

The chemical reaction of the nickel cadmium cell is:

$$Cd + 2NiOOH + 2H_2O \underset{\text{Discharged}}{\overset{\text{Charged}}{\rightleftharpoons}} Cd(OH)_2 + 2Ni(OH)_2 \quad \text{(Eq. 1)}$$

Notice that the reaction can go in either direction. If current from a charging source flows in the proper direction, it will drive the reaction backward toward the charge direction and in effect will recharge the electrodes. What is not clear from the equation, though, is that during the final part of a charge cycle, and during periods of overcharge, NiCads generate gas. Oxygen is generated at the nickel (positive) electrode and hydrogen is generated at the cadmium (negative) electrode as each reaches full charge. If the charging rate is about 1 C (defined later) the pressure and temperature inside a cell will soar at full charge, and the cell will be damaged or destroyed. Since the cells are sealed, the pressure must not become excessive. The cells have vents that will release pressure when it exceeds 150 to 300 psi, but such venting shortens the life of a cell. The manufacturers avoid the generation of hydrogen gas by making the positive electrode smaller than the negative one, so that the positive electrode becomes fully charged first. Oxygen is generated at this positive electrode at full charge, but this gas can migrate back to the negative electrode, with which it reacts, preventing the negative electrode from charging further. This also prevents it from becoming fully charged and producing hydrogen. The NiCad cell can be overcharged indefinitely then, without being damaged, owing to this protective mechanism (well, in theory, anyway).

Another interesting fact about the NiCad that makes it different from other types of batteries is that the terminal voltage is at maximum around 75° F (24° C). The voltage decreases as the temperature goes above or below that temperature. Similarly, the internal resistance is smallest at 75° F, and it increases as the temperature goes above or below that temperature. Because of this characteristic and for other reasons, a NiCad should be operated inside of the temperature range of 32° F to 105° F (0 to 40° C).

Cell Capacity

The capacity (C) of a NiCad cell is stated in ampere hours or in milliampere hours. A 500-milliampere/hour cell has a C equal to 500. It means, for example, that you may discharge the cell at a 50-mA rate for 10 hours, or at a 500-mA rate for one hour, but the capacity decreases with increasing discharge rates. The term C has another meaning. It can define the charging or discharging current. A 1-C discharge rate means a discharge current of 500 mA for a battery rated at 500 mA/hours, while a 0.1-C charging rate implies a charging current of 50 mA (0.1 × 500). Hence, C defines a certain milliampere/hour capacity, or a charging or discharging current based on that milliampere/hour rating.

Charging Characteristics

Now that the basic theory of NiCad cells has been reviewed, how can the cell be recharged sensibly so that we can approach a thousand or so recharge cycles? First, the charging rate must be limited to 0.1 C. As the charging rate exceeds 0.1 C, the oxygen generated as the cell nears full charge does not diffuse and react quickly enough at the negative electrode. The internal pressure will build up, and damage will take place. A 0.1-C charging rate implies a 10-hour charging time (0.1 C × 10 = 1 C), but the battery is not 100% efficient. It is necessary to put in 140 to 160%

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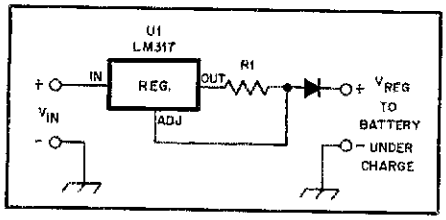


Fig. 1 — Circuit for a simple constant-current battery charger. The series diode can be a 1-A, 50-PRV silicon rectifier. U1 is a three-terminal regulator.

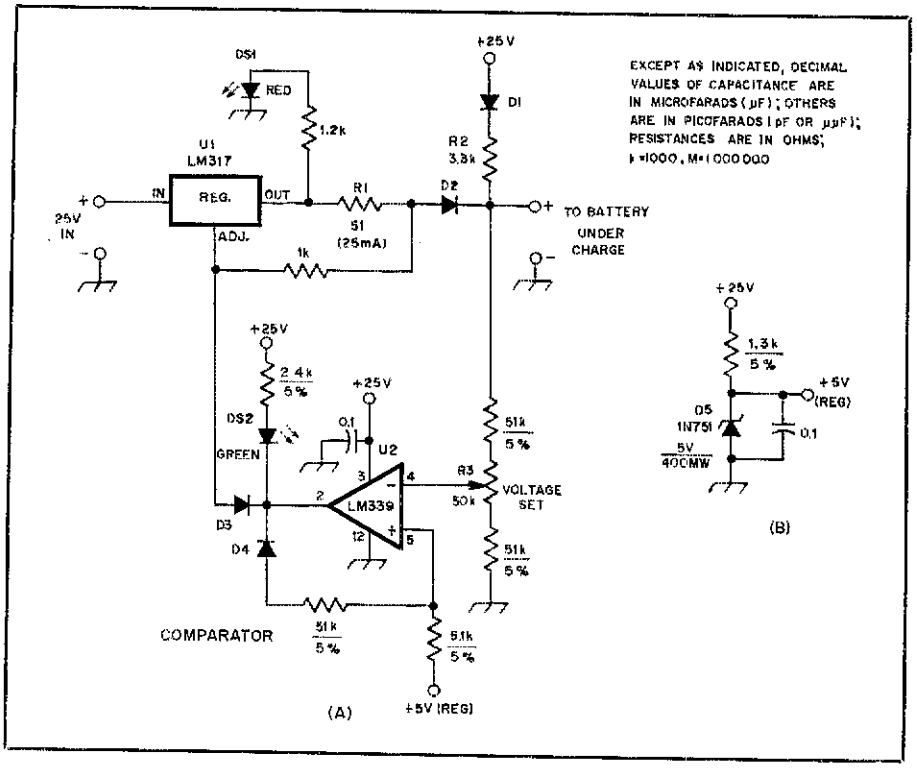


Fig. 2 — Schematic diagram of a constant-current charger with an automatic shut-down feature. R3 is adjusted to provide the maximum desired battery voltage. The capacitors are disc ceramic or Mylar. D1-D4, inclusive, are 1-A, 50-PRV silicon rectifiers. DS1 and DS2 are LEDs (see text). R3 is a linear-taper, wire-wound control. See text for details of the circuit at B.

of the charge. Now you can see where the familiar 14- to 16-hour charging time comes from. It is typical for completely charging the NiCad battery.

A battery consists of two or more cells in series. Because no two cells have exactly the same capacity, one cell will become discharged before the rest. When this happens, the weak cell will be *reverse-polarized* by the remaining cells. When this happens, oxygen will be generated at the cadmium electrode and hydrogen at the nickel electrode. Not only will the gas pressure soar, but the internal resistance will increase, and heating will take place. Manufacturers have introduced clever schemes to suppress this generation of gas in the reverse-voltage case, but the protection is effective up to discharge rates of only 0.1 C. Since the discharge rate may be in excess of 0.1 C, you should stop discharging a NiCad battery when the potential drops below 1 volt per cell. Some battery-powered amateur gear has low-voltage indicators. Cease operation when that condition is observed.

NiCad batteries can supply large pulse and dc discharge currents because of their low internal resistance. The inquisitive reader might wonder why a cell may be discharged at rates of several C safely, yet charging them at those rates can be destructive. The reason is related to the gas and heat that is generated at or near the full-charge condition, as we discovered. Quick chargers do exist, but special NiCads are used. The "quick chargers" generally measure the temperature of the cell or battery. As the temperature climbs (near the end of the charge), a temperature sensor turns the charger off or reduces the charging rate to a "trickle" charge. Such chargers and special batteries are not commonly found in Amateur Radio equipment.

Chargers for the NiCad Battery

If you enjoy building electronic circuits, you can save some money and end up with a better charger than many that you can buy! A charger can be built for a few dollars, plus some components that you probably have in your shack. A simple charger, using a constant current that is equal to 0.1 C, can be realized by using an LM317, which is a three-terminal, adjustable (positive) voltage regulator. The circuit in Fig. 1 is for a constant-current charger. The regulator is available in several types of cases. Pick your favorite. The input potential should be at least 5 to 6 volts greater than the desired maximum output voltage, and it may be up to 40 volts greater. Therefore, you have a broad range of input dc voltages with which to work. The greater the voltage difference between the input and output, the greater will be the dissipation in the regulator. The charging current in milliamperes is given by:

$$mA = \frac{1200}{R1} \qquad \text{(Eq. 2)}$$

If your battery is rated at 250 mA/hr, set the current for a 25-mA charging rate. Similarly, you would set a 45-mA charging rate for a 450-mA/hr battery. These 0.1-C charging rates will require 14 to 16 hours to recharge a fully discharged battery. Overcharging should not damage them with this rate. The series diode in the schematic diagram disconnects the battery from the charger in the event that the charger is turned off, or if there is a power failure.

You can add a simple feature (Fig. 2B) that shuts down the charger when the terminal voltage of the battery reaches some fixed value. A trickle charge equal to 0.01 C to 0.03 C is supplied by resistor R2. This is the recommended "float" or leveling charging rate. The voltage comparator circuit employs 0.4 volt of hysteresis so that if the battery voltage should fall 0.8 volt below the set point, the full 0.1-C charging rate will be reinstated until the voltage reaches the desired level. A red LED (DS1) indicates that the unit is charging; the green LED indicator (DS2) shows that the battery has reached the desired (fully charged) condition. These LEDs serve only as indicators, and one or both can be eliminated.

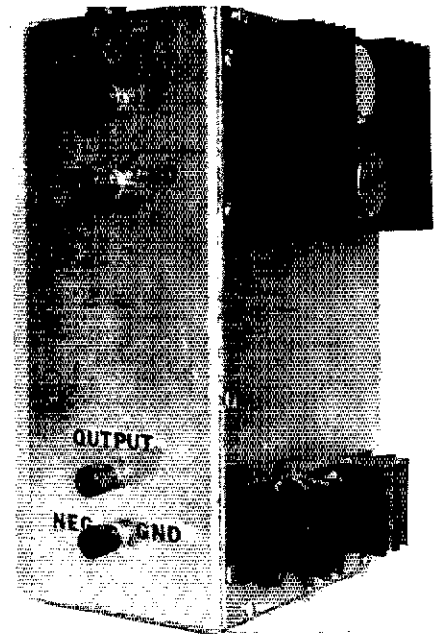
The voltage comparator that I used is an LM339. This version has four comparators in a 14-pin DIP format, which is useful because my charger has the capability to charge several batteries independently at the same time. Just add as many constant-current regulators as you need; one LM339 will control four regulators.

All of my batteries have terminals on the bottom; they do not have connectors. I have fashioned battery supports from wood, and they have screws in the base that contact the battery terminals if the battery is inserted correctly in the blocks. A table-top charger to hold and charge an HT and spare batteries can be made with a scrap of 2- × 4-inch (51 × 102-mm) lumber and a pine board. You can decide how to connect the charger to your battery. Now go to it! Charge sensibly!

Polarity Inverter

Impossible to run a negative-ground-only rig in a positive-ground vehicle? It can be done! Here's one way.

By Gary Laurence,* WB7NAE, Dustin Laurence,* KA7FIU and Rodney Reitan,** WB7VTS



We had a unique problem: Most vehicles have negative ground electrical systems, but our motor home (a converted 1954 Greyhound bus) has a *positive* ground system! Most radio equipment these days is designed for negative ground systems. We considered changing the bus generator, regulator and wiring, but the cost was prohibitive. So we isolated the negative-ground from the positive-ground chassis for some of the circuits.

The challenge came when we decided to install a 2-meter fm rig in the bus! It would have been simple enough to isolate the radio from the bus chassis, but not so for the antenna. Besides, we were determined to use the "expansive acreage" of the roof as a ground plane for our antenna. With those constraints in mind, the possibility of damage from an accidental short outweighed the relative ease of isolating the equipment from ground. We searched for another solution.

The Answer

A polarity inverter seemed like the obvious answer. A basic circuit was decided upon. The problem was in locating a 1:1 transformer of adequate current rating for T1 of Fig. 1. We thought of winding the transformer on a large toroid, but soon abandoned that idea because we could not locate a large enough toroid, so we decided to use the core of an old TV transformer. The primary of T1 consists of 40 turns of no. 10 enameled wire, center tapped, while the feedback windings contain five turns each of no. 30 enameled wire. The secondary has 40 turns of no. 10 enameled wire also (no. 14 enameled wire should be more than adequate for both the primary and the secondary).

A regulator circuit was added as a safety feature. We used a 1-A, 12-V monolithic regulator chip (type 7812) for U2. R3 and R4 set the output voltage slightly above the rating of the chip. This results in a drop in dc output voltage from 13.8 to 13.4 when current consumption rises from approximately 700 mA (receive) to 4 A (high-power transmit). Better

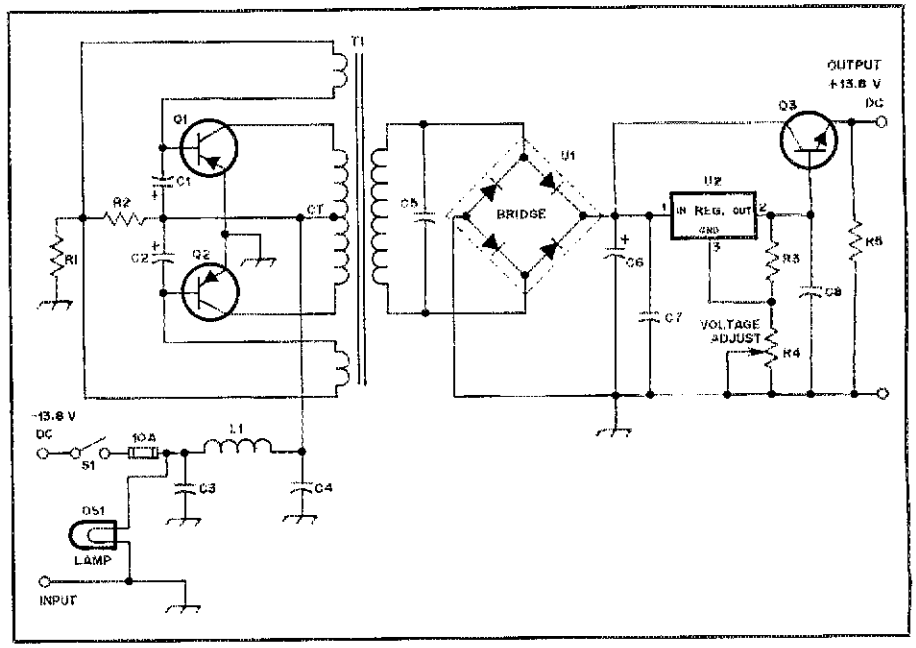


Fig. 1 — Schematic diagram of polarity inverter. Refer to text for a discussion of component types and values, which are not critical. Layout and construction techniques are not critical either.
C1, C2 — 25 μF, 150 V electrolytic.
C6 — 5000 μF, 50 V electrolytic.
DS1 — 12-V lamp, Radio Shack 272-332 or similar.
L1 — See text.
Q1, Q2 — Silicon pnp audio power bipolar transistor, 100 W, GE-4 or equiv.
Q3 — Silicon npn audio power bipolar transistor, 115 W, REN-130, Radio Shack 276-2041 or equiv.
R3 — 470 Ω, 1 W carbon composition.
R4 — 2-kΩ, 1-W potentiometer (linear taper).
S1 — Spst, 10-A toggle switch.
T1 — See text.
U1 — Monolithic bridge rectifier, 25 A, 50 PIV, Radio Shack 276-2285 or equiv.

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**67 Beaver Creek Blvd., Havre, MT 59501

regulation might be had by substituting an adjustable regulator chip and circuit (such as the LM-317) for the 7812. However, for our use the performance of the 7812 circuit is adequate. Q1, Q2 and Q3 are mounted on heat sinks.

Filtering

The input filter of Fig. 1 (C3, L1 and C4) prevents noise from the bus electrical system from being coupled into the inverter. Component values are not critical. In our case, C3 and C4 are 0.47-μF, 200-V dc capacitors, but larger-value capacitors should work. We recommend maintaining the somewhat-high voltage rating to prevent damage caused by voltage spikes. Our L1 carries Motorola part number 24A4/2536-0. If you do not have something comparable in your junk box, you can "roll your own" by winding at least 20 turns of no. 10 enameled wire on a 3/4-in. (19-mm) form. If the output of your inverter contains a "whine" component, increase the number of turns of L1 or increase the capacitance of C3 and C4.

R1 is a 2-Ω, 25-W wire-wound resistor. You may want to substitute five 10-Ω, 5-W wire-wound resistors in parallel, because of ease of procurement. R2 is a 75-Ω, 10-W wire-wound resistor. C5 is a 0.047-μF, 50-V dc nonpolarized capacitor. C7 and C8 are 0.22-μF, 200-V dc capacitors. The value is not critical, and the voltage rating is probably higher than necessary. But, again, we relied on the contents of our junk boxes. These two capacitors should be located quite close to the regulator chip. R5 is a 1200-Ω, 2-W carbon resistor: The value is not critical.

Operation

The operation of the circuit is similar to an astable multivibrator, with the inductance of the primary windings controlling the frequency of oscillation — the greater the core mass, the lower the frequency. The TV transformer that we used provided an output frequency of about 100 Hz.

If the power supply fails to oscillate when first turned on, reverse the direction of the feedback windings on the base terminals of Q1 and Q2. It is easier to determine the proper connection by trial and error than by doing the "mental gymnastics" necessary to wire it correctly the first time. If it is backwards initially, no harm will result when power is applied: The circuit simply will not oscillate. If your transformer gets hot while operating, it is a sign that the core is not of adequate size. If the voltage "sags" under heavy load, the wire used on the primary and secondary of T1 is probably too small.

On-the-air operation indicates that there is no hum or objectionable whine on the output signal of the radio. Besides, we've got our super ground plane, and there is no danger of shorting the rig to ground!

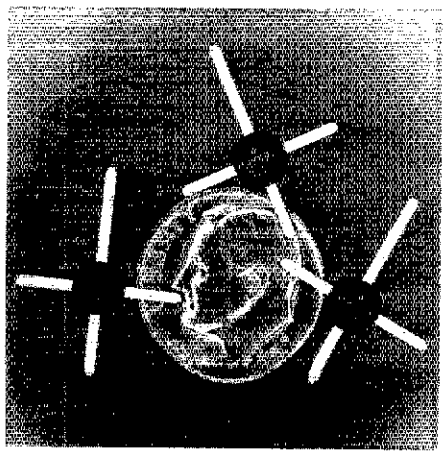
New Products

NEW MOTOROLA SEMICONDUCTOR

☐ The slogan is "Performance up, cost down," in new low-power rf transistors, as noted in some recent Motorola promotional literature that describes the MRF559 0.5-watt bipolar transistor, which has a recommended operating range of 250 MHz to 1.5 GHz. Effective emitter ballasting (protection against hot-spotting) is ensured by the current techniques in geometry, processing and packaging. This type of design in overlay transistors improves the operating linearity and enhances the reliability of the device. The metalization of the semiconductor "sandwich" uses Nichrome, titanium, tungsten and gold to eliminate the corrosion malady that is referred to in the industry as "purple plague." This is said to improve the transistor longevity by a factor of 10.

The MRF559 is contained in a Macro-X plastic package, rather than in the more familiar TO-39 case. Four 10-mil- (0.25 mm-) thick, silver-plated copper leads extend at 90-degree increments from the case, and aid cooling of the semiconductor junction.

The new transistor has large signal characterization at 470 and 870 MHz for mobile/hand-held fm operation. It should work well at vhf and uhf through 1296 MHz in amateur applications. Its ratings at 870 MHz are: P_o = 0.5 W; gain = 8 dB (min); eff. = 50%; V_{cc} = 12; 1-dB compression greater than +20 dBm (typ). The f_T is rated at 3 GHz and the noise figure at 1 GHz is 4 dB [I_c = 40 mA (3 dB at 500 MHz)]. P_D is 2 watts at a case temperature of 50° C. Price class: $1.80 in 100 to 999 lots. Available from Motorola distributors or the factory in Phoenix, Arizona 85036. Phone Tom Bishop at 602-244-6394 for additional information. — *Doug DeMaw, W1FB*



CURTIS ELECTRO DEVICES, INC. 8044M CMOS KEYER IC

☐ The number of this particular IC may be familiar to you. An 8044M IC forms the core of the Curtis EK-480M keyer, which was described in the June 1980 *QST* Product Review column, and earlier versions (the 8043 and 8044) have been appearing in *The Radio Amateur's Handbook* since 1977. As you might suspect, the "M" suffix denotes a change. This change is an *addition to* and not an *alteration of* the 8044IC.

An 8044 is a 16-pin IC, while the 8044M is an 18-pin device. By connecting a 100-μA meter and a few components to the added pins, the operator of a completed 8044M keyer can read the keyer speed directly from the meter. According to the manufacturer, the speed indication is accurate and stable for a speed range of from 6 to 50 wpm using the components recommended in the specification sheet accompanying the IC.

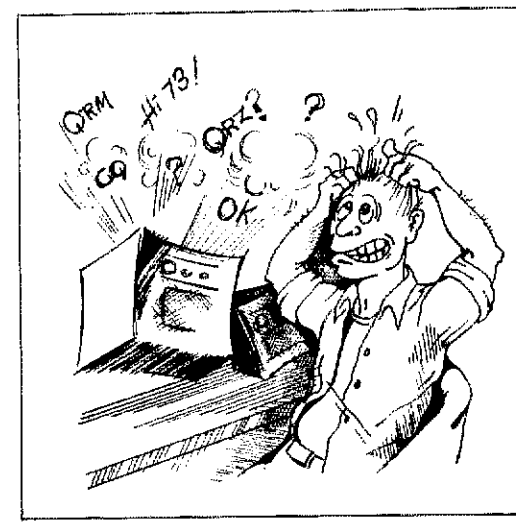
Why the emphasis on addition to and not alteration of the 8044? Neatly, Curtis has arranged the package so that the 8044 and 8044M are compatible despite the 2-pin difference in package size! So, if you already have an 8044 keyer and don't wish to "start from scratch" again, you can plug the 8044M into the existing 16-pin socket, allowing pins 9 and 10 to hang over the end of the socket. Attachment of the speed-meter components may then be made directly to the overhanging pins. Or the 8044 can replace the 8044M simply by leaving the two end-pin connections open and sacrificing the speed-meter circuitry. How about that!

If you're planning to construct a compact, multifeature keyer, investigate the possibility of using this IC. With it, you'll have self-completing dots, dashes and spaces; iambic operation; dot and dash memories; weight control; sidetone; a TUNE and straight key input; selectable speed range; and a keying output level sufficient to drive a keying transistor. Because it is a CMOS device, the 8044M draws a minimum of current during a standby (50 μA at 5 V dc). Key-down current is approximately 30 mA, with most of that being required for the sidetone output and drive for the output transistor.

In quantities of one to nine, price classes are: 8044M IC only, $20; 8044-3 (IC, pc board, socket), $30; 8044M-4 (limited kit), $60. These items and further information may be obtained from Curtis Electro Devices, Inc., Box 4090, Mountain View, CA 94040. — *Paul K. Pagel, N1FB*

BEGINNER'S BENCH

Beating Rotten QRM — CW Filtering for the Beginner

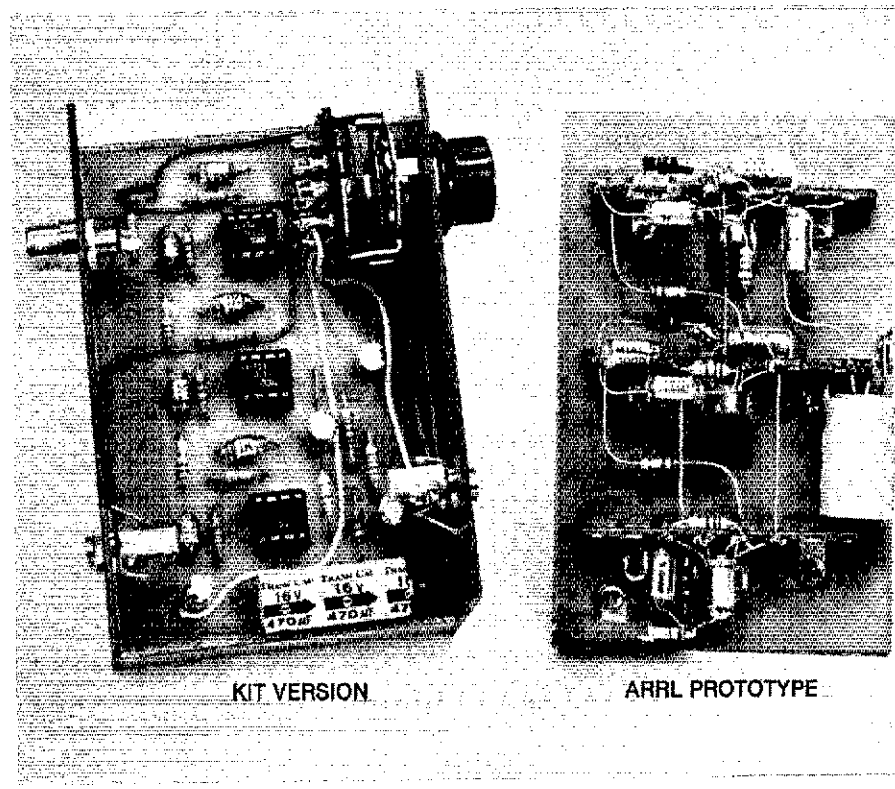


Sorting out those cw signals in a crowded band can drive an inexperienced operator to distraction. Providing cw selectivity for the receiver will help. Here's how.

By Doug DeMaw,* W1FB

What's this? You can't operate in the 40- and 80-meter Novice bands because there are too many signals, and you can't sort them out? Perhaps your ham receiver isn't tailored to handle QRM (interference) effectively. Some simple cures may be in order if that receiver just isn't "chopping it" on cw.

But first let's consider the human factor in separating signals that are close to one another in the ham bands. It has been said, and rightfully so, that the human brain and ears form the most effective filter one can utilize. Unfortunately, most of us started out in our prelicense months by learning the Morse with a code-practice oscillator. There wasn't any QRM to spoil our concentration, and we listened to a single pitch (note). When that license finally arrived and we went on the air (gulp) for the first time, things weren't a bit like they used to be! The cw notes sounded quite different in the receiver, and many notes of different pitches



KIT VERSION

ARRL PROTOTYPE

*Senior *QST* Technical Editor

(audio frequencies) were blending together like a pot of stew. Sure, we could sift a loud one out of the mayhem and perhaps even copy it perfectly, but the weaker signals couldn't be pulled out of the confusing mess because the other signals tended to degrade our concentration. That wonderful ear/brain filter wasn't broken in yet, so it wasn't of much use to us. If we add that to the usual jitters experienced by a new amateur, we may feel like "cashing in our chips" in favor of tennis or some other pastime.

The fact of the matter is that the human filter doesn't become really effective until the cw operator has spent many weeks on the air. He or she must develop the ability to concentrate solely on a single pitch in order to filter out the unwanted beat notes. So what does the poor beginner do to aid reception while that built-in filter is developing its potential? The rapid solution is to employ electrical filtering of some type, and that is the topic of this month's beginner's article.

I-F Filters

There are a number of receiver filters that we might elect to use in reducing the effects of QRM when operating in the cw mode. First, and perhaps best, is the i-f (intermediate-frequency) filter that we can install immediately after the receiver mixer stage. It has a center frequency that is the same as the receiver i-f. Hence, if the receiver has a 9-MHz i-f, the center frequency of our filter must be 9 MHz. Most modern receivers and transceivers come equipped with an i-f filter, but the stock filter is too wide in response for most cw work and is intended mainly for ssb reception. Many receivers and transceivers have blank positions on the circuit boards to add one or more additional i-f filters, and these are sold as accessories. Each has a different bandwidth for use with a different mode of reception — cw, a-m (amplitude modulation), fm, radioteletype and so on. Generally, these filters are in the $50+ price class, but the benefits obtained from having the proper filter for a specified operating mode are well worth the expense when we consider, for example, that a $50 filter for an $800 rig represents only 0.065 the total cost of the equipment! We can extrapolate the cost of a $50 filter to 13-1/2 cents per day for 12 months of use. A cup of coffee costs *more* than that nowadays!

Filter Bandwidth and Shape Factor

When selecting an i-f filter for cw reception we are interested in the center frequency (f_c) nose selectivity (-6 dB points on the filter response curve) and the skirt selectivity (-60 dB points on the lower portion of the response curve). Other factors of interest to designers are the insertion loss (signal loss in decibels through the filter), ripple (flatness of the response across the top of the response curve) and the characteristic impedance of the filter, expressed in ohms. We won't cloud the issue by discussing all of the characteristics of an i-f filter. A detailed discussion of filters can be found in other ARRL literature.[1] We will concern ourselves here with the filter bandwidths (BW) and the filter shape factors. Fig. 1 illustrates how a filter passband would appear on a spectrum analyzer during the testing of a particular filter. In this example we find a -6 dB bandwidth of 500 Hz (0.5 kHz) and a -60 dB bandwidth of 4 kHz. The shape factor is the ratio of the two bandwidths, which in this case is 8:1. The smaller the ratio the better the i-f selectivity of the receiver and hence the greater rejection of signals adjacent to the one we're interested in copying. The more resonators or filter poles we use, up to a practical limit, the better the skirt selectivity and the more spectacular the shape factor. In a crystal filter the poles are the crystals, as seen in the ladder filter of Fig. 2. A 4-pole filter is illustrated. Typical crystal i-f filters have from one to as many as eight poles. Mechanical filters contain resonator discs, which are the selective elements for that kind of filter.

Why is the shape factor important? Well, consider the example in Fig. 3, which has a better response for cw reception than does the example in Fig. 1. The sides of the curve are much steeper for the 8-pole filter of Fig. 3. Imagine that you are listening to a cw signal that is tuned in at center frequency (f_c). A strong signal is present 750 Hz lower in frequency (8999.25 kHz on the curve). That signal will be 45 dB weaker than if it were tuned to f_c on the curve, by virtue of the *attenuation characteristics* of the filter. Now, imagine the same signal combination while using the filter represented in Fig. 1. The unwanted signal would be only 23 dB down on the curve. Hence, the wider the skirt of a filter, the more pronounced the QRM from the interfering signal. An ideal filter would have perfectly straight sides (rectangular response), but this is not attainable with the present state of the art.

We can have good results when using 500-Hz bandwidth cw filters, but some operators like even more i-f selectivity. They install 250-Hz filters in their receivers to help improve the copy when QRM is heavy. The ssb filters that come with most transceivers and receivers have 6-dB bandwidths from 2.0 up to 2.4 kHz. Therefore, no matter how steep the sides of the response curve for an ssb filter, the relatively flat part at the top of Fig. 1 will accommodate all of the signals between f_c and either limit on the nose of the curve with no more than 6 dB of attenuation. The wider filters are mandatory for ssb reception in order to provide ample fidelity of the reproduced human voice. If we

[1]Notes appear on page 42.

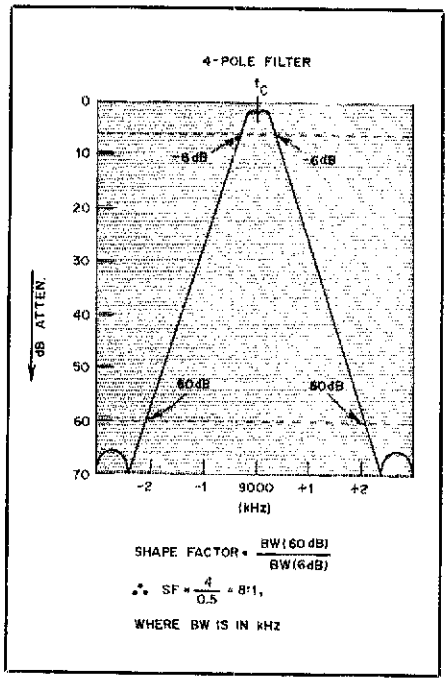


Fig. 1 — Representation of a filter response in terms of bandwidth and selectivity. The filter shape factor is determined by the relationship between the nose and skirt characteristics in decibels, as measured at the -6 and -60 dB points on the curve (see text).

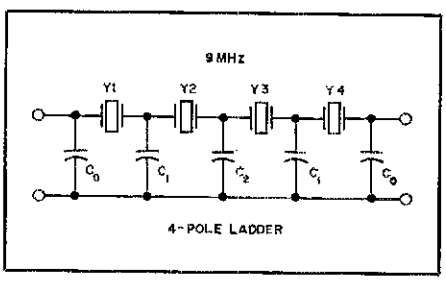


Fig. 2 — Circuit of a 4-pole ladder filter that uses crystals as the selective elements. The capacitors are chosen in accordance with the operating frequency and terminating resistance of the filter. (See J. Hardcastle, G3JIB, "Some Experiments with High-Frequency Ladder Crystal Filters," *QST*, Dec. 1978.)

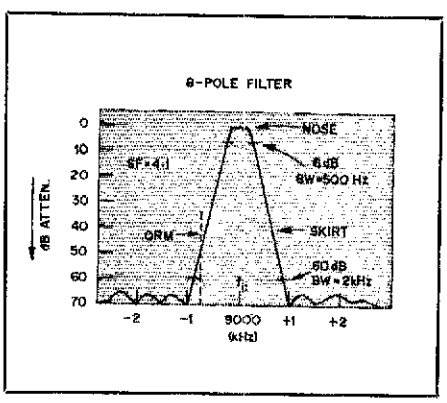


Fig. 3 — A response curve that might be obtained when testing an 8-pole crystal filter for cw reception. Compare the skirt selectivity of this filter with that shown in Fig. 1 for a 4-pole filter.

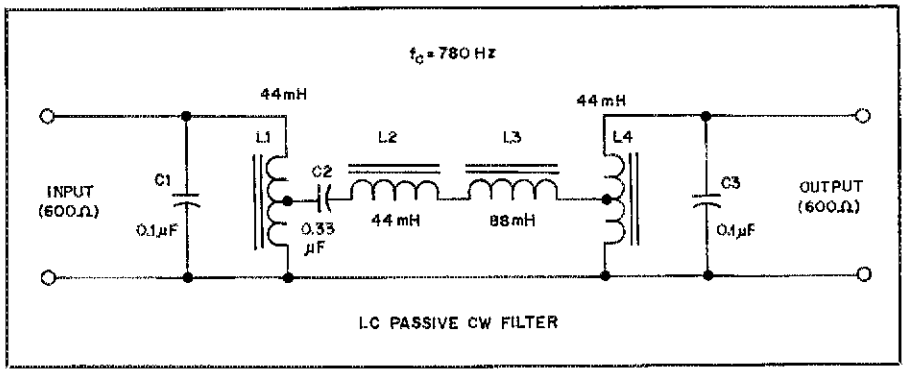


Fig. 4 — Circuit of a passive LC filter for cw reception. Surplus telephone toroids are used for the inductors (see *QST* Ham Ads for suppliers of these toroids).

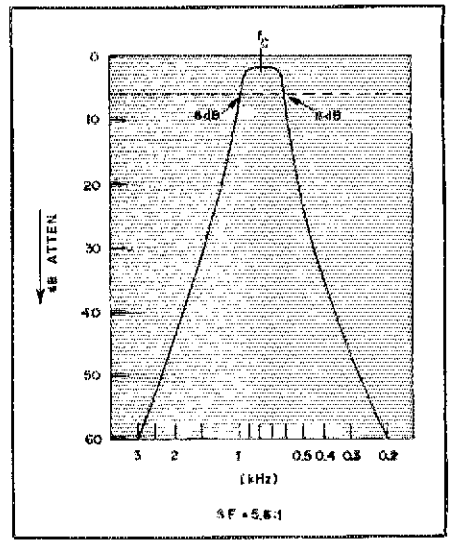


Fig. 5 — Typical response curve for the filter of Fig. 4.

were to tune in an ssb signal with a narrow cw filter, the audio would be restricted to such a narrow band of frequencies that we would be unable to understand what the operator was saying.

What About Audio Filters?

There seems to be a glut of R-C (resistance-capacitance) active audio filters on the market today. Some have fixed values of Q (selectivity) and frequency, while others contain provisions for varying the Q and the peak frequency. Still others enable us to notch out interfering cw signals that are near in frequency to the one of interest. Some R-C filters are switchable to facilitate band-pass, low-pass and high-pass responses, which makes them more flexible for multimode operation (cw, ssb, a-m and RTTY). But, let's concern ourselves here with R-C active filters that exhibit a band-pass response similar to those shown in Figs. 1 and 3. The principal difference between the i-f filters and audio filters is the operating frequency. There are some distinct advantages in using i-f filtering over audio filtering, but audio filters offer some plus factors, too.

Audio filters are inexpensive to build and to get operating. We need only a small handful of parts to build a practical filter: A couple of op amps, a few 5% resistors and some polystyrene capacitors will do the job. An audio filter can simply be plugged into the headphone jack of the receiver, and it's ready to use. Furthermore, the audio filter will greatly reduce the wide-band noise that is generated in the receiver i-f and audio circuits. This improves the *overall* signal-to-noise ratio of our receiver.

Many of the commercially made R-C active audio filters contain amplifiers that enable us to connect loudspeakers to the filter output, while others have only enough audio-output power to operate headphones. Most of the fancier commercial units cost more than a narrow-bandwidth i-f filter does, but they have the advantage of being usable with any receiver. Also, these filters provide variable selectivity, variable frequency and two or three response modes. So, the investment can be a worthwhile, lifetime one.

As we add poles (filter sections) to an audio filter, we improve the shape factor, as is true of all types of filters. Generally, two to four poles of audio filtering are used by amateurs to obtain good cw selectivity, although many more poles can be used by skilled designers. One amateur reported building a super cw filter that contained 100 op amps! Such a design is anything but casual!

Actually, there are two popular types of audio filters in use by amateurs. The remaining kind is called a *passive* filter. It contains high-Q inductors (coils — toroids or pot cores) and high-Q capacitors. An example of this style of filter is given in Fig. 4. Surplus telephone toroid coils are used for the inductances (L1-L4). Standard-value Mylar capacitors can be used at C1, C2 and C3. The filter needs a 600-Ω termination to provide the proper response, which is shown by the curve in Fig. 5. This filter was designed by D. C. Rife, WA2PGA, and was described in *QST* (Technical Correspondence) for May 1972. It requires an 8- to 600-ohm audio transformer between the receiver speaker jack and the filter input. Headphones of the 600-ohm variety can be connected to the filter output, or a second matching transformer may be obtained for stepping down from 600 ohms to a pair of 8-ohm hi-fi phones.

The term "passive" means that no operating voltage is required to make the circuit function. On the other hand, "active" devices require an operating voltage. Generally speaking, if we use a passive audio filter we will lose some signal through it (insertion loss, expressed in decibels), but the active audio filter will yield unity gain, or an actual gain in decibels. Unity gain means that we will have no loss or no gain. How much loss (passive) and the amount of gain (active) will depend on the particular design of the filter and how well it is terminated in terms of the characteristic impedance of the filter (600 ohms for the circuit of Fig. 4, for example).

Either style of filter will "launder" the audio heard in the phones or speaker. This is especially useful to us if we have unwanted hum on the audio-output line from the receiver. The usual 60- or 120-Hz hum will be greatly attenuated by a well-designed band-pass type of cw filter.

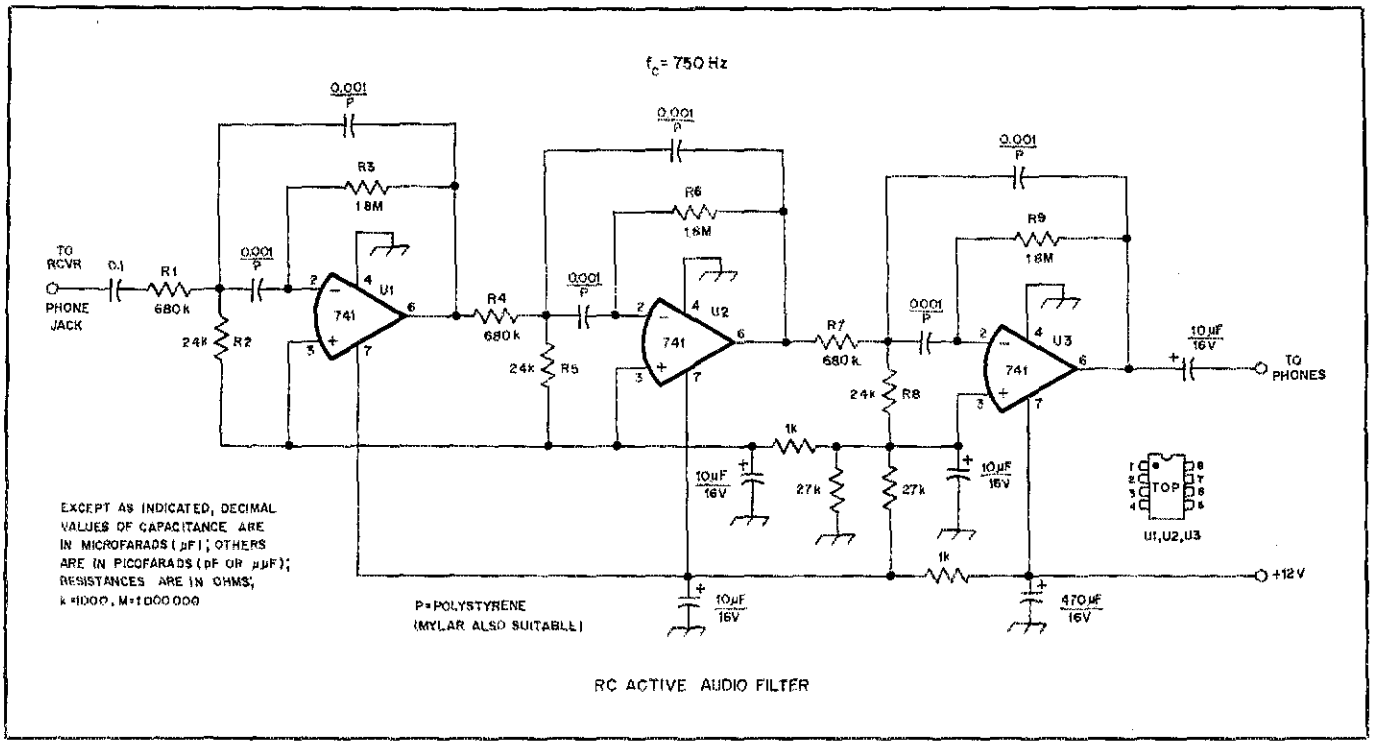
A Practical R-C Active Filter

We can build a fixed-frequency R-C active cw filter at low cost by duplicating the circuit in Fig. 6. Three inexpensive 741 op amps are used in the three-pole filter. A center frequency of 750 Hz has been chosen as a compromise value for most commercial receivers. The filter is used between the phone/speaker jack of the receiver and a pair of headphones.

Best performance will result when the polystyrene or Mylar capacitors are matched in value. If a capacitance meter is available, select six 0.001-μF capacitors that are close in value to (above or below) the marked value. If the set is not exactly on the mark at 0.001 μF, that will be okay. The capacitors should be within 5% of the value in Fig. 6 if a matched set can't be obtained. Performance will still be good over a ±5% spread. Resistors R1 to R9, inclusive, should be 5% types. The more closely matched the capacitors and resistors are to the prescribed values, the narrower the nose of the response curve.

Construction and Operation

We can build this filter with point-to-point wiring on a piece of perf board, or we can use a pc board (Fig. 7).[2] Some may wish to assemble the circuit on a universal IC breadboard, such as those that are sold at Radio Shack stores. The



RC ACTIVE AUDIO FILTER

Fig. 6 — Schematic diagram for a practical 3-section R-C active audio filter that uses type 741 op amps as the active elements. See the text for details concerning the choice of capacitors and resistors in the frequency-determining part of the circuit. Resistors are 1/4- or 1/2-watt composition types. Polarized capacitors are tantalum or electrolytic.

important consideration is to lay out the ICs and their associated components in a straight line. This will help to ensure input/output isolation to reduce leakage around the filter. It will also enhance stability. All component leads should be kept as short as possible.

Although a 12-volt dc supply is specified, the filter will operate satisfactorily from a 9-volt transistor-radio battery. If you have a tube type of receiver, chances are that you can obtain sufficient operating voltage for the filter from the cathode of the audio-output tube. Generally, between 6 and 8 volts of clean dc is developed across the cathode resistor of the output tube.

When using the filter, control the headphone audio level at the receiver in the normal manner. Too high an audio level will result in distortion, so be conservative for best results.

Tune in the desired cw signal for peak response (maximum loudness) as heard in the headphones. The response at peak frequency (750 Hz) will be fairly sharp, so tune slowly. It is a good practice to rock the tuning dial back and forth over the signal slowly, observing the point of maximum loudness. After a little experience with the filter it will become a simple matter to tune in a cw signal properly on the first pass across it.

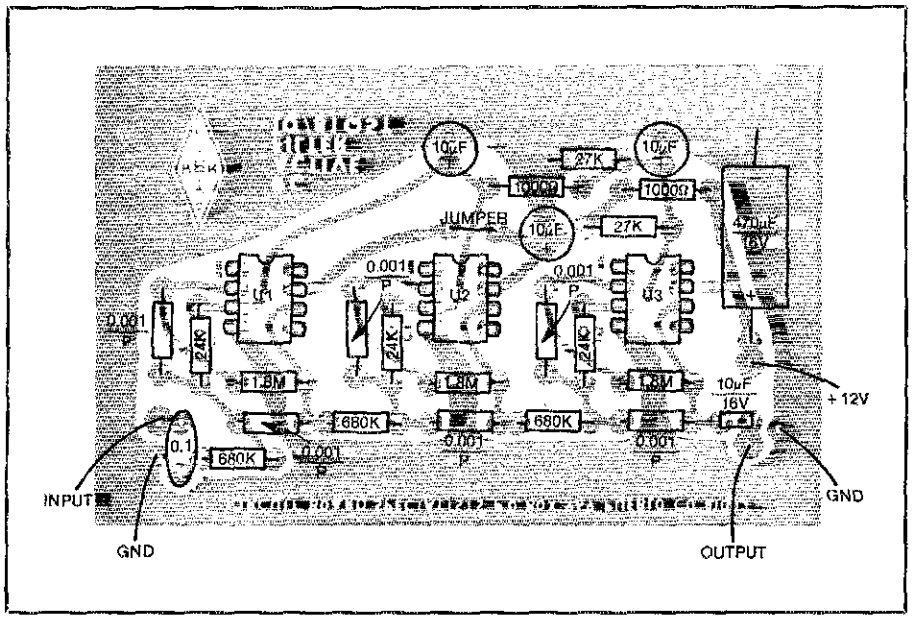
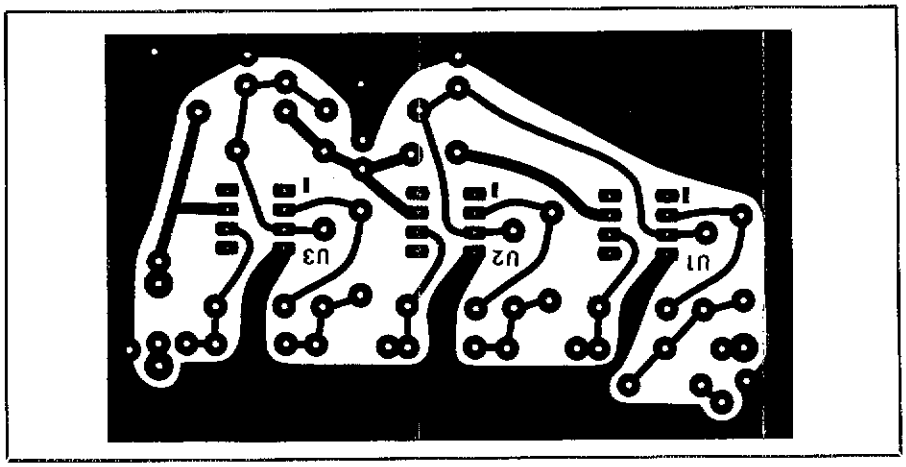


Fig. 7 — Parts-placement guide for the R-C active audio filter. View is from the component side of the board.

Summary

The choice between i-f and audio filtering is ours to make. How we approach the QRM problem on cw will depend on the amount of money we are willing to spend for selectivity, whether or not a narrow cw filter is available as an accessory for the rig we're using, and what our operating objectives are. If an audio type of filter is desired, we have the choice of buying one of the many commercial versions that appear in *QST* ads, or we can build the filter of Fig. 6. We may want to go further and employ a cw-bandwidth i-f filter plus an R-C active audio filter. This has been a highly desirable operating technique at W1FB for a number of years because it not only provides a high degree of QRM rejection, but also launders the audio out-



Scale pattern of the audio-filter board, as viewed from the foil side.

put of the receiver by reducing wide-band noise and hum. Both filters are on line at all times, even when loud signals are being copied.

If you haven't been using selective cw filters, perhaps it's time you did. The signal-laden 80- and 40-meter Novice bands will become fresh vistas if you can reduce the rotten QRM that spoils reception on those bands during night-time operation.

Notes

[1]W. Hayward, W7ZOI, and D. DeMaw, W1FB, *Solid State Design for the Radio Amateur*, (Newington: American Radio Relay League, Inc.). Also, see the receiving chapter of *The Radio Amateur's Handbook*.

[2]Circuit boards, negatives and parts kits are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002.

Strays

DEBUNKING THE MYTH ABOUT SATELLITE WAC

☐ Heavily populated areas of the continent have been resigned to the impossibility of working all continents with satellites because East Coast hams have no satellite communications paths to Oceania and Asia, and West Coast amateurs have none to Africa and Europe. Careful calculations will show, however, that portions of the Midwest can indeed program and expect to work all continents via OSCARs 7 and 8.

The area of mid-America where amateurs can work all continents is shown on the map, which has an odd bullet shape that is the result of parameters indicating coincidence of AOS (acquisition of signal) and LOS (loss of signal) at the very extremes of the desired ranges. Calculations were based on norms and should be considered theoretical. Experience has shown, however, that AOS occasionally is earlier than what is calculated, and LOS occurs more often later than what is calculated. This affords a greater "window" in that given direction. Another variable to consider is the local topography, which can also add or subtract time from the "window."

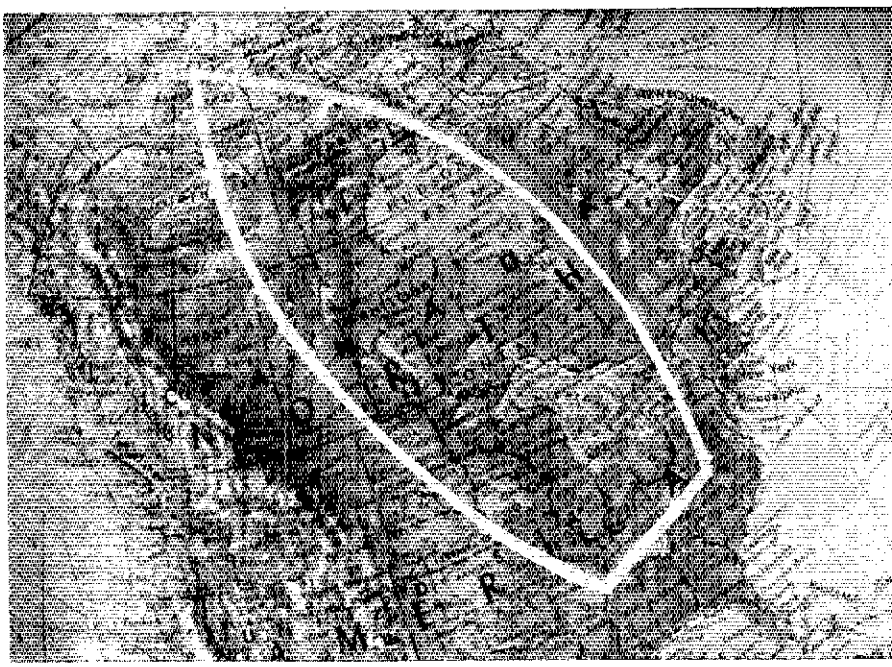
The western edge of the bullet-shaped area is dictated by the maximum range possible from a known satellite user in Africa, and begins at the junction of the states of Missouri, Arkansas and Tennessee. It then travels generally to the northwest just to the east of Kansas City, through Omaha, Council Bluffs, Sioux Falls and the International Peace Gardens on the North Dakota and Manitoba border. It then travels diagonally across Saskatchewan.

The southern edge of this area responds to the maximum range from a known Asian satellite user located at Cape Chelyuskin (104° east longitude and 78° north latitude). It begins again at the junction of Missouri, Arkansas and Tennessee, moving eastward past just north of Nashville to Cumberland Gap National Forest.

The eastern edge of this area is the maximum range possible from Hawaii, the only Oceania area that can be considered at this time; it is again taken from a known Hawaiian satellite user. Starting at Cumberland Gap National Forest and traveling generally northward, the line goes just to the west of Charleston and Wheeling (West Virginia), Buffalo, and to the east of North Bay (Ontario).

The most northerly point is the apex of the eastern and western borders that meet at 75° north latitude. This is just west of the magnetic North Pole at 118° west longitude, north of Victoria Island.

Satellite communicators operating from within these "possibility" boundaries are in an excellent position to earn WAC, with endorsement, via Phase II satellites. The only additional ingredients necessary are for the operator to have a sharp pencil and to pay attention to details, especially time and timing. But with careful work and diligent application of the knowledge available to us, be assured that "it can be done." — *Nick J. Laub, WØCA, Sarasota, Florida*



Bullet-shaped area showing section of mid-America where WAC using Phase II satellites is within the definite range of possibilities. *(photo courtesy WØCA)*

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

TS-830S FINAL-AMPLIFIER CURRENT MONITORING

☐ The reason for monitoring individual tube currents of paralleled tube final amplifiers is to ensure that one tube is not loafing and the other doing all the work. Parallel-tube final amplifiers should have near equal (within 10%) currents flowing through them at all times. All the transceivers I've owned have not provided a means of ensuring this was happening. The manufacturer simply specified that the tubes should be balanced and connected in parallel, and provided a means for monitoring the *total* cathode current drawn by both tubes. The TS-830S is no exception. After many months of hard use, I noticed the power output of the rig had decreased, and cathode current readings (I_p on the meter) led me to believe one of the tubes was "goofing off." Investigation proved this to be true and prompted me to alter the cathode current monitoring circuit.

Remove the top and bottom covers of the transceiver, the final-amplifier cage cover and the two final-amplifier tubes. Turn the rig upside down. Remove the blue wire to the pin labeled DRV (driver input), and also remove the seven screws securing the final-amplifier pc board to the stand-offs. Invert the board; locate R4, R5, R6 and J2. Using a low-wattage iron (25 W) and wicking material, remove those components.

On the foil side of the board, solder R4 and R5 between V2 pin 2 foil and the ground foil. (One resistor lead may be placed into the hole previously occupied by J2.) Solder a length of wire to V2 pin 4 and another wire to the V1 pin 1 foil at the hole vacated by R6. Solder the short end of R6 to the IPM ("plate" current meter) foil. Replace the final-amplifier pc board, securing it with six screws; do not replace the screw near the J1/L2/R8 foil yet. Resolder the blue wire to the DRV pin. Mount a small, four-lug (three-isolated, one ground) terminal strip to the pc board at the mounting hole near the J1/L2/R8 foil; use a lockwasher beneath the screw head.

Wire the circuit as shown in Fig. 1. S1 is a miniature spdt toggle switch (Radio Shack 275-613) mounted in one of the pre-punched 1/4-in. (mm = in. × 25.4) holes on the rear panel. Route the wires from the terminal strip across the rear of the chassis and up through the clearance hole behind the PLL unit board. Use of two or three tie wraps will make the installation of the wires neat in appearance. Before replacing the covers, make certain you know which position of the switch is used for which tube, and label the switch. You'll now be able to spot easily any imbalance between the tubes and to take corrective measures early. — *Paul K. Pagel, N1FB, ARRL Hq.*

*Assistant Technical Editor

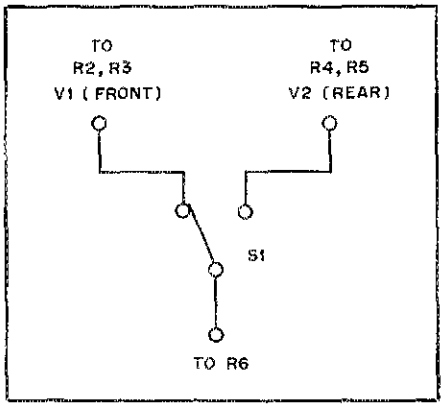


Fig. 1 — Current in each final-amplifier tube of the Kenwood TS-830S can be monitored by installing the switching arrangement shown here. Paul K. Pagel, N1FB, *QST* New Products editor, suggested this modification. It permits the operator to observe any tube imbalance.

ELECTRONIC AIDS FOR BLIND TECHNICIANS

☐ Two electronic circuits are presented for use by blind technicians. One (Fig. 2A) is a type of voltage-controlled oscillator (VCO) that converts a slowly varying signal voltage to a proportional frequency change. This proportional frequency change is then amplified and fed to a miniature loudspeaker. For example, a 0- to 5-volt signal variation is converted to a proportional frequency change from 200 to 2000 Hz. The other electronic circuit (Fig. 2B) converts a slowly varying signal voltage to a proportional amplitude change of a single-frequency tone. This single-frequency tone is then amplified and fed to the loudspeaker. Call this a voltage-controlled amplitude circuit (VCA).

Both of these circuits are suitable for various instruments that drive X-Y or strip-chart recorders. The amplitude changes of the recorders are thus converted to an audible frequency change if the VCO is used, or to an audible amplitude change if the VCA is employed. Both of these devices were tested with an NMR Spectrometer, an instrument for determining structure in liquids and soluble chemical compounds.

The heart of the VCO is the 566 function generator, which is itself a VCO. It gives, however, an output frequency at pin 3 that is inversely proportional to its input voltage from pin 5 to ground. In order to make the output frequency of the 566 directly proportional to the input signal voltage, the 741 immediately preceding the 566 is connected as a summing amplifier. It has two inputs, namely the output from the first 741 (the buffered version of the input signal V_{in}) and −5 volts. Thus, as V_{in} varies from 0 to +5 volts, the voltage into the 566 at pin 5 varies from +4 volts to 0. Hence, the frequency of the output voltage at pin 3 of the 566 varies from 200 to 2000 Hz. The 7400 gate can be used to drive the speaker because its input voltage from the 566 varies between +5 volts and ground.

The +5-volt and the −5-volt supplies must be regulated so that the frequency of the signal does not waiver for a fixed value of input signal voltage. A 7805 and an LM320T provide the needed voltage regulation.

In the VCA circuit, the 555 timer is con-

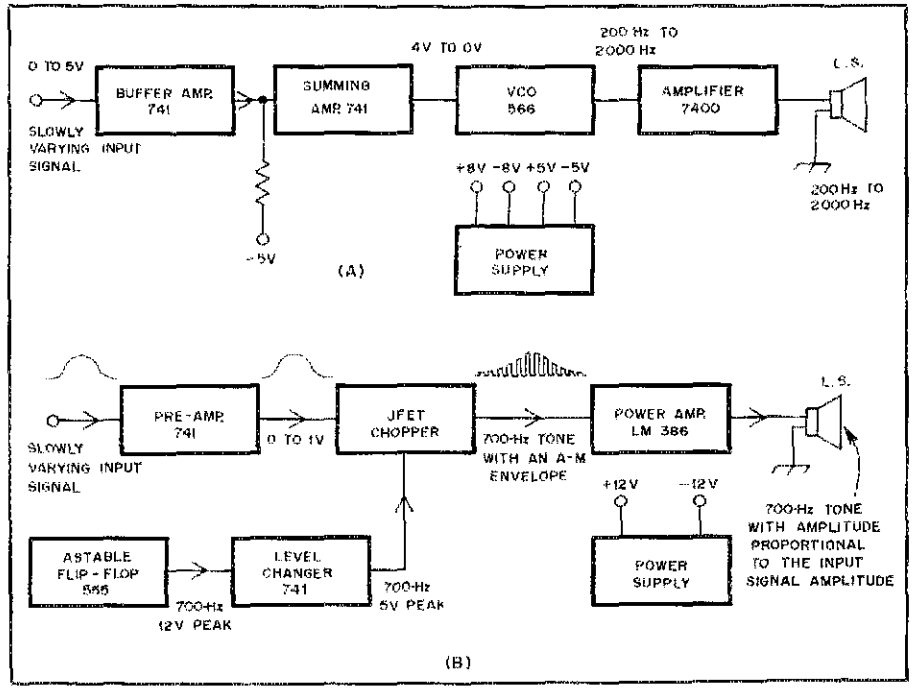


Fig. 2 — Dr. William S. Wagner, AA4WW, of the Physical Science Department at Northern Kentucky University, designed two electronic aids for blind technicians. These are shown in block diagram form. The complete diagrams are available from the ARRL for $1. Enclose an s.a.s.e.

nected in the astable mode, allowing it to run free as a multivibrator. With the particular component values shown, it produces a 700-Hz, square-wave voltage with a peak value of 12 volts. The 741 operational amplifier immediately following the 555 changes the output level of the 555 circuit to a 0- to −5-volt, 700-Hz square wave. This square wave is applied to the gate of the JFET in order to turn it on and off. The JFET thus acts as a chopper to allow the chopped version of V_{in} to reach the 386 power amplifier. The signal into the channel of the JFET must be in the range of 0 to 1 volt. The 5-kΩ potentiometer and the plug-in feedback resistor in the input circuit to the 741 allow for this condition to be satisfied. Both power supplies are regulated. The 7812 must have a heat sink because it supplies power to the 386 power amplifier. — *Dr. William S. Wagner, AA4WW, Physical Science Dept., Northern Kentucky University, Highland Heights, Kentucky*

MINIATURE KEYING CIRCUIT FITS INSIDE PHONE JACK

☐ How simple a keying circuit can be is illustrated by Fig. 3. Moreover, it can be mounted in a 1/4-in. in-line phone jack. The parts consist of two 0.01-μF capacitors, a transistor and one resistor. These are mounted on the terminal end of a 1/4-in. in-line phone receptacle. With the receptacle cover in place, the components are protected. The arrangement shown in the drawing was for use with an ICOM 551, but may be applied to other transmitting equipment.

Construction consists of cutting an audio cable equipped with a miniature plug (Radio Shack no. 42-2434 or equiv.) to a desired length. Connect a 1/4-in. in-line receptacle to the cable end that is opposite the miniature plug. Remember to slide the Bakelite cover of the receptacle back toward the miniature plug before connecting the cable to the receptacle. Mount the 2N3904, capacitors and resistors on the in-line receptacle terminals using the diagram for guidance. Screw the cover in place, and the circuit is ready to operate. The necessary operating voltage is generally available at the key jack of the transmitter and at the output of an electronic keyer. — *Jay Rusgrove, W1VD, QST Technical Consultant*

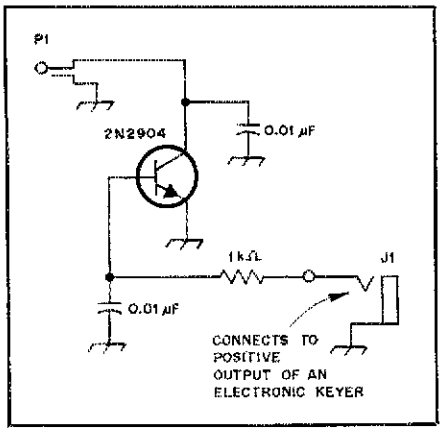


Fig. 3 — If you want an ultra-simple keying circuit that will fit inside an in-line phone-plug receptacle, here it is. You may just want to try this idea for the fun of it. Jay Rusgrove, W1VD, explains in the text how it is made.

USING A CUSHCRAFT BALUN WITH A MOSLEY TRIBANDER

☐ When I moved to a new location, I decided to rework my Mosley triband antenna, which had been in use for 12 years. The balun I had been using needed to be replaced. In seeking a replacement I found that many baluns are for use with wire antenna systems, but are not easily adapted to beam use. My search ended while helping a friend install a Cushcraft ATB-34 triband beam antenna. I found that the Cushcraft antenna is furnished with a balun that is suited to my needs. This unit is designed for the 10-, 15- and 20-meter bands rather than 80 through 10 meters. Although the mounting hardware that comes with the unit is for a tubular-boom installation, I adapted it easily to the driven element of my Mosley beam antenna. Fig. 4 shows how the installation was accomplished. — *Don Klesick, WA2VVW, Savannah, Georgia*

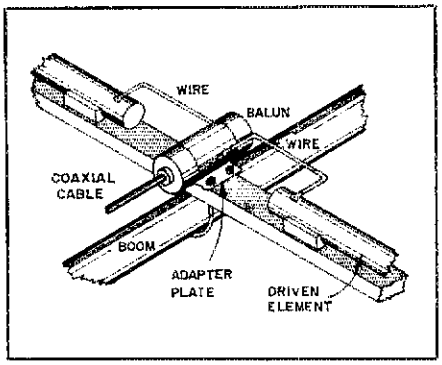


Fig. 4 — Don Klesick, WA2VVW, installed a Cushcraft balun on his Mosley triband antenna using the arrangement shown here. The adapter plate of the balun is modified to fit the bolts on the Mosley antenna.

HEAT CONTROL FOR SOLDERING IRON

☐ Precise heat control of a soldering iron can be obtained economically by use of a standard dimmer switch. Controllable heat permits safer work on delicate components. With plug-in irons, the controlled heat prevents burning of the tip coating (essential to good soldering). Better heat control with less triggering is obtained for gun types of irons. Satisfactory soldering on light work can be done between 70 and 90 volts, depending on type and size of iron.

The dimmer switch shown in Fig. 5 is a typical SCR, 600-watt unit used in lighting circuits. It is designed for use only on incandescent lighting, but works safely on any resistive load within its wattage rating. I have used the dimmer successfully on a 1/4-in. drill motor, taking care to lock the motor switch closed and to always start and stop the drill at the zero position of the knob.

I've placed the dimmer switch and a ground-type, split-circuit, duplex-plug receptacle on the cover plate of a 4-in. outlet box. The receptacle is split by removing the thin bar connecting the upper and lower terminals on the "hot" side of the receptacle. A connection for the source is made to the upper plug (observing hot and neutral polarities). The dimmer switch is wired between the hot side of the source and the hot terminal of the lower plug. Safe wiring practice calls for grounding the box and receptacle through a power cord or cable with a built-in grounding conductor (or grounding a separate wire to a good ground).

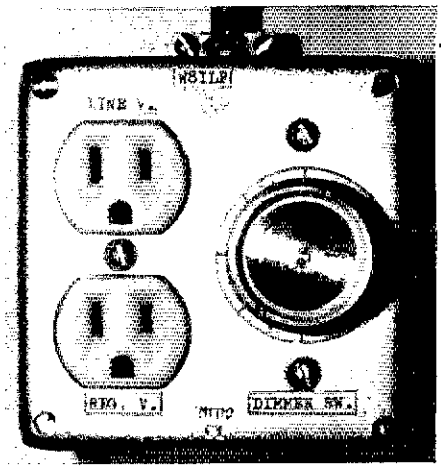


Fig. 5 — A 600-watt light-dimmer switch is mounted in the outlet box shown in this photograph. It offers a convenient means for controlling the voltage to a soldering iron. The author, Gerhard Lampinen, W8ILP, has also used the dimmer to control a 1/4-in. electric drill.

The dimmer switch has an internal ON/OFF switch that is operated by pushing the knob. Rotating the knob varies the voltage. The segmented dial plate shown was installed to facilitate positioning the knob, which bears a mark on its edge. The maximum dimmer voltage under load is always several volts lower than the line voltage. — *Gerhard Lampinen, W8ILP, Rochester, Michigan*

COUNTERACTING SALT-WATER CORROSION ON AN ANTENNA

☐ My doublet antenna for 80 through 10 meters is located only 100 ft (m = ft × 0.3048) from the ocean. As a result it gradually became "victimized" by corrosion. After the antenna had been in use for four years, I replaced the cadmium-plated hardware with stainless-steel equivalents, using silicone grease on the nut and bolt threads. I was not familiar, however, with the galvanic action that takes place between aluminum clamps and copper wire, especially when exposed to salt air. Corrosion on aluminum causes the surface to become very resistive. This deterioration built up over the next three years to the point where at times the SWR reached as high as 4:1. With help and advice from a friend (WB4KGY) the antenna was dropped, and the fault discovered. The corroded aluminum parts were cleaned, burnished and reassembled with the help of NOALOX, a conductive anticorrosive compound for protecting aluminum-to-aluminum or aluminum-to-copper fittings and wire connections. I suggest that when installing an antenna having aluminum and copper connections, an application of NOALOX be made to the connecting points. The stainless-steel hardware, mentioned here, has served the purpose well. — *Otto Freytag, K4QFM, Riviera Beach, Florida*

[Editor's Note: NOALOX is made by Ideal. Penetrox, another anticorrosive product, is manufactured by Burndy. They are available at many electrical supply stores. Both are distributed by General Electric Supply Co.]

OPTIMIZING FILTER USE IN THE TEN-TEC OMNI-B

☐ The Omni-B uses the first stage of its eight-pole cw active audio filter as a selectable filter for ssb reception. This stage has a center frequency of 750 Hz and a 3-dB bandwidth of 450 Hz. One would expect such a filter to distort the voice signals somewhat, but at the same time to reduce QRM from adjacent stations. I find that it is more effective at the former than the latter.

There is very little information-bearing sound power within a band of frequencies centered at 750 Hz in the human voice.[1] The Omni voice filter is, therefore, peaked at the wrong frequency, with the result that, in addition to distorting the desired signal, it also attenuated the signal relative to some types of interference.

These effects can be minimized simply by tuning the Omni notch filter to 750 Hz. Natural-sounding voice, with clarity and crispness, can be had by carefully tuning the notch across the voice filter passband until the desired signal sounds best. In addition to shaping the filter response for a more voice-like characteristic, the filter is made more effective by the addition of this new stopband.

This technique should be applicable to the Ten-Tec Delta and possibly to other rigs that have notch filters as well as outboard audio filters. — *Gary Myers, K9CZB, Naperville, Illinois*

[1]R. W. Harris and J. F. Cleveland, "A Baseband Communication System," *QST*, Nov. 1978, pp. 11-18.

TS-520S SWITCHABLE BROAD/NARROW CW FILTERS

☐ The addition of a switch to allow selection of the cw or ssb filter during cw operation will make a significant improvement in the operating convenience of the TS-520S. This change is simple and so unobtrusive that it looks like original equipment. The switch operates only in the cw mode and has no effect on USB or LSB mode switch positions.

Obtain a miniature spdt toggle switch, such as Radio Shack 275-662 or equivalent. After making careful note of the position of all knobs and the tuning dial, take them off by loosening the respective set screws. Remove the hex nut holding the transparent meter and dial window, and then take out the window. Both the top and bottom of the cabinet are to be removed next. Check behind the panel just above the phone jack and to the left of the microphone socket. There will be an empty area with a few wires crisscrossing. Move them out of the way. Now, stuff a small rag in the area to catch drill chips. Through the front panels, very carefully drill a 1/8-in. pilot hole, centered 7/8 in. above and 1/8 in. to the right of the center line of the phone plug. Before drilling, check your rig and visualize how the switch will be positioned. Once drilled, the hole is *forever!*

Next, remove the top and bottom edge flathead screws holding the front panel. Also remove the front decorative panel. Enlarge the 1/8-in. hole in the main chassis to accept the switch shank. Deburr the edges. A good idea is to poke something hard behind the panel when you drill so that the drill does not blast through and damage something. Continue by carefully enlarging the hole in the front decorative panel. I used a 1/4-in. drill. It provided sufficient clearance for my miniature switch. Drill carefully, as the panel is die cast and brittle. I darkened the inside rim of the hole with black ink so that it would not shine.

Solder three lengths of small-diameter insulated wire to the switch terminals, and twist them together. Install the switch on the panel, and snake the wires up through the openings and across the filter area. Unsolder the brown filter wire (see page 35 of the TS-520S owner's manual), and connect it to the lead to the common switch terminal. Tape the junction. Then solder one of the two remaining switch leads to the soldering post beside the cw filter marked cw and the other lead to the ssb post between the two filters. I wired mine so that with the switch "up," the brown lead is connected to the cw filter.

Make sure all of the metal chips are removed. Then, replace (in order) the outside panel, plastic meter/dial window and nut, knobs, dial and the cabinet top and bottom. Check to make sure the screws are tight and the dials are positioned correctly. Be careful while you work, keeping track of each operation. You will find that this is an easy change to incorporate and that the switchable filters are a real convenience.

I have not had the opportunity to check the TS-820, but as the mechanical arrangement and circuit diagram are much the same as for the TS-520S, the filter-switch addition may be applicable. You might remove the bottom cover of your TS-820 and see if there is sufficient room. — *R. M. Stevens, W1SUZ, Winsted, Connecticut*

IMPROVING HIGH-PASS FILTER CONNECTION ON TV SET

☐ The reception on channel 17 was degraded noticeably after I installed a Drake TV-300 HP filter on a neighbor's TV set. Connecting the filter after the vhf-uhf splitter (Fig. 6) cured the problem. In this case, the uhf tuner had very good rejection of signals below 54 MHz and did not require further filtering.

The signals from my 6-meter transmitter apparently were entering the TV set through the vhf tuner and were reaching the i-f amplifier. Shielding in the TV receiver did not seem adequate.

If you install a high-pass filter to reduce TVI, and your transmitter is known to be clean but you cannot eliminate the interference, check the splitter, if there is one. I found that one of these splitters had an open inductor that resulted in the TV-300 filter failing to provide the expected 40-dB rejection. The etched inductor had been trimmed too closely, chopping off a turn. Ohmmeter readings for the splitter are shown in Fig. 6. — *Bruce Randall, WD4JQV, Alpharetta, Georgia*

THOUGHTS ON CALIBRATING AN ELECTRONIC KEYER WITH A POCKET CALCULATOR

☐ Jim Pitts, KE4Y, explained in Hints and Kinks, *QST*, May 1980, how to use a pocket calculator to calibrate an electronic keyer. His idea is really neat, especially for being so simple. Instead of punching 1 + 1 before starting the keyer, I suggest that you punch 0 + 1. Then the first pulse from the keyer will produce "1" on the calculator rather than "2." Following this, the code speed can be read directly from the number of dashes counted in a five-second interval. This involves a small approximation (yielding about a half wpm error at 13 wpm) but this approach is much quicker to use.

On my calculator, I disconnected the external de power jack and rewired it in parallel with the " = " key contacts. This counter input can handle pulse rates of up to 900 per minute. — *Tim Wulling, WB0JZX, Roseville, Minnesota*

☐ A simpler way of calibrating an electronic keyer by means of a pocket calculator than that suggested by Jim Pitts, KE4Y, is to punch 0.04 + 0.04 instead of punching 1 + 1. After 60 seconds, the speed rate can be read directly from the display. Alternatively, you may punch 0.08 + 0.08 and reduce the operating time of the keyer to exactly 30 seconds. The results will be more or less the same. — *Jesús A Géliga-Torres, KP4DIN, Aquadilla, Puerto Rico*

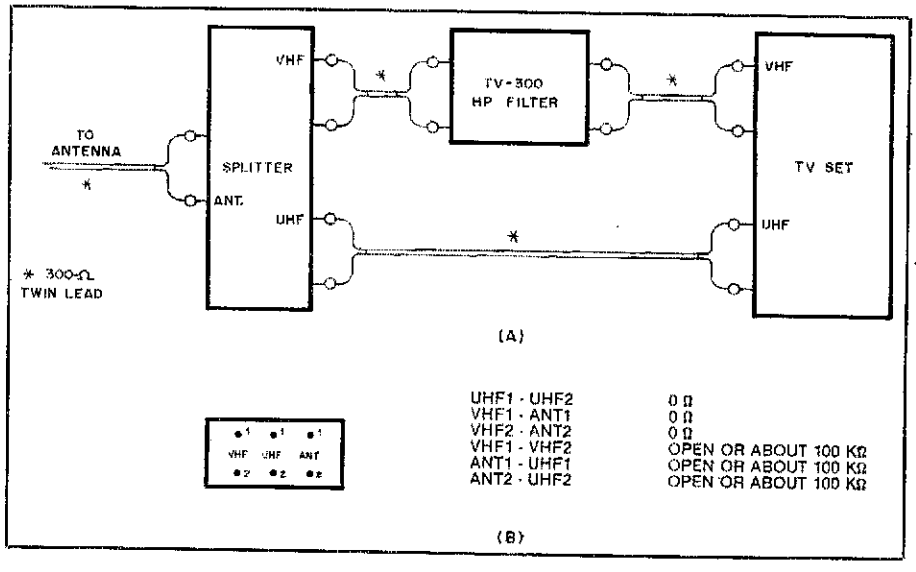


Fig. 6 — When signals from WD4JQV's 6-meter transmitter disrupted a neighbor's channel-17 reception, a high-pass filter placed between the antenna splitter and the TV set cured the problem. The filter was not effective when placed in the line to the antenna. Ohmmeter readings at the terminals of the splitter are shown.

Product Review

Conducted By Paul K. Pagel,* N1FB

Yaesu FT-480R 2-Meter Multimode Transceiver

This is one of a new breed of multimode 2-meter transceivers from Japan. It covers the entire 144-MHz amateur band (and then some) and operates on fm, upper and lower sideband, and cw. A versatile radio, the '480R is equally convenient to use in your automobile or at your home station.

Frequency Control

The FT-480R operating frequency is determined by a microprocessor-controlled PLL circuit composed of three PLL oscillators, each consisting of a reference crystal oscillator, a programmable divider, a prescaler and a phase comparator. The circuit develops local signal voltages for the receiver and transmitter stages using a synthesis scheme that produces 10-Hz steps. A 4-bit CPU controls the PLL circuitry. This CPU halts transmission and prevents spurious radiation if any VCO is unlocked. A seven-digit fluorescent-blue readout displays the operating frequency.

Aside from the main tuning knob, 13 of the controls are related to frequency selection. The STEP switch controls the 10-Hz, 100-Hz or 1-kHz increments on ssb and cw, and 1-kHz, 20-kHz or 100-kHz increments on fm. The CLAR switch provides a function similar to RIT. When the CLARifier switch is depressed, the operator can use the main tuning knob to move the receive frequency ±10 kHz from that indicated by the readout without changing the transmit frequency. The VFO A/B TXA control allows split operation using the two built-in VFOs, receiving on VFO B and transmitting on VFO A. This is especially useful for operating strange splits on fm. Normal +600-kHz or −600-kHz repeater splits and simplex operation are controlled by the RPT switch on the bottom panel of the FT-480R. The F-SET switch on the front panel eliminates the fractional frequencies that might occur if one switches from the low end of the band to the fm portion of the band. For example, if you are operating on 144.213 MHz and wish to QSY to 146.52, you may go up frequency in 100-kHz steps (MODE switch at FM) until you reach 146.513 MHz. Then, press the F-SET switch, and the transceiver operating frequency becomes 146.500 MHz. From there you move in 20-kHz steps to 146.520 MHz.

One of the nicer features is the frequency memory. If you have several favorite repeater frequencies you use often, you can program them into the memory and call them up with the ease of a crystal-controlled radio. The MEMORY control, ganged along with the STEP switch, allows the operator to choose among any four frequencies in memory. To load a frequency, simply set the MEMORY switch to one of the four positions, dial up the desired frequency using the main tuning dial and touch the M (memory) button. When calling up any of the memory channels, touch the MR (memory recall) button, which transfers frequency control from the main dial to the MEMORY switch. To return frequency control to the main dial, simply press the DIL (dial) button. If you want to retain the frequencies stored in memory after turning off the FT-480R, activate the BU (backup) switch on the rear apron, and the memory will continue to operate as long as dc power is connected to the POWER jack.

A scanning feature is built into the '480R. With the MEMORY switch in the MS position, the rig will scan all four memory channels. Push buttons on the microphone allow the operator to activate and stop the scan function. In addition, these push buttons allow the operator to scan up and down the entire 2-meter band in increments selected by the STEP control. With the mode switch in the FM position, you can use the SCAN switch on the bottom panel to have the rig stop scanning on either the first open or first busy channel it comes to. With the SCAN switch in the MAN position and the MEMORY switch in the MS position, you can switch through the memory channels at your discretion using the push buttons on the microphone. If you are operating from the main tuning dial and want to keep tabs on one of the frequencies in memory, the PRI (priority) switch allows you to scan one of the memory channels every five seconds. If the priority channel is in use or clear (your choice using the SCAN switch), the rig will automatically go to the memory channel.

In addition to displaying the operating frequency, one digit of the main readout also indicates which memory channel is in use. In the priority mode, the character P is displayed. An LED display in the upper left-hand corner of the front panel serves as an S meter on receive and as a relative power output indicator on transmit. LEDs indicate when the rig is transmitting and when the clarifier is activated. The BUSY/MOD indicator has a dual function; on receive, it lights when the channel is occupied, and during fm transmissions it indicates modulation.

Other Features

The transmitter section is rated at 30-watts input. A HI/LOW switch on the front panel allows operator selection of high- or low-power output. An indicator near the S meter lights when the rig is in the low-power position. The final transistors are VSWR protected; the higher the reflected power, the lower the output power.

Yaesu also recognizes that not all repeaters are carrier access. The T-CALL switch closes the PTT line and transmits an 1800-Hz tone for accessing repeaters. The CALL button on the microphone performs the same function. The TONE-IN connector on the rear apron provides easy access for the optional FTS-64 tone encoder, which synthesizes 32 PL or tone-burst frequencies. Other rear-apron jacks include antenna (SO-239), 1/8-inch (mm = in. × 25.4) key, external speaker and power connections.

The SAT switch, located on the bottom panel, is used for OSCAR work. This switch allows the operator to move the transmit frequency

*Assistant Technical Editor

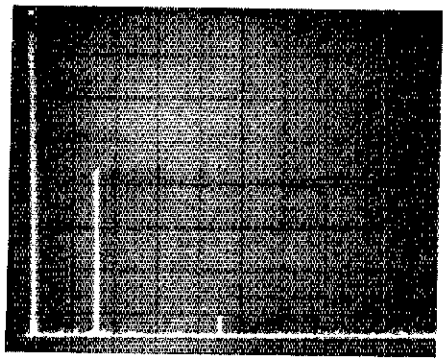


Fig. 1 — Spectral display of the FT-480R. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. The fundamental has been reduced in amplitude approximately 36 dB by means of notch cavities; this prevents analyzer overload. Power output is 10 watts at a frequency of 146 MHz. The third harmonic is visible approximately 70 dB below peak fundamental output. Tests were performed in the ARRL lab. The FT-480R complies with current FCC specifications for spectral purity.

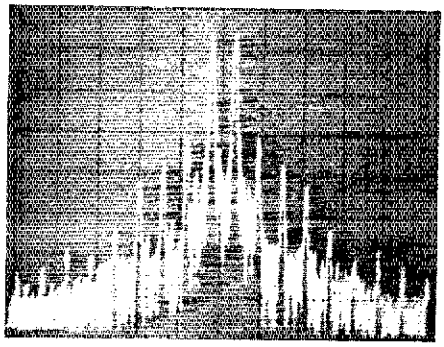


Fig. 2 — Spectral display of the FT-480R output during two-tone IMD test. Third-order products are 32 dB below PEP, and the fifth order products are 37 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at rated 15-watts PEP output on the 2-meter band.

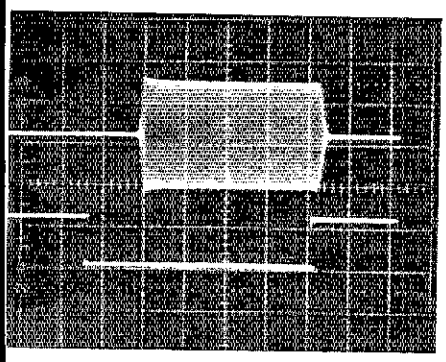


Fig. 3 — Cw keying waveform of the FT-480R. Horizontal divisions are each 5 ms. The upper trace is the output of the transceiver; lower trace is the actual key closure. There is a delay of approximately 6.5 ms between key down and actual output. This waveform will produce key clicks.

(while transmitting) to compensate for Doppler effect. This control should be left in the OFF position during normal operation because neither the VFO A/B TXA nor the CLAR function operates when the SAT switch is activated.

There's also a built-in noise blanker, activated by the front panel NB switch. This noise blanker was reasonably effective against airborne pulse-type noises.

Installation and Operation

Compact size makes the '480R a natural for mobile installation. Yaesu provides a universal mounting bracket that slides into guide rails on the sides of the transceiver, making it easy to take the rig in and out of the car. Power connections can be made at the fuse panel or the battery. Since I couldn't find a convenient access hole to the engine compartment, I used the accessory connection on my fuse panel. A 5/8-wavelength whip antenna completed my installation.

Mobile operation with the unit was a little difficult until I got used to the positions and functions of the controls. A few days of use solved this problem. When driving, I found it especially useful to program a few frequencies into memory and then to use the push buttons on the microphone to select among them. This feature made mobile operation much easier.

For home installation, Yaesu provides a wire mounting stand that supports the front of the transceiver. This stand performs two functions. It provides easier viewing of the front panel, and it allows audio to escape from the speaker located on the bottom panel. The manual recommends use of a 5-A, 13.8-V/dc power source. We measured the current consumption at 3 A in the ARRL lab, and my 4-A supply ran the radio for extended periods with no problem. I used beam antennas for both fm and ssb/cw operation from home.

Fm operation with the transceiver was a dream once I became familiar with the controls. The receiver is sensitive, the audio clean and the squelch smooth. I experienced no interference problems, even in areas with a repeater on every pair. All transmit audio reports I received indicated that the transmitted signal was clean and that my voice sounded natural. My only complaint is the intermediate 20-kHz fm channel steps. Often I found the 1-kHz steps too slow for easy frequency selection, so I switched to the 20-kHz steps and tuned right past my intended target. Yaesu says that the 20-kHz position may be converted to 5-kHz stepping through a simple modification. With a little practice, I found I could dial up even the strangest repeater splits with ease.

Being used to an hf transceiver with outboard transverter for the vhf ssb and cw operation, I was a little skeptical of the FT-480R because of its compact size. A few hours of operation convinced me that the rig is indeed capable of good performance on these modes. The 13 watts of output was enough to enjoy many local ssb contacts as well as a few with stations in the Philadelphia and Washington, DC, areas when band conditions were right. I consistently got good signal reports, with no evidence of splatter or distortion. Semi-break-in and a sidetone are provided for cw operation.

Receiver sensitivity was adequate for all but the weakest-signal contacts. As with most multimode vhf transceivers, a good outboard preamp is a valuable asset. On cw, the absence of a narrow filter sometimes caused problems, especially during times of crowded band conditions. Another annoyance in times of heavy activity was the excessively long agc release time.

I used the '480R during the ARRL VHF Sweepstakes contest with good results. The receiver held up even with several local stations running the full legal power limit. I was able to hear most of the stations that were on, and the transmitter easily drove a homemade amplifier that uses a pair of 4CX250B tubes.

I enjoyed using the FT-480R. The performance exceeded my needs, and I appreciated the convenience of having everything in one compact box. It was nice to be able to listen to 2-meter ssb without having to wire up the transverter. I would recommend this transceiver to anyone looking for a multimode 2-meter rig.

Station accessories available include the FP-80 power supply, FTS-64 tone encoder and AD-1 antenna coupler. Price class: $530. Manufacturer: Yaesu Electronics Corp., 6851 Walthall Way, Paramount, CA 90723. — *Mark Wilson, AA2Z*

Yaesu FT-480R Transceiver Serial No. OHO20232

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 143.500-148.500 MHz.	As specified.
Modes of operation: Fm, ssb and cw.	As specified.
Readout: Digital, 7-digit, fluorescent-blue digital display.	0.25-inch-high digits.
Resolution: 100 Hz.	As specified.
kHz/turn of knob: Not specified.	Ssb/cw: 0.5, 5, 50. fm: 50, 1000, 5000.
RIT range: ± 10 kHz.	As specified.
S-meter sensitivity (μV/S9): Not specified.	1.7.
Receiver sensitivity: Ssb, cw — 0.5 μV for 20-dB S/N; fm — 0.35 μV for 20-dB quieting.	Ssb, cw — 0.2 μV for 10-dB S + N/N; fm — 0.3 μV for 20-dB quieting. Noise floor (MDS) dBm: – 133. Blocking DR (dB): 104. Two-tone, 3rd-order IMD DR (dB): 79.
Audio power output (8-ohm load): 2.0 watts at 10% THD.	1.02 watts at 10% THD.
Current consumption: Receive, dc 0.5 A; transmit, dc 3.0 A.	As specified..
Transmitter rf output: Fm/cw, 10 watts/1 watt; ssb, 10 watts.	Fm/cw, 13 watts/3 watts; ssb, 13 watts.
Spurious emission: At least – 60 dB (ssb).	– 70 dB.
Carrier suppression: Better than 40 dB.	As specified.
Third-order IMD: Not specified.	32 dB below PEP.
Size (HWD): 2.4 × 7.2 × 9.5 inches.	
Weight: 6.5 lb.	
Color: Two-tone gray.	

KENWOOD TR-7850 2-METER FM TRANSCEIVER

☐ This unit is a big brother to the TR-7800.[1] Front panel layout and operational features are exactly the same on both units, except the TR-7850 has an additional 6 dB of power output.

Operation with the '7850 in different environments proved to be flawless. At my home in Newington, Connecticut, I was able to work through many repeaters, some up to 75 miles away, using the high-power mode and a 1/4-wavelength ground plane up 40 feet and fed with 75 feet of RG-58/U. Coverage during mobile operation was exceptional. This area is very hilly, and holding a repeater for any distance is difficult. With 50 watts available, the range of coverage increased dramatically.

Power consumption in the high-power mode is 8 A. The power cord is heavy gauge and should be connected directly to the battery or fuse box to prevent excess voltage drop.

Observations

Kenwood has done a good job in the human engineering department with this rig. Although the front panel is quite small, people with large hands should have no trouble operating the controls. Perhaps the addition of tactile feedback (such as a "beep" upon key closure) on the keyboard would be useful for mobile operation so the operator would know when the key was hit without looking at the display.

For those who spend many hours on the highways or who live far from a repeater, the high power and versatility of the TR-7850 would be a great asset. The TR-7850 is distributed by Trio-Kenwood, 1111 West Walnut St., Compton, CA 90220, and is available from dealers throughout the U.S. and Canada. Price class: $450. — *Gerry Hull, AK4L*

[1]"Kenwood TR-7800 2-Meter FM Transceiver," Product Review, *QST*, Sept. 1981, p. 46.

Kenwood TR-7850 Serial No. 1110120

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 144.000-147.995 MHz	143.900-148.995 MHz.
Power requirements: 0.4 A receive, 9 A high-power transmit at 13.8 V.	0.4 A receive, 3 A low-power, 8 A high-power transmit.
Power output: Hi, 40 W minimum. Low, 1 to 15 W, depending on frequency.	High, 50 W. Low, 144.000—3 W, 145.000—6 W, 146.000—9 W, 147.000—12 W, 148.000—15 W.
Harmonic and spurious outputs: Not specified.	More than 70 dB down (see spectral photo).
Receiver sensitivity: Better than 0.5 μV for 30-dB S/N.	0.21 μV for 20-dB S + N/N.
Squelch threshold: Not specified.	0.15 μV.
S-meter sensitivity: Not specified.	S1 = 1.1 μV, S9 = 6 μV, 20 dB/S9 = 7.4 μV.
Audio output: More than 2 W across 8 Ω at 10% distortion.	1.8 W at 8 Ω.
Frequency display: 4, 1/2-in. red LEDs.	
Size: 6-7/8 × 1-1/2 × 8-5/8 in.	As specified.
Weight: 4.84 lb.	As specified.

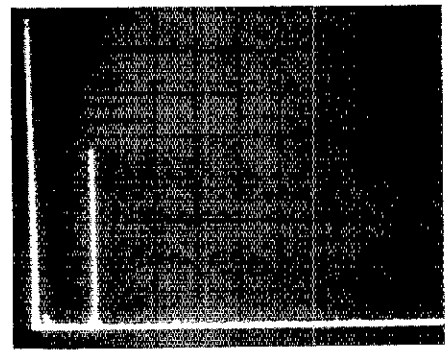
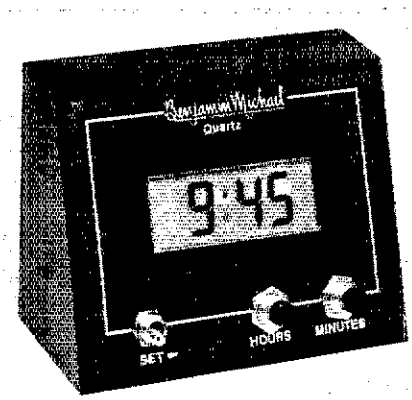


Fig. 4 — Spectral display of the TR-7850. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. The fundamental has been reduced in amplitude approximately 33 dB by means of notch cavities; this prevents analyzer overload. Power output is 50 watts at a frequency of 146.94 MHz. Tests were performed in the ARRL lab. The TR-7850 complies with current FCC specifications for spectral purity.

BENJAMIN MICHAEL INDUSTRIES MODEL 173B STATION CLOCK

☐ Digital station clocks, especially those with readout in UTC, are as handy a station accessory as any ham could desire. The BMI 173B is a relative newcomer deserving attention: It is simple, functional and accurate.

The 173B has a black plastic case with a slanting faceplate for viewing ease. An LCD readout with highly visible 1/2-inch-high digits is provided; a flashing colon indicates the seconds with the 24-hour display. If you'd rather have an A.M. and P.M. indication, you can order the 12-hour version.



The clock face is uncluttered — a toggle switch for stopping the count and two momentary-contact push buttons for setting the hours and minutes. WWV synchronization is easy. Turn the SET switch on, and the clock seconds reset to zero and the display stops. Set the HOURS and MINUTES, then snap off the SET switch on the WWV tone. The clock has remained accurate within four seconds per month since I've had it, well within the 30-seconds-per-month maximum error claimed by BMI. One 1.5-V penlight cell powers the clock for about one year, according to the manufacturer. The clock module has outputs for an alarm and various other functions. Wiring details are available from BMI. A pleasing standard feature on the 173B is a backlight for the display actuated as long as the HOURS button is depressed; the backlight feature may be wired separately if a larger battery is used to power the clock.

Several versions of the 173B are available in addition to the 12- and 24-hour models discussed here. A panel-mount unit is designed for those who wish to add a flush-mounted clock to their operating-position console. Dual-display versions may be obtained for simultaneous local and UTC timekeeping. These models range in price from $32.95 for the 12- or 24-hour panel-mount clocks, to $124.95 for the dual-display Presentation Model housed in a walnut enclosure. They're available from Benjamin-Michael Industries, 65 East Palatine Rd., Prospect Heights, IL 60070. — *Sandy Gerli, AC1Y*

KLM 144-148-13 LB ANTENNA

☐ The 13 LB (13 elements, long boom) will perform with low VSWR across the entire 2-meter band. It can be mounted horizontally or vertically and can be stacked in two- and four-bay arrays.

Assembly instructions, assembly pictorial, dimension sheet and parts list are easy to read and the assembly pictorial mechanical drawing detail is excellent, showing the driven element and coax balun feedpoint connections. No problems were encountered during assembly, each step was explained very well. The ready-made RG-144/U 4:1 coaxial balun aided assembly. Making the connections simply involved slipping the balun terminals over the driven element and ground post studs, adding lockwashers and nuts, and tightening them. All electrical hardware is stainless steel.

Operating with this antenna at 40 feet[2] using 80 watts and a low-noise receiving preamplifier was all that was needed to work aurora with contacts from Nova Scotia to West Virginia and Indiana to Michigan from south central Connecticut. A total of 19 states and two Canadian provinces have been worked terrestrially. Five new states were added from west of the Mississippi as far away as South Dakota during an intense sporadic Es opening in July 1980. Distances of 150 to 200 miles are common communication ranges with this antenna and 80-watt power level during non-enhanced conditions. Long-range fm work is possible by rotating the antenna elements to the vertical position. Loosening the boom to mast clamp is all that is required, but for best results in the vertical position the manufacturer suggests using a hardwood, fiberglass or other non-conducting material for the mast.

Hundreds of OSCAR satellite contacts were made using this antenna for transmission and reception. When transmitting on 145 MHz, uplinks at elevation angles of 30° or less, 10 watts was sufficient to operate through the OSCAR 7 and 8 satellites on modes A and J. At elevation angles of over 30° an 80-watt amplifier was needed for good results. Receiving mode B on 145 MHz was good on the

[2]ft × 0.3048 = m, in × 25.4 = mm, mi × 1.609 = km, lb × 0.454 = kg.

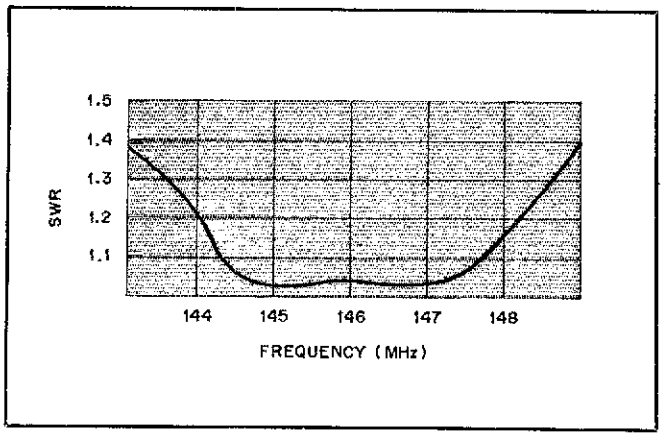


Fig. 5 — SWR curve for the KLM 144-148-13LB.

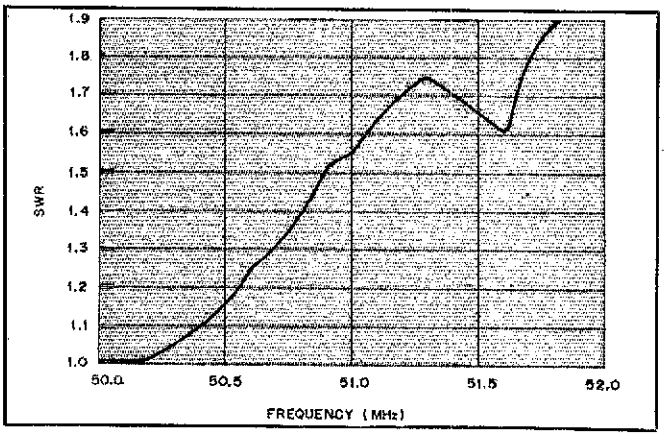


Fig. 6 — SWR curve for the KLM 50-7LD 6-meter Yagi.

KLM 144-148-13 LB Antenna

Manufacturer's Specifications

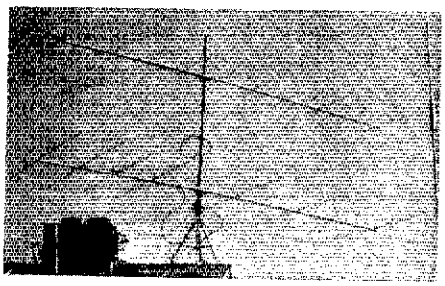
Frequency coverage: 144 to 148 MHz.
Number of elements: 13.
Power rating: 1 kW. (KLM 144-148-100N balun is recommended for powers greater than 1 kW.)
Weight: 9 lb.
Boom length: 21.8 feet.
Boom diameter: 1.5 inches.
Mounting: 4 × 8 inch plate for 2-inch mast to 1.5 inch boom.
Feed line required: 50 ohms unbalanced.
Feedpoint impedance: 200 ohms balanced, 4:1 balun supplied.
Longest element: 40 inches.
Shortest element: 31 inches.
Spacing dimensions: 2 bay, 13 to 15 feet between antennas. 4 bay, 14 to 16 feet between bays.
Manufacturer: KLM Electronics, Inc., 17025 Laurel Rd., Morgan Hill, CA 95037.
Price class: $90.

horizon, but there was too much fading at the higher angles. It is recommended that for maximum communications effectiveness through the OSCAR satellites, azimuth and elevation tracking antennas with switchable polarization be used.

Beamwidth and gain were noted when conducting front-to-side and front-to-back checks. This antenna is very directional and the received signals drop off sharply on a medium-strength distant signal, within about 15° of rotation. Most unwanted stations could be nulled out and this was very helpful during the ARRL VHF Sweepstakes. During the January SS event, 74 QSOs were made in 14 ARRL sections totaling 10 states, in eight and a half hours of operating time.

The most impressive feature of this antenna is the uniform VSWR across the entire 2-meter band. This is realized by the KLM design of dual, split, high-impedance driven elements and a low-loss balun matching system. One driven element is cut for a higher frequency, the other cut for a lower frequency.

With a 21.8 foot boom length and 13 elements, this is a ideal size beam for terrestrial and moonbounce communication. After one year of operating using this "long-boomer" my conclusions are that the KLM 144-148-13 LB will meet all expectations of performance and endurance that the most discriminating amateur could expect. — *Bernie Glassmeyer, W9KDR*



The KLM 144-148-13LB is mounted above the 50-7LD at W9KDR.

KLM 50-7LD 6-METER ANTENNA

☐ Erecting a 50-7LD — seven elements on a 20-foot[1] boom optimized for 50.1 MHz — says you're quite serious about a respectable signal on 6 meters. The LD stands for "light duty" and the manufacturer recommends use only in milder climates where extremely high winds and ice loading are not a problem. The review antenna has survived the Connecticut south-central coast weather for over a year. The only wind-created problem encountered occurred because the wrong element mounting blocks were supplied and a few of the elements broke off. A call to the factory revealed all of the seven blocks had to be changed. The bad blocks were brittle and could be broken by applying pressure at the end of the element. The new blocks could not be broken by hitting them with a sledge hammer while holding the blocks in a vise!

Wind loading is reduced by using a 1-1/2 inch boom and 3/8 inch elements, which keeps the weight at 12 pounds. This makes the antenna ideal for a moonbounce array if four 50-7LDs are stacked on an "H" frame. KLM will provide stacking information, but does not supply "H" frame or power dividers for 50 MHz.

Antenna assembly was delayed because the instruction sheets were missing and the coaxial balun sent was a 1:1 type instead of the 4:1 needed. Like all KLM antenna assembly instructions they are detailed, and with the use of good mechanical drawings the assembly is made easy.

Reviewing this antenna during the peak of solar cycle 21 added to the excitement of 6-meter operation — it's been my favorite band for many years. I've worked a number of new countries and states in the last year using this antenna and 200 watts' input power, with the antenna mounted at a height of 30 feet. A total of 21 countries and 47 states (needing only Montana, Wyoming and Utah for WAS) have been worked since putting up this antenna. Sporadic-E, F2, aurora, ground wave and scatter were all used with good success. One way to improve communication effectiveness is the addition of a bit more power. For this reason an old HT-33B was converted recently to 6 meters. This addition resulted in a 2 to 3 S unit increase in received signal reports.

Probably the most important aspect of using a beam having more than 3 or 4 elements on 6 meters, other than the additional gain, is the ability to null out unwanted signals. This can be used to advantage, especially during periods of high activity. The 50-7LD performed well in this respect, but still exhibited a 15 to 20° beamwidth when peaking a received signal. Some periods of intense sporadic-E or F2 propagation with backscatter disallow any specifications regarding antenna performance and leave one undecided as to which way to turn the antenna, but that's part of the fun of operating 6 meters!

Most often, when the step up from makeshift or small 2- or 3-element antennas is made, one realizes that a new operating dimension exists, taking you from occasional sporadic-E contacts to ground wave, scatter and aurora communications that exist every year regardless of the solar cycle. If you are contemplating operation on 6 meters or want a little more enjoyment, try a long-boom Yagi and see if you don't agree that it's the way to go on 6 meters! — *Bernie Glassmeyer, W9KDR*

[1]ft × 0.3048 = m, in. × 25.4 = mm, lb × 0.454 = kg, ft² × 0.093 = m²

KLM 50-7LD 6-Meter Antenna

Manufacturer's Specifications

Frequency coverage: 50 to 51 MHz.
Number of elements: 7.
Power rating: 4 kW PEP.
Weight: 12 lb.
Boom length: 20 feet.
Boom diameter: 1.5 inches.
Mounting: 4 × 8-inch plate for 2-inch mast to 1.5-inch boom.
Feed line required: 50 ohms unbalanced.
Feedpoint impedance: 200 ohms balanced; 4:1 balun supplied.
Longest element: 122 inches.
Shortest element: 100 inches.
Wind area: 2 sq. feet.
Manufacturer: KLM Electronics, Inc., 17025 Laurel Rd., Morgan Hill, CA 95037.
Price class: $120.

Technical Correspondence

Conducted By
Gerald L. Hall,* K1TD

LINEAR-READING RF WATTMETERS

☐ Kroenert's article, "What Your Wattmeter Really Reads,"[1] naturally raises the questions of how to make a wattmeter and what to do with it then. This note gives some guidance on the first question, and leaves the second open.

Taking a "forward and reflected power" bridge, Fig. 1, we find that the dc output voltages are the phasor sums of samples A and B (including -B) and a term combined with the cosine of the angle between rf current and voltage.[2] Sample A is proportional to rf voltage, and sample B is proportional to rf load current. The combined term, AB cos C, is directly proportional to rf power accepted by the load. Therefore we can "measure" power by isolating this term.

If we start with the conventional bridge and its two dc outputs, E_f and E_r, we can square them and subtract E_r^2 from E_f^2 (Fig. 2). The voltmeter, V, can then be calibrated linearly in watts.

$$E_f = \sqrt{A^2 + B^2 + 2AB\cos C} \qquad \text{(Eq. 1)}$$

$$E_r = \sqrt{A^2 + B^2 - 2AB\cos C} \qquad \text{(Eq. 2)}$$

where

C = the phase angle between A and B or between rf voltage and rf current

From this,

$$E_f^2 - E_r^2 = 4AB\cos C \qquad \text{(Eq. 3)}$$

Note that for the special case of A = B and C = 0 that $E_r = 0$, the indication that the SWR is now 1:1.

Unfortunately this approach (brute force) takes a bridge, five integrated circuits and six zeroing potentiometers to obtain an indication linearly in rf watts. An MC1494L and MC1456G may be used in each squarer (see Motorola's data sheet on the MC1594L/MC1494L), and an operational amplifier such as the 741 may be used to make the subtraction.

A bit more finesse can be used by building the calculation into the rf bridge if you are willing to start from scratch. See Fig. 3. The bridge can be used to drive a doubly balanced ring mixer. The mixer has two outputs, one of which is shorted at twice the radio frequency by the capacitor marked C, and the other is proportional to AB cos C, the power term. As this second output is at dc, a dc voltmeter can be calibrated linearly in watts.

[1] J. T. Kroenert, "What Your Wattmeter Really Reads," *QST*, Feb. 1981, p. 26.
[2] The basic equations for this type of bridge are shown in Geiser's paper, "The Impedance-Match Indicator," *QST*, July 1980, p. 11. Appropriate changes must be made to account for the signal splitting of Figs. 1 and 3.

*Associate Technical Editor

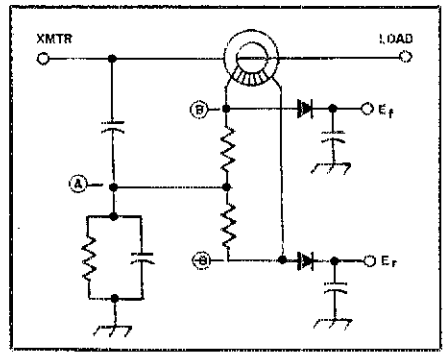


Fig. 1 — A phase-compensated form of the common "directional wattmeter" SWR bridge circuit. Dc output voltages are proportional to E_f and E_r in Eqs. 1 and 2.

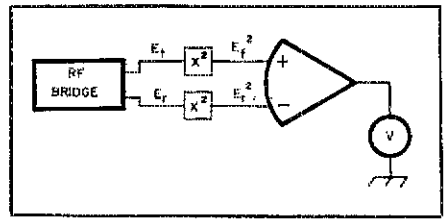


Fig. 2 — IC processing of outputs of the common bridge to give voltmeter readings at V proportional to rf power. Power supplies are also needed.

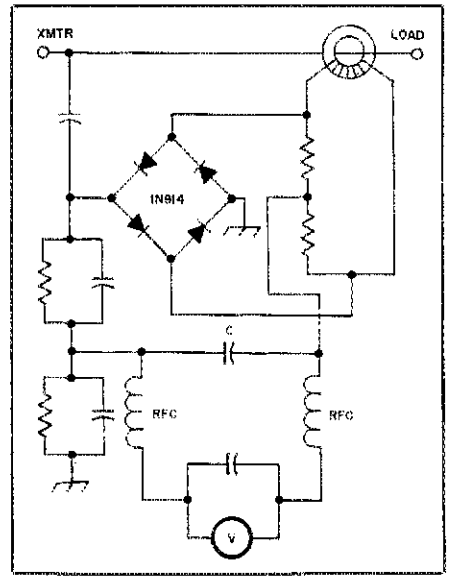


Fig. 3 — Splitting the bridge to drive a ring-modulator detector directly gives a dc voltage proportional to the rf power.

Any measurement scheme has errors. The bridges shown pay a bit more attention to phase angle than some of the more common commercial models.[3] At low A and B values the detector diodes become nonlinear. There is always some frequency effect, and linear ICs aren't always linear. — *David T. Geiser, WA2ANU, ARRL TA, RD 2, Box 787, Snowden Hill Rd., New Hartford, NY 13413*

References

Bruene, W. B., "An Inside Picture of Directional Wattmeters," *QST*, April 1959, p. 24.
Edwards, J. "Wattmeters," *Ham Radio Horizons*, Aug. 1980, p. 15.

TURNS RATIO VS. IMPEDANCE RATIO

☐ I would like to call attention to an ambiguity in Doug DeMaw's article, "Simple Gain Antennas for the Beginner" (August 1981 *QST*, p. 32). The 2-element beam he describes has a driven impedance of approximately 25 ohms. He shows a number of ways to match this impedance to either 50- or 75-ohm coaxial cable. One method involves the use of a toroidal broadband 2:1 matching transformer.

The 2:1 implies a turns ratio, and since the impedance ratio is the square of the turns ratio, this would result in a 4:1 impedance ratio. The 25-ohm antenna impedance would be stepped up to 100 ohms and if fed with 50-ohm coax cable, the SWR would be 2:1, thus negating the attempt at impedance matching. What is required is an impedance ratio of 2:1 or a turns ratio of $\sqrt{2:1}$ or 1.41:1, and this was not made clear. — *Robert J. Ruplenas, W1DDO, 90 Sawyer Ave., Dorchester, MA 02125*

PIN DIODE SWITCHING

☐ In the article on PIN diode switches,[4] I noticed that there was a rather large difference between the measured isolation of the switch and the theoretical prediction of 55 dB for a single-section unit. To get to the bottom of the problem I derived an approximate formula for this type of PIN diode switch for the general case of N sections. At the same time I modeled the circuit on a digital computer using a program called Compact, written by Compact Engineering, which is used widely in the microwave industry. My approximation formula for high isolation agrees very closely with Compact. The isolation for this type of switch is given as:

$$\text{Isolation} \triangleq -10\log\frac{P_{rx}}{P_{tx}} \qquad \text{(Eq. 4)}$$

[3] "An Amateur's Guide to Wattmeters," *Ham Radio Horizons*, Aug. 1980, p. 12.
[4] Ridpath, "T-R Switching With PIN Diodes," *QST*, March 1981, p. 19. Also see Feedback, April 1981 *QST*, p. 53.

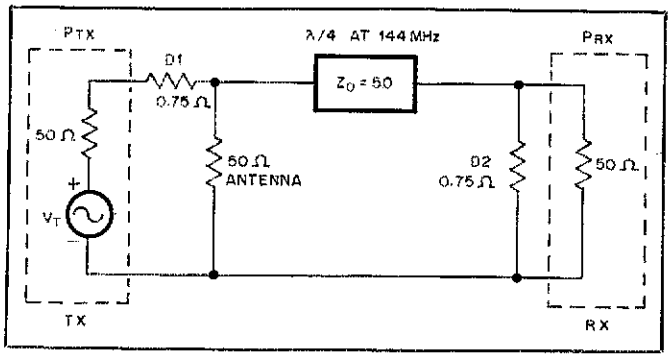


Fig. 4 — Single-section PIN diode switch for a 50-ohm system. Resistor symbols identified as D1 and D2 represent forward-biased PIN diodes. The rectangle represents a length of transmission line.

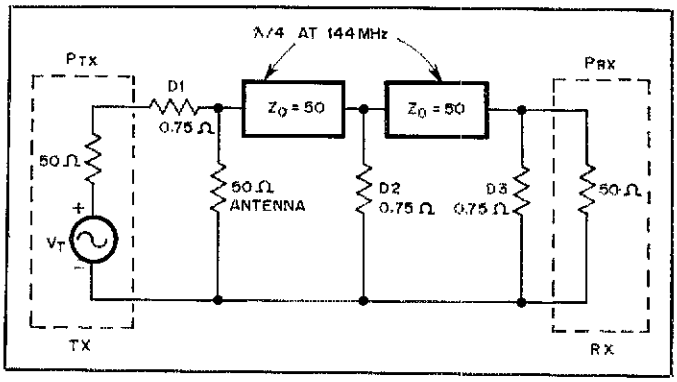


Fig. 5 — A two-section PIN diode switch. The resistances of forward-biased PIN diodes are represented as D1, D2 and D3.

where

P_{rx} = input power at the receiver

P_{tx} = available power from the transmitter

$$ISO = 20\,N \log \frac{Z_o}{R_d} \qquad \text{(Eq. 5)}$$

where

Z_o is the transmission line characteristic impedance

R_d is the PIN diode resistance (0.075 ohm in this case)

N is the number of sections

For example, if N = 1 (two diodes used) then ISO = 36.48 dB, which agrees with the experiment but differs with the presented theory of 55 dB. (See Fig. 4.) Similarly, if one uses three diodes (see Fig. 5), then the isolation from Eq. 5 is given as 72.9 dB. As you can see, the effect of cascading sections is much greater than 10 dB, as claimed.

I think that the article is a very important one, but is quite misleading for the amateur who is trying to make these switches. For a single-section switch the theoretical limit on isolation is 36.74 dB, which means that for a 100-W (50-dBm) transmitter the receiver will have a 13.26-dBm signal at its input. This will be too much for many receivers. For the two-section switch the receiver power level is only −23.22 dBm.

This type of switching may be used for frequencies other than those at 2 meters. I obtained a computer printout from the Compact program for the frequency range of 130 to 150 MHz, but the output can also be interpreted as 13 to 15 MHz. This information shows that the switch is quite good over the whole of the 20-m band. For example, the return loss at 13 MHz is 23 dB, which is the worst case between 13 and 15 MHz. I think a fair design goal of 33 dB isolation for a single-section switch and 66 dB for a two-section switch is practical at 14 MHz, and about 2 dB less for 144 MHz. PIN diode switching is a very interesting area for amateurs who are working with digitally controlled rigs. — *David Conn, VE3LAO, 47 Barnes Cres., Nepean, ON K2H 7C1*

FINDING A PAD

☐ If a variable capacitor is to tune a given frequency range, the inductance and padding capacitance must be found. Having had enough of the tail-chasing that normally ensues, I decided to meet this problem head on. I solved for the required pad as follows:

From the formula for resonance of an LC circuit,

$$\frac{C_{max}}{C_{min}} = \left(\frac{f_{max}}{f_{min}}\right)^2 = K^2 \qquad \text{(Eq. 6)}$$

Let the maximum and minimum values of the variable capacitor be C2 and C1, respectively. Let the residual circuit capacitance be Cx. Then,

$$C_{max} = Cp + C2 + Cx, \text{ and} \qquad \text{(Eq. 7)}$$

$$C_{min} = Cp + C1 + Cx \qquad \text{(Eq. 8)}$$

where Cp is the fixed padding capacitor. Substituting,

$$\frac{Cp + C2 + Cx}{Cp + C1 + Cx} = K^2, \text{ from which} \qquad \text{(Eq. 9)}$$

$$Cp = \frac{C2 + Cx - K^2\,(C1 + Cx)}{K^2 - 1} \qquad \text{(Eq. 10)}$$

Note that K cannot exceed $\sqrt{\frac{C2 + Cx}{C1 + Cx}}$

The required inductance is

$$L = \frac{1}{4\pi^2 f_{min}^2\,(Cp + C2 + Cx)} \qquad \text{(Eq. 11)}$$

Cx may be neglected in Eqs. 10 and 11 if it is much less than C1. — *Frank W. Noble, W3MT, 10004 Belhaven Rd., Bethesda, MD 20034*

FM TERMINOLOGY

☐ With regard to the Technical Correspondence letter by Thurston, W4PPB,[1] and the article by Hyder, W7IV,[2] there still remains confusion between deviation ratio and modulation index. They are closely related and yet different. Both express the ratio of carrier deviation to the frequency causing that deviation. Deviation ratio is the maximum carrier deviation (100% modulation) divided by the maximum modulating frequency. This is a constant for a given fm system. In narrow-band fm the maximum deviation is 5 kHz, and the maximum audio frequency is 3 kHz, giving a deviation ratio of 1.67. Regardless of any set of operating conditions, the deviation ratio for nbfm remains 1.67.

Modulation index, on the other hand, describes a set of operating conditions. Modulation index, β, is the carrier deviation under those operating conditions divided by the frequency of the audio tone that causes that deviation. This is obviously a variable; it can range from 0 to 16.7 for nbfm, assuming 300 Hz as the lowest modulating frequency. Both examples assume a single-frequency modulating tone. — *C. L. "Chuck" Hutchinson, K8CH, ARRL Hq.*

[1] J. N. Thurston, "Fine Points on Modulation Systems," Technical Correspondence, *QST*, May 1981, p. 42.

[2] H. R. Hyder, "Phase Versus Frequency Modulation," *QST*, July 1981, p. 33.

Feedback

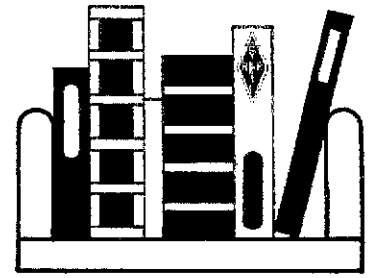
☐ Harry Hyder, W7IV, author of "Phase Versus Frequency Modulation," July 1981 *QST*, mentions that he made a small error in the third from the last paragraph on p. 34, in a statement about fm broadcast stations pre-emphasizing audio frequencies above 1 kHz at the rate of 6 dB per octave. Harry mentions that, in fact, the pre-emphasis/de-emphasis curves only approach 6 dB per octave, as do all single R-C networks. The FCC actually specifies these curves in terms of a time constant of 75 microseconds, he states.

☐ In "Modifications for the Plessey IC Receiver," Technical Correspondence, June 1981 *QST*, p. 40, the sixth and seventh lines should read, "These remarks were based on the performance of a receiver that I tested in the ARRL lab."

☐ Dan Sanderson, KM5T, tells us that a couple of errors crept into his July 1981 *QST* article, "The Burglar Alarm that Resets Automatically," p. 28. The collector and emitter are reversed in the bottom views of the TO-92 packages in Fig. 1. As a result, Fig. 3 shows Q1, Q2 and Q3 mounted backward. The trace going from U1, pin 2, to ground should be removed (leave the 10-kΩ resistor connected to pin 2). Dan also advises that it may be necessary to install a capacitor (approximately 50 μF) across the alarm leads to prevent interference from transients if the builder plans to use a high-current alarm (e.g., a large bell).

☐ In "The New Frontier," September *QST*, p. 76, Fig. 1 should have noted that all elements should be 0.2 in. wide.

Instructor of the Year, 1979 and 1980: N3DR and W9VEY



The Herb S. Brier, W9AD, Memorial Instructor of the Year Award goes to two outstanding teachers whose contributions to Amateur Radio will be remembered for many years to come.

By Steve Pink,* KB2GG

"Without Dr. Smith's help I would not be able to endorse this letter with my Extra call. I've had it for over a year now, and a feeling of accomplishment still comes over me every time I see it up on the wall." — AB3N

"I will never forget the first time I met Dan Hoover. He was a warm, friendly man whose main purpose in life seemed to be helping those who wanted to be Amateur Radio operators." — K9SM

These are only two of the many fine comments we received about the winners of the 1979 and 1980 competition. The Lake County (Indiana) Amateur Radio Club, in cooperation with the ARRL Club and Training Department, presents the Herb S. Brier Memorial Instructor of the Year Award to Dr. Arthur Smith, N3DR, for 1979, and to Dan Hoover, W9VEY, for 1980.

Herb S. Brier, W9AD, was for many years the Novice Editor for *CQ Magazine*. Despite illness, he devoted a lifetime to Amateur Radio: tutoring students, writing articles, building equipment and operating. His dedication was boundless, and his efforts introduced thousands to the exciting world of Amateur Radio. In 1978, the Lake County ARC established the Instructor of the Year Award to honor instructors who have carried on the good work of W9AD.

Herb S. Brier, W9AD, Award

1978 Sam May, AD7F
1979 Dr. Arthur Smith, N3DR
1980 Dan Hoover, W9VEY

The 1979 Winner

Dr. Arthur Smith, N3DR, teaches Amateur Radio classes at Ridley South Junior High School in Ridley Park, Pennsylvania, where he is chairman of the Science Department. First licensed in 1976, Dr. Smith, or "Doc" as his students affectionately call him, started an Amateur Radio program that year in the Ridley School District. Since that time, 1156 students have received licenses through the program. Classes are offered before and after school, during study halls, and on Saturday mornings. One year at Ridley 186 students entered Smith's program and all 186 passed their FCC exams!

This phenomenal success rate can be attributed to the spirit Doc inspires in his students. "If it had not been for the fine teaching of Dr. Smith," says Henry Park, K3OXS, a graduate of one of Doc's adult evening classes, "I would never have earned my Extra Class license. I just wish you could see how he has the attention and respect of his students in junior high."

Smith's inspiration is not limited to *students* at Ridley South. "As I would drive to school each morning I would see all the antennas and ponder the science of the radio spectrum. I often went into the radio shack and poked around. The enthusiasm of the students was catching. Last summer I was inspired and started studying Morse code. I passed my Novice examination and am now KA3BST. It was an accomplishment I will never forget." So writes Art's boss, the principal of Ridley South Junior High School, Oliver S. Alexander.

Smith's goal in teaching is not simply to produce licensed hams, but to turn out good radio operators. "The primary objective of our program," says Smith, "is communications competence. It is not sufficient to simply know information. Students must be able to implement their knowledge, when it is highly paraphrased, turned inside out or presented in problem form. Further, they must be able to apply this new knowledge to solve practical problems in their operating experience." He teaches radio theory with a hands-on approach and emphasizes on-the-air capability as the goal of code instruction: "Students take daily code practice using a special series of tapes from 3 to 30 wpm, each with 8-minute QSOs after which they answer a 10-question multiple-choice test on the material presented on the tape. The stress is skill and competence, the proof is in the operating." And all those Extra Class hams at Ridley South are proof that N3DR is indeed an instructor of the year. (For a closer look at the Ridley School District Amateur Radio Program, see May 1979 *QST*.)

Runners-Up for 1979

First-runner-up of the W9AD Instructor of the Year Award is Leslie E. Taylor, WAØQIT, of Duluth, Minnesota. Les has taught many students both in class and in his home, including a number of handicapped people through the Courage Handi-Ham System. One day, as Les was working a station in the North Cook

*Training Program Manager, ARRL

N3DR (center) and students during lunch hour at Ridley Junior High.

Dan Hoover, W9VEY, 1906-1976.

Islands, "You are the one who started all this for me" burst forth from the speaker! The DX station operator had been one of Les's students back in Minnesota.

Second runners-up for 1979 are William J. Arcieri, KØPNO, of Grand Junction, Colorado, Charles E. Rodgers, WØQNN, of Omaha, Nebraska, and Larry Henley, W7PFF, of Yakima, Washington. Hats off to these instructors who have given so much to Amateur Radio teaching.

The 1980 Winner

This year we depart from our usual practice of choosing the winning candidate from among those who taught Amateur Radio in the preceding year. Dan Hoover has been a Silent Key since 1976, but his students will never forget him. For more than 20 years, Dan taught hundreds of students, mostly in his own home in Hillsboro, Illinois, "Elmering" many of them from their Novice all the way to their Extra. He was secretary of the Montgomery County (Illinois) ARC for 20 years, a member of the A-1 Operator Club and an experienced traffic handler. An engineer for the Illinois Power Company, Dan was also a published poet, story writer and naturalist of some note; the Dan A. Hoover Memorial Nature Library was dedicated in 1977 in Harris County, Texas.

Dan Hoover began helping others get their license in 1953. At that time Richard Hewitt, now W9LZE, was 13 years old and Dan's first student. Richard spent almost every evening at Dan's home until he passed his Novice exam. More study with Dan led Richard to St. Louis, accompanied by his "Elmer," for the General test. "Mr. Hoover had a wonderful outlook and philosophy toward Amateur Radio and life in general," Hewitt says. "In his unselfish way, he became a part of Amateur Radio that will always be remembered."

Indeed, Dan made it a practice to accompany his students who wanted to upgrade to the FCC office in St. Louis, 60 miles away. "A lot of new amateurs find upgrading very hard because they are left to 'die on the vine,' so to speak," writes Daniel Altenberger, WB9QYS. "Not so when you have an 'Elmer' like I did." Dan Hoover helped Altenberger set up a Novice station and coached him on code and theory until they both felt that he was ready for the General exam. "On the 60-mile drive back to Hillsboro," WB9QYS continues, "I don't know which of us was happier. I was now General class."

Dan Hoover was a shining example of an instructor who works best in a one-to-one situation with his students. Dan's daughter Carol, W5NQQ, remembers the many aspiring hams who visited their Hillsboro home: "Dad's reputation as a teacher grew and grew, and there seemed to be someone coming for a radio lesson almost every night. I remember being asked to 'shhhh' countless times when someone was sitting at the kitchen table taking a Novice exam. He taught a 65-year-old man who could copy code easily but struggled to understand even the simplest theory. He spent hours working with a blind man whose world opened with the attaining of his license. Dad would accept students of any age, his only requirement being that they try their best."

Carol Hoover Allen is not the only other ham in Dan's family tree. Carol's husband, Bill Allen, W5NQR, and their daughter, Jane, KA5JVF, age 12, make up one branch. And Dan's son, Dan L. Hoover, W9EZA, his wife, Diane, W9LBP, and their daughter, Lisa, WB9IFW, make up the other branch. Finally, at the top of the tree is Dan's wife, Golde, K9AXS, who, on hearing of Dan's award, remarked: "Isn't ham radio a wonderful thing!"

Ham radio has been a wonderful thing for the many hams Dan helped to license. And many of them are also experienced traffic handlers. Some of Dan's students established the W9VEY Memorial Net on 2 meters to honor the memory of the man who so patiently taught others the important skill of traffic handling and the value of public service. W9VEY is a Silent Key, but because of his selflessness and dedication there are now many hams in central Illinois to teach others and to keep our wonderful hobby alive and growing.

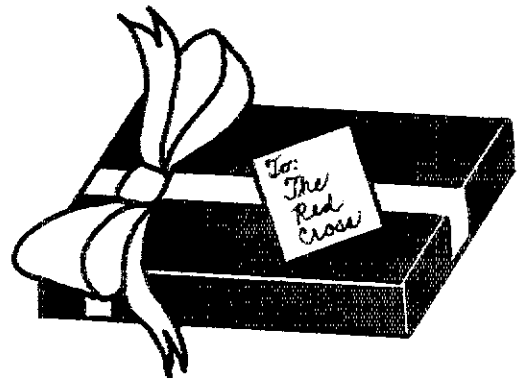
Runner-Up for 1980

The runner-up for this year is James A. (Alex) Chalmers, VE7AMK, of Burnaby, British Columbia. Alex has been teaching classes for the Burnaby ARC for over 15 years, and through his teaching more than 150 amateurs have received licenses. Alex has written teaching guides for a Canadian license course based on ARRL material and his own experience in the special aspects of Canadian licensing. Among these projects is a code practice tape using a professional radio announcer as narrator who also happens to be an Amateur Radio instructor in Burnaby: Wally Garrett, VE7CJT. One of the highlights of Alex's course is taking his students into his own electronics lab at home and giving them hands-on experience with the nuts and bolts of Amateur Radio. This learning-by-doing approach pays off in the success rate of his students at exam time. We extend a hearty congratulations to VE7AMK for a fine record of Amateur Radio instruction.

Nominations are Open for 1981

Perhaps you know of an instructor worthy of the Herb S. Brier, W9AD, Memorial Award. If so, please write to us at the Club and Training Department. The winner, determined by a committee at Headquarters, will receive an engraved plaque in his or her name. With this award, the Lake County Amateur Radio Club and ARRL extend recognition to outstanding instructors in Amateur Radio.

ARRL / Red Cross Message Relay Report



The ARRL field organization says "Happy Birthday" to the Red Cross

By John Manning,* WB4MAE

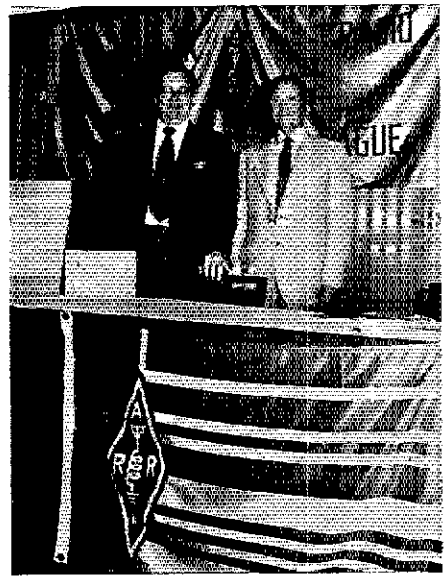
It was the 100th birthday celebration of the American National Red Cross — and radio amateurs were there! This well-conceived and -implemented program of initiating congratulatory radiograms to the Red Cross convention from chapters throughout the U.S. and Canada has been described previously (see April *QST*, p. 11). The Northern Virginia Amateur Radio Club station, W4PAY, served as the collection point for all of the messages received prior to the convention. As club president, it was my privilege to make a formal presentation of the messages, in a gift-wrapped box, to Red Cross officials at a ceremony on Wednesday, May 20. A total of 834 messages were received (including 38 from Canadian Red Cross chapters who were not celebrating the centennial).

Excerpts

Here are some of my remarks made at the presentation ceremony: "It is with great pride and a sense of achievement that I appear before you today. I have with me radiograms from more than 800 Red Cross chapters in the United States and Canada. These are congratulatory messages addressed to this centennial convention. They were transmitted as a public service by radio amateurs working through the Amateur Radio Emergency Service and National Traffic System of the American Radio Relay League.

"This venture was conceived as a way to congratulate you on your centennial, to promote local level contact between amateurs and chapters, and to provide an indicator that can be used to improve communications between our local level groups. Many chapters have strong ties to the Amateur Radio Service.

*Northern Virginia Radio Club, Inc., 4117 Chain Bridge Rd., Fairfax, VA 22030



The author (left) and WA4PBG staff the ARRL booth at the Red Cross National Convention in Washington, DC.

The gift-wrapped package of radiograms, containing birthday greetings from all over the United States and Canada, was presented to Mrs. Sarah Hutchinson, of the Red Cross Board of Governors, by John Manning, WB4MAE (right). At left is Rick Kessler, the executive director of the Fairfax, Virginia, Red Cross chapter, which is the home of W4PAY. *(photo courtesy of Milford Fink)*

"The hand-in-hand cooperation of our two organizations is long standing. We have maintained a formal cooperative agreement since 1940. A cordial relationship between League Headquarters and national level Red Cross officials has existed for many years, as has a joint effort to promote cooperation at the local level.

"The American Radio Relay League, through our field organization, offers emergency communications services to the Red Cross. These facilities are available to all Red Cross chapters from coast to coast.

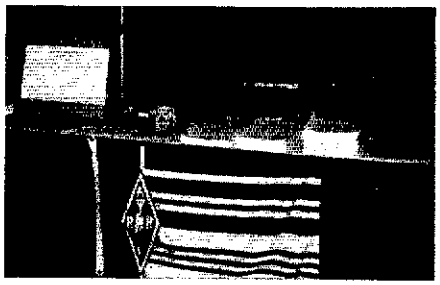
"On behalf of the radio amateurs of North America, I say, 'Congratulations to the American National Red Cross on your one hundredth anniversary.' It is a sincere pleasure for me to present these congratulatory messages to you."

Amateur Radio Booth at the Convention

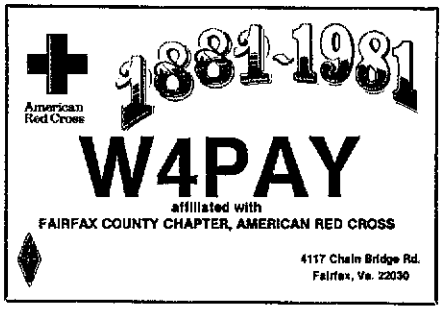
Members of the Northern Virginia Radio Club manned a booth in the exhibit area of the convention, with the ARRL banner displayed prominently. Various handout materials were distributed to interested convention delegates, including copies of the ARRL/Red Cross Cooperative Agreement, a list of ARRL section emergency coordinators and a commemorative QSL card that had been prepared by our club especially for the occasion.

The most important aspect of the booth at the convention was the opportunity provided for one-on-one conversations with the Red Cross representatives. It was gratifying to note the positive attitude of those in attendance toward the Amateur Radio Service in assisting the Red Cross in its mission. This attitude no doubt reflects the excellent work done in many areas by amateurs at the chapter level.

One of the features of the Amateur Radio booth was a message origination



The ARRL Booth at the Red Cross Convention provided delegates with a wealth of information about Amateur Radio.



This special QSL commemorated W4PAY's participation in the Red Cross Centennial.

Section Relay Coordinators

The following volunteer amateurs served as section relay coordinators, spearheading efforts to garner congratulatory radiograms from Red Cross chapters in their section.

Alabama—W4IBU, Alaska—KL7JIG, Arizona—N7EH, East Bay (CA)—WB6KQU, Los Angeles—AK6Y, Orange—WA6WZO, Sacramento Valley—N6JV, San Diego—W6INI, San Francisco—WB6ZRK, San Joaquin Valley—WA6YAB, Santa Barbara—W6RIC, Santa Clara Valley—WB6IZF, Colorado— K3PUR, Connecticut—W1SY, Delaware—WA3WIY, Northern Florida—NO4A, Southern Florida—AA4WJ, Georgia—K4VHC, Idaho—W7IWU, Illinois—W9QBH, Indiana—KB9HH/W9UMH, Iowa—WØRPK, Kansas—WØKL, Kentucky—KZ4G, Louisiana—N5IB, Maine—W1BJ, Maryland/DC—WA3TAI, Eastern Massachusetts—WB7TPY, Western Massachusetts—K1BE, Michigan—AF8V, Minnesota—KBØMB/WAØQIT, Montana—W7LR, Nebraska—NØAIH, Nevada—W7BS, New Hampshire—KB1A, Northern New Jersey—W2TCA, Southern New Jersey—W2HOB, New Mexico—W5ALR, Eastern New York—KA2FAS, New York City/Long Island—WB2YUJ, Western New York—KA2IVK, North Dakota—WBØTEE, Ohio—WB8KKI, Oklahoma—WA5FSN, Ontario—VE3GOL, Oregon—W7LNE, Pacific—KH6CKJ, Eastern Pennsylvania—WA3PZO, Western Pennsylvania—W3YBR, Quebec—VE2BP, Rhode Island—W1EOF, Saskatchewan— VE5AQ, South Carolina—WD4HLZ, Tennessee—NO4Q, Northern Texas—K5PC, Southern Texas—WA5RVT, Vermont—WA1YEH, Virginia—N4AZI, Washington—W7DZX, West Indies—NP4D, West Virginia— K8QEW, Wisconsin—W9OAK/K9UTQ, Wyoming—WB7EIN.

service. ARRL message blanks were available for use by the convention registrants in originating messages back home. A large replica of an ARRL radiogram showed the delegates the proper format. The booth was equipped with a 2-meter transceiver, and traffic was relayed to NVRC members for later NTS transmission via the WB4YRB repeater, maintained by the Alexander Graham Bell Amateur Radio Club. The cooperation of the club, and its trustee, WB4YRB, was appreciated during the convention week. Message originations totaled 183; our thanks to all the NTSers who handled such convention traffic.

Advance Planning

So many people cooperated in the planning and operation that any attempt to list all their names and calls would certainly be incomplete. I do want to thank all the volunteer section relay coordinators who supervised the efforts in obtaining the message originations from Red Cross chapters. At the local level, I would like to acknowledge assistance from Roanoke Division Director W4UG, and the following amateurs who put in long hours at the booth: W3ABC, WA4PBG, WD4KQJ, K4JDM, WA4LWB, WB4QAX, K4FD, K4LMB, N4DPV, K4BAV, K4DBH and W4HV.

The centennial celebration was such a success that planning is already underway for W4PAY's participation in the Red Cross Bicentennial! QST

Red Cross Disaster Exercise: The Role of Amateur Radio

Secure and reliable communications are fundamental to the orderly flow of information in our society, and they become even more important during disasters. Enter Amateur Radio.

By Harvey M. Solomon, M.D.,* WB3BCJ/Ø and Jo Ann Bender

The congressional charter of the American Red Cross, in part, charges the organization with the responsibility for disaster relief. There has been a long history of cooperation between ARRL and the American Red Cross. Amateurs have traditionally handled welfare messages during emergencies when normal communications are inoperative, thereby helping the Red Cross meet its responsibilities.

In addition to disaster and safety services, the Red Cross is active in other areas. Through its blood services program, it maintains a national network of 57 blood centers that collect and distribute over five million units of blood annually. During a recent local disaster exercise, we evaluated how Amateur Radio operators could use their expertise to assist our Red Cross Blood Services program, which sup-

*American Red Cross Blood Services: Hawkeye Region, Waterloo, IA 50701

plies blood to 20 hospitals in 16 counties of northeast Iowa. Our simulated disaster was part of local activities saluting the Red Cross on its 100th birthday, and was designed to test emergency medical relief services of various public and private agencies in the Waterloo/Cedar Falls area. [Editor's Note: The ARRL Field Organization honored the American Red Cross on its centennial by conducting a special message relay — see the accompanying article for details.]

Planning for the exercise was under the joint direction of the Hawkeye Chapter American Red Cross and the Black Hawk County Civil Defense Office. Among the 35 community agencies involved was the Northeast Iowa Amateur Radio Club.

The drill was a simulated crash of a commercial airplane, occurring shortly after takeoff, which resulted in the deaths of several passengers and crew members as well as extensive injuries to 32 others. Fourteen amateurs, equipped with 2-meter fm rigs, were assigned to the crash site, to the emergency rooms of four local hospitals, to the Red Cross center where the regional blood bank is located and to buses transporting the injured to hospitals. In addition, two motorcycle-mobile amateurs were assigned to the Red Cross blood bank to provide emergency deliveries of blood to the hospital blood banks. (Prior to the exercise, amateurs assigned to the hospitals were briefed about the functions in the emergency room procedures, particularly under crisis conditions.) Each operator who participated in the exercise was provided with an official Red Cross armband and a vehicle sticker to allow entry through police lines at the disaster site.

At 11 A.M. on April 25, the Waterloo Airport tower informed police that a plane was down. The police department identified the crash site, alerted the nearest local hospital (which sent a team of six doctors to the site), and informed the county civil defense office of the disaster.

At 11:10 A.M., the civil defense office notified amateurs, and an emergency net was activated immediately. Following a short period of initial confusion at the disaster site (related in part to crowded conditions in an inadequately sized c.d. communications van), net control secured an effective base of operations outside the van. Direct communications were then established with the disaster site, Red Cross Hq., ambulances and area hospitals.

Effective Communications

Throughout the exercise, Amateur Radio was the most widely and effectively used mode of communication. Survivors, including those severely burned or seriously injured, were rushed to all four local hospitals where blood bank stores were rapidly depleting. Mock replacement shipments from the blood bank requested by the amateurs operating from the emergency rooms were delivered to all four hospitals in only 20 minutes by motorcycle-mobile operators.

The Northeast Iowa ARC provided reliable communications during a simulated plane crash at Cedar Falls. Amateurs were located at the crash site, emergency rooms of local hospitals, the central blood bank at the Red Cross center and on buses transporting the injured to hospitals. *(photo by Jo Ann Bender)*

The extraordinary demand for blood reduced local Red Cross supplies to dangerously low levels, and additional units were requested from an adjacent region. A mock shipment was flown in by the Civil Air Patrol from Dubuque, Iowa, and delivered by the motorcycle couriers.

From the technical viewpoint, we learned an important lesson regarding the kinds of equipment to use in the future. Hand-held rigs performed well in the field and on the buses, but were not adequate for reliable communications in the emergency rooms. None of the emergency rooms had ready access to external antennas, and it was quickly determined that rigs with an output of 10 watts or less were ineffective.

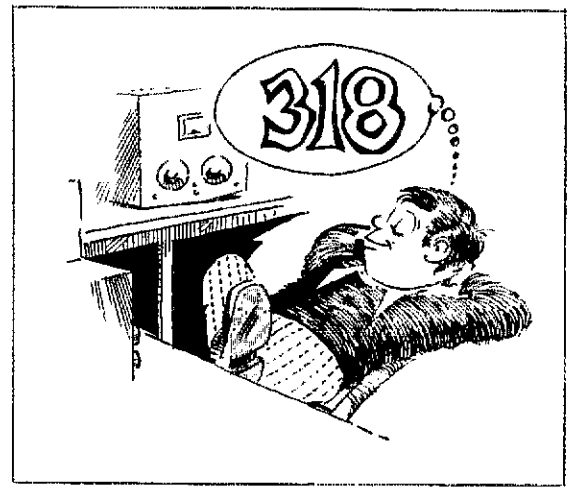
Even though all amateurs carried identification, several had problems when they tried to provide emergency room staff with information about the number of victims who would be arriving and the nature of their injuries. This was partially a result of poor victim identification at the disaster site. While the information handled by the amateurs was timely and correct, the hospital personnel were not familiar with Amateur Radio. If emergency room staffs could be exposed more routinely to ham radio operations, particularly in these kinds of training drills, much confusion could be eliminated.

WB3BCJ/ϕ was among the local amateurs who assisted Red Cross and Civil Defense personnel during the simulated disaster.

During the exercise, Rep. Cooper Evans, of Iowa's Third District, visited the disaster site, the hospitals and the blood bank. We took advantage of his visit to demonstrate Amateur Radio operation and to stress our involvement in public service.

The American Red Cross has moved into its second century of service and will continue to rely heavily on Amateur Radio operators whenever normal channels are disrupted or overloaded. The spirit of cooperation demonstrated by the hams of northeast Iowa is representative of organized Amateur Radio's commitment to its public service obligation.

318



He used to be a nice fella, then . . . he worked 'em all.

By John G. Troster,* W6ISQ

"Hey, Old DXer, you listening on the Cats Net? Think I heard you in there calling BW5C . . . or something like that."

"Ahhhh . . . yeah, Charlie. I'm here, but I got no time for rag chewing."

"Aw geee . . . haven't heard ya in a long time. What is a 'BW5'?"

"Ahhhh . . . sorry, it was a 6Y5. Thought it was a new country."

"How come you're still looking for new countries? I seen on the Honor Roll list where you worked all the countries there is that's possible to work. There ain't no more new ones for you to chase."

"Yeah, right. I worked 'em all."

"Well, then, I thought you'd take it easy for a while . . . back to basic rag chewin' like we used to do in the old days."

"Naw, no time. Gotta keep lookin'. Never can tell when a new country is likely to show up."

"Where ya gonna get a new country out of nowhere?"

"I'll tell ya where! Volcanoes . . . that's where. Them things is poppin' off all the time. One big blowout in the ocean and ya got a new island. New island . . . new country. Simple as that. I gotta keep watchin' out for them."

"Yeah, but all that lava from the volcano is hot. How you gonna set up . . ."

"You don't know them Dxpeditioners . . . they'll get there and have a dipole drooped over a hot rock before the satteylites or sea gulls spot the place."

"Yeah, but that all takes time . . . boats, rigs, QSL managers . . ."

"And remember all them earthquake faults, too. They're likely to snap off a piece of land somewhere and drop it out there in the water . . . and there it is . . . a new country . . . back to listenin', Charlie."

"Listening for what? You got 'em all. Geee, you used to be a nice fella . . . maybe like 10 on a scale of 10. Then you worked about 300 countries and you started gettin' grumpy and dropped to a 7. Then it was 315 or so and you hit the Honor Roll, and you slid to about a 3 on my Good Guy scale. Then you worked all 318 . . . and now you're a fat zzzeeerrroooo."

"You don't understand, Charlie. I got a prestige position to maintain now. Supposed I took Old Marge out shopping . . . and a new country came on while we was gone?"

"Where ya plan on going shopping? Hong Kong? And suppose your rig blew up or your antennas fell down? What would ya do then?"

"I just put up . . . ahhhh . . . 10 elements . . . on all bands . . . 290-foot tower . . . to back up the tribander. And two new Doomsday Blaster finals . . . hoooo hummmm. Sorry, Charlie, getting sleepy."

"Yeah, I was gonna ask when you was sleepin'? Might be a new one come on while you was snorin'."

"I got Old Marge . . . hmmmm . . . Marge listening to . . . low end of . . . 20 . . . if she hears more than three stations on same frequency . . . hoooo . . . at one time . . . she wakes . . . mmmmm . . . zzzz."

"Hey, you go to sleep 'er sumpin? And Marge ain't on duty yet? Hah. You're crazy! Don't you know that no new country ever comes on without everybody knowing about it for at least a month, and they stay on for a week . . . and . . ahhh . . . say . . . ahhhh . . . hey, old DXer . . . hey, I'm hearing a . . . he's signing SB4/V. Hey wake up . . . must be a pirate . . . kinda weak cw . . . QRX, I'll call . . . he gave me a 5 Charlie . . . Sorry, 5NN . . . ahhhh, you ever hear of Lava Island? Hmmmm, say's he's a geologist . . . was sailin' past and a volcano blew . . . south Atlantic . . . Old Dxer . . . hey, Old DXer . . . wake up . . . a new one . . . got a *new one* for ya."

"Wah? . . . What? I told ya! Was it a volcano or an earthquake?"

"Don't hear him now. He only worked a dozen or so of them Honor Roll types . . . ahhhh . . . and me . . . but the whole world is still callin'. Entire 20-meter band choked up with callers. What's a '/V'?"

"V's for volcano. What frequency . . . what heading?"

"I dunno. Don't hear him no more. He was sayin' the volcano was gurgling again and sinking down a bit faster . . . naw, guess he's . . . aw, he must of been a pirate, wouldn't you say . . . ahhhh . . . or was he?"

"What I tell ya? What I tell ya?"

"Aw, he'll be back on . . . ahhh . . . perhaps. After another lava blow or two. So I'll help ya listen. Anyway, you're still pretty high up on the Honor Roll even if you miss out on a volcano or an earthquake country now and again. Where are ya? You want me to monitor for ya? . . . You there Old DXer?"

"No, Charlie, Old DXer ain't here . . . this here's Old Marge. He said something about the top of his new tower. But he didn't strap on his pouch full of tools like usual. I can see him climbing the tower now . . ."

"You don't think . . . ahhhh . . . is there a deep swimming pool down below?"

"Funny he don't have his safety belt strapped on him like usual, neither."

"Marge, you got a old . . . ahhh . . . mattress out there in the garage?"

"He hasn't left the shack for months. Can't imagine what got him to leave now . . . now he's up there on top of that tower waving around like King Kong."

"Ahhhh . . . Marge . . . you got a big net around anywhere?"

"Charlie, why do you suppose the Old DXer is a standin' way up there on the top of that tower with no tool pouch and no safety belt and . . .?"

*82 Belbrook Way, Atherton, CA 94025

Happenings

Conducted By W. Dale Clift,* WA3NLO

FCC Proposes Changes at 1215 MHz to 40.5 GHz Based on WARC-79 Results

The Federal Communications Commission has taken another step toward implementing the Final Acts of the World Administrative Radio Conference (WARC) held in Geneva, Switzerland, in 1979. The Third Notice of Inquiry in General Docket 80-739 proposes revisions of the U.S. Table of Frequency Allocations for the frequencies 1215 MHz through 40.5 GHz. The Third NOI also proposes revisions to the definitions in Section 2.1 of the Commission's Rules. When a term or definition appears in Part 2 it is the definitive term that prevails throughout the Commission's Rules. The first and second NOIs dealt with proposed revisions for frequencies below 1215 MHz. Readers interested in these NOIs should read this year's "Happenings," April, page 66; June, page 54; August, page 57; and September, page 56.

Although the Final Acts of the 1979 WARC do not become effective until January 1, 1982, for those countries ratifying the Treaty, the FCC has begun consideration of the Treaty's effect on domestic frequency allocations now to enable timely implementation of the modified provisions should the U.S. Senate ratify the Treaty. (The Treaty has not yet been submitted to the Senate for ratification.) As with the previous NOIs, the Third NOI comment period is very short. The Commission released the document August 7, and the deadline for comments was September 8. The Third NOI can be summed up as follows:

1215-1300 MHz — As expected, the Commission proposes to delete the amateur allocation at 1215-1240 MHz to protect the NAVSTAR/GPS radionavigation-satellite system. Furthermore, the footnote authorizing amateur satellite operations (uplink only) at 1260-1270 MHz has not been included in the domestic Table. This omission may simply be a typographical error and an oversight; however, the League's comments are expected to underscore the footnote's importance to the future of the Amateur Satellite Service. The allocation on these frequencies would be secondary to radiolocation and aeronautical radionavigation.

2300-2450 MHz — The most serious proposal at these frequencies is one that would withdraw the amateur allocation at 2310-2390 MHz. According to the discussion of the proposals in the document, the secondary amateur allocation in this segment will be deleted to protect the aeronautical mobile telemetry service. League Hq. expects to file in opposition to this proposal because it is inappropriate to treat such a complex subject in a proceeding having such a broad scope and short comment period. The information provided in the Notice is not enough to determine how widespread these telemetry operations will be. Furthermore, there does not appear to be a need for haste in this matter, as the amateur allocation at these frequencies has existed for decades. Anyone with information concerning amateur operation between 2310 and 2390 MHz is urged to communicate with Dave Sumner, K1ZZ, at Headquarters.

At the frequencies 2300-2310 MHz a footnote will protect the amateur service from harmful interference caused by the fixed and mobile services, which are secondary sharing partners with the amateur service. Radiolocation is primary. At the frequencies 2390-2450 MHz the amateur service continues to be secondary to radiolocation. Footnotes require that the amateur service cause no interference to other listed services operating at 2400-2450 MHz and require the Amateur Satellite service to accept interference caused by devices operating in industrial, scientific and medical (ISM) applications operating at these same frequencies.

3300-3500 MHz, 5650-5925 MHz, 10.0-10.5 GHz and 24.0-24.25 GHz — At these frequencies the FCC proposes no changes that were not expected as the result of the Final Acts of WARC-79. For a complete story on the results of WARC-79, see February 1980 *QST*, page 62. Also, information about the new WARC-79 amateur satellite sub-bands can be found in July 1981 *QST*, page 72. The Commission will be issuing a Fourth NOI in General Docket 78-739 for frequencies above 40.5 GHz.

The Third NOI also proposes many changes, deletions and additions to the definitions found in Part 2 of the Commission's Rules. Those of particular interest to the amateur service are as follows:

> *Active Satellite* — A satellite carrying a station intended to transmit or retransmit radiocommunications signals.
>
> *Amateur-Satellite Service* — A radiocommunication service using space stations on Earth satellites for the same purposes as those of the Amateur Service.
>
> *Amateur Service* — A radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.
>
> *Emission* — Radiation produced, or the production of radiation, by a radio transmitting station. For example, the energy radiated by the local oscillator of a radio receiver would not be an emission but a radiation.
>
> *Harmful Interference* — Interference that endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with these Regulations.
>
> *Interference* — The effect of unwanted energy due to one or a combination of emissions, radiations or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation or loss of information that could be extracted in the absence of such unwanted energy.

The FCC staff contact for General Docket 80-739 is William Torak, and he can be reached at tel. 202-632-7025.

ITU LODGES COMPLAINT AGAINST U.S.

The International Frequency Registration Board, a division of the United Nation's International Telecommunication Union (ITU), has lodged an official complaint against the United States because of illegal shortwave broadcasting allegedly originating from the Miami, Florida area. The complaint asks the FCC to "ascertain whether or not the reported interfering stations are under the jurisdiction of your administration and, if in the affirmative, to take all possible steps to eliminate the harmful interference."

The complaint appears to be related to propaganda broadcasting against Cuba's Fidel Castro transmitted on the 40-meter amateur band. Earlier this year ARRL President Harry Dannals, W2HD, protested U.S. Attorney Atlee W. Wampler's decision to drop charges against an allegedly illegal broadcasting station operating in the amateur 40-meter band from the Miami area. (See July 1981 *QST*, page 54.) The FCC, which had invested more than 1000 hours of staff time to develop charges against one Jose M. Gonzalez, also protested the decision not to prosecute Gonzalez for his alleged pirate radio broadcasts. "Happenings" (August 1981 *QST*, page 58) reported Wampler's response to President Dannals' protest.

President Dannals contended that Wampler's decision to dismiss the charges against Gonzalez was based on politics. Through his assistant, Kenneth W. Lipman, Wampler denied that politics played any role in the decision not to prosecute Mr. Gonzalez, however.

According to FCC spokesmen, the illegal broadcasts are continuing. Recently, Commission officials identified three stations broadcasting propaganda to Cuba. U.S. State Department spokesmen have refused to comment on how the U.S. will respond to the International Frequency Registration Board. The Board's complaint is the first of its kind ever made against the United States.

STAFF NOTES

McCoy Retires From League Hq.

After a distinguished career that stretches over 30 years, Lew McCoy, W1ICP, has officially retired from ARRL Headquarters. Lew, or "Mac," as he is known by many of his friends, began working at League Head-

*Deputy Manager, Membership Services, ARRL

Lew McCoy, W1ICP

quarters in September 1949 as Assistant Communications Manager for Phone Activities. About a year later Mac transferred to the Technical Department as a technical assistant.

In July 1951, the FCC made the Novice license available for the first time. Soon after, Mac became the Novice Editor for *QST*, and his monthly columns soon became "required reading" for the beginner. TVI was *the* boogeyman of ham radio in those days, and Mac traveled the country explaining to hams how this nemesis could be beat.

Mac is especially proud of his role at Headquarters in developing and adapting the circuits for the Monimatch and the Ultimate Transmatch, circuits that are duplicated in ham shacks throughout the world today. He stayed with the Technical Department throughout the years and also became *QST*'s FM Editor and Product Review Editor. He was Senior Assistant Technical Editor when he became semi-disabled in the winter of 1977 as the result of a heart attack.

Mac has recovered from his illness and is enjoying his retirement from the League at his home in Silver City, New Mexico, where he resides with his wife, Martha. Martha does not have a ham license, but daughter Marsha, a psychiatrist practicing in the Salt Lake City area, is W1HAQ. Mac's plans are to enjoy life while living at his QTH atop the continental divide and to be a technical consultant and writer specializing in (you guessed it!) Amateur Radio. His many friends at Hq. wish Mac and Martha all the best in their ventures.

David Hazelton Houghton, 1900-1981 — A Tribute

"The Chair announced the opening of nominations for the office of Treasurer. Mr. Egbert nominated Mr. Houghton, who expressed appreciation but withdrew his name as a candidate . . . Mr. Houghton addressed the group briefly, citing some of the highlights of the League's history during his *fifty-four* years of association with the Headquarters staff . . ."[1] Since those words were written in 1976, another five years of involvement with ARRL — as an Honorary Vice President and Honorary Life Member — have been logged by Dave.

How do you say the final "goodbye" to a friend, an associate, a willing coworker, with that kind of record? How do you record for history the accomplishments of a David Hazelton Houghton, now alas gone from us? The answer to the second question has to be, "Inadequately," and to the first, "With great difficulty." Perhaps you just start with statistics: born in Bethesda, Maryland, on August 31, 1900; served in the military during World War I; was a member of St. James Episcopal Church, the West Hartford Rotary Club and the Chamber of Commerce; died after a short illness August 22, 1981, leaving two daughters, Mrs. Benedict D. Flynn, Jr. and Mrs. Richard C. Bacon, a son, Alan N. Houghton, two brothers, Livingston Houghton and Col. Eugene Houghton, and eight grandchildren.

Dave first climbed the rickety stairs of 1045 Main St., Hartford, on April 10, 1922, beginning a new job as Circulation Manager of *QST*, which then was mailed each month to 8000 League members; its total circulation was 23,000. Helping him were two clerks and a hand-cranked addressing machine. The staff totaled about a dozen, and there were three rooms in the third-floor Headquarters. When Dave retired (only from full-time service) on August 31, 1965, the organization was in a new building of 26,000 square feet on two floors and sent its magazine to 100,000 members and 10,000 others; it took 25 employees under Dave's direction to handle *QST* and a whole family of supporting publications. Some three and a half million *Handbooks* had marched out the door under his eye over the years, along with two million *License Manuals*, a million *How to Become A Radio Amateur* and hundreds of thousands of other books bearing the League diamond.

As we said in "Happenings" in October 1965 *QST*: "Throughout these intervening 43-plus years, the integrity and devotion to duty of David H. Houghton, his conscientiousness and ability to keep watch over details important to individual members as well as over-all basic League policies and functions, have been in a large measure responsible for the growth and progress of ARRL and contributed much to the League's stature. His bold signature is known from Afghanistan to Zambia, and he has made hundreds of close friends, many of whom (as in ham radio) he has never met."

In 1941 he was given, on an "acting" basis, the additional (unpaid) job as Treasurer of the League. The office was his, officially, the next year and continued to be his until he declined further nomination in 1976! And we mentioned Dave as a friend. There were all sorts of private kindnesses Dave offered fellow employees; these are recorded nowhere but in the heart. No one was more faithful, however, in observance of others' birthdays, as just a small example. Since he truly was a friend, there are lots of Dave Houghton stories. We'll close here with just one. Some years ago when the Chicago Trade Show was the biggest event in the electronics world, the League team went out to dinner with a large party of advertisers and book dealers to a well-known and not-inexpensive restaurant. There was a silent conspiracy of all present to have the check given to Dave. He looked at it, gulped, cleared his throat and said, "Gentlemen, there will be no June issue of *QST*!" — *Perry Williams, W1UED*

[1]Minutes 24 and 25, *QST*, July 1976, p. 52.

Donald B. Morris, W8JM — In Memoriam

Can one be a warm friend to thousands? Seems impossible — until you consider Donald B. Morris, W8JM, past Vice Director of ARRL's Roanoke Division (1974 through 1976) but far more well known as the guiding spirit of West Virginia State Conventions in an unbroken string back to 1959. There, at the beautiful State 4-H Camp at Jackson's Mill, you could meet Don, greeting the family of a convention speaker, answering the question of, say, the ticket chairman, presenting the Outstanding West Virginia Amateur of the Year Awards from the pillared porch of the dining hall (except in 1964, when he himself was the recipient) or asking the blessing before the family-style meals. As SCM Karl Thompson, K8KT, put it in the 1981 Convention Program, "The impact Don had on the advancement of Amateur Radio was great, and he shall long be remembered and missed by those of us who knew him. We shall miss his warm, on-the-air operating manner — the friendly voice, the accommodating attitude and the wisdom he always seemed to have even in the most difficult situations. He was our friend, and we shall all miss him in a very personal way."

And Don leaves a hole in the mechanisms of organized Amateur Radio that will take a squad of people to fill: He served four separate "hitches" as Section Communications Manager, 1930-1931, 1946-1952, 1959-1975 and 1977-1979; cofounder, past president, past vice president, past secretary, past treasurer of the Mountaineer Amateur Radio Association and trustee of W8SP; founder and longtime president of the West Virginia State Radio Council and its convention organization, and trustee of W8WVA; originator of the West Virginia Worked All Counties Award; winner of the Roanoke Division Public Service Award, 1968; member of ARES, QCWA, A-1 Operator Club; member and former net control station of West Virginia Army MARS, the West Virginia Phone Net and West Virginia CW Net, and Life Member, ARRL. Licensed since 1928, Don had worn out the calls W8APN, W8IXG and W8JFV. His enthusiasm for Amateur Radio was shared by his wife Dorothy, WB8LAI. Don died on May 24, 1981, after a long illness; he was 70 years old. As Karl said, we'll all miss him in a very personal way. — *Perry Williams, W1UED*

GRIZZLY PEAK REPEATER INVESTIGATION CONTINUES

On July 16, 1981, engineers from the FCC San Francisco Field Office were continuing investigation (see "Happenings," May 1981 *QST*) into unauthorized activities by users of the Grizzly Peak (California) repeater, WB6AEE/R. Unidentified transmissions were observed from 7:24 P.M. to 7:36 P.M. on 146.22 MHz, the input frequency of the repeater. The transmissions consisted of sound effects and whistlings that were being retransmitted over the repeater on 146.82 MHz, causing interference to ongoing communications on that frequency. Through the use of mobile direction-finding equipment, the

source of the transmissions was found to be an amateur station in San Leandro, California. The "WB6" Amateur Radio station at the located address is licensed to an operator holding an Advanced class license. He has been issued an Official Notice of Violation alleging his violation of §97.84(a) — Transmitting signals which were not identified by call sign as required; §97.123 — Transmitting unidentified signals; and §97.125 — Transmitting signals which caused interference. — *FCC Public Notice*

GUIDELINES FOR ACCEPTING APPEALS IN *QST* FOR DONATIONS

Occasionally, individuals and clubs write to the Editor requesting that *QST* run an appeal to benefit that individual's goals or organization. Eligibility for publication in *QST* is based on the following guidelines:

(1) must be an Amateur Radio organization.

(2) must send descriptive material on the organization.

(3) must send details on how the donations will be used.

(4) must supply names, addresses and telephone numbers of the organization's officers (and sponsor if a school group).

(5) must supply the name, address and telephone number of one reference who must be a League member and a licensed radio amateur.

(6) the appeal must be for the *general* good of Amateur Radio and must not be for the benefit of any individual.

CALL FOR ARRL ADVISORY COMMITTEE MEMBERS

Each December, the ARRL President appoints new members for the ARRL Advisory Committee from nominations submitted from the general membership. Positions are open because of expirations of terms or resignations. Terms of appointment run for two years. These committees, whose rules are set forth in the League's bylaws, prepare recommendations within their specialty areas to the ARRL Board of Directors and staff.

Advisory Committee recommendations are based on consultations with the general membership of the League and on studies conducted by the committees. Each committee is composed of 11 volunteers representing Canada and each of the U.S. call areas. Members wishing to serve on a committee need to be nominated by three League members. Forms for this purpose are available from Headquarters. League Advisory Committees and their members for 1981 are listed in Table 1.

TWENTIETH ANNIVERSARY AMATEUR SATELLITE FUND DRIVE: $73,460

Contributions continue to roll in to the ARRL Foundation in response to its Twentieth Anniversary Amateur Satellite Fund Drive (see "It Seems to Us . . .," February 1981 *QST*). The call is for the continuation and expansion of amateurs into the satellite arena with the specific goal of orbiting a Phase III satellite in the near future. Won't you become part of tomorrow's telecommunication world today? Send your tax-deductible contribution to: The ARRL Foundation, 225 Main St., Newington, CT 06111.

Contributors of $100 or more include: Edmonds Foundation; George B. Foote, Jr., N1AG, and Lisa H. Foote, KA1ETK; J. Douglass Berry, W3SAU; Ray Edwards, W2IOQ; Stanley F. Kaisel, K6UD; Mountain Amateur Radio Club; L. Dennis Shapiro, W1UF (The L. Dennis and Susan R. Shapiro Fund); Delmar W. Rowe, W9BPU/W7EDT; and Alice Virginia Shaver, WA4QWC. — *Richard Palm, K1CE, Assistant Secretary, ARRL Foundation*

Table 1

League Advisory Committees and their Members for 1981

DX Advisory Committee

Anthony C. Berg, W1OT, 7 Conant Dr., Stow, MA 01775; *David Beckwith, W2QM,* 151 Whitney Ave., Pompton Lakes, NJ 07442; Edward J. Kuebert, K3KA, 3369 Tanterra Circle, Brookeville, MD 20729; Robert W. Hudson, K7LAY, 29826 24th Pl. S., Federal Way, WA 98003; Sanford E. Hutson, K5YY — Chairman, P.O. Box 5299, Little Rock, AR 72215; David Novoa, KP4AM, P.O. Box 50073, Levittown, PR 00950; *Daryl H. Kiebler, WB8EUN,* 517 Farmstead La., Lansing, MI 48917; *Norman E. Meyers, N9MM,* RR1, Box 490, Rossville, IN 46065; John C. Kanode, N4MM — Board Liaison RFD 1, Box 73-A, Boyce, VA 22620; *Harold E. Parsons, VE3QA,* RR 3, Metcalfe, ON KØA 2PØ; *James T. Rafferty, N6RJ,* 178 Paseo Robles, Anaheim, CA 92807; James L. Spencer, WØSR, 3712 Tanager Dr., NE, Cedar Rapids, IA 52402; Don Search, W3AZD — Hq. Liaison.

Emergency Communications Advisory Committee

W. D. Bemmels, WØKL, 40 Rockwood Dr., Ottawa, KS 66067; Edward W. Dunn, Jr., W4NZW, P.O. Box 10393, Knoxville, TN 37919; Michael Goldstein, VE3GFN, 298 Warden Ave., Scarborough, ON M1N 3A4; Edward Gribi, Jr., WB6IZF, 51280 Pine Canyon Rd., King City, CA 93930; *Frank Jasinski, W1XA,* 42 Saddleback Hill Rd., Bellingham, MA 02019; *Bob Josuweit, WA3PZO,* 9 Derwen Dr., Havertown, PA 19083; Michael Karp, AF2L, 83 Onyx Pl., Matawan, NJ 07747; Dr. Allen S. Lefohn, KA7M, P.O. Box 196, Clancy, MT 59634; Ronald L. Moorefield, W8ILC, 6531 Le Mans La., Dayton, OH 45424; *Robert P. Schmidt, W5GHP* — Chairman, 5100 Press Dr., New Orleans, LA 70126; James Stanley, WD9CIS, 649 Monroe Ave., Evansville, IN 47713; John C. Sullivan, W1HHR — Board Liaison, Whitney Rd., Columbia, CT 06237; Robert J. Halprin, K1XA — Hq. Liaison.

Contest Advisory Committee

Alan Brubaker, K6XO, 34456 Colville Pl., Fremont, CA 94536; *Edward C. Gray, WØSD,* RFD 2, Salem, SD 57058; *Howard Huntington, K9KM,* 65 South Burr Oak, Lake Zurich, IL 60047; Phil Koch, K3UA, 124 Long Dr., Coraopolis, PA 15108; *Thomas Morrison, K5TM* — Chairman, P.O. Box 817, Round Rock, TX 78664; *Bill Myers, K1GQ,* Laurel Hill Rd., Hollis, NH 03049; *Tod Olson, KØTO* — Board Liaison, 292 Heather La., Long Lake, MN 55356; James Stahl, K8MR, 3592 Atherstone Rd., Cleveland Heights, OH 44121; Larry Strain, N7DF, Box 213, Fort Duchesne, UT 84026; *Henry Thel, VE7WJ,* Box 3112, Langley, BC V3A 4R3; *Lewis Thompkins, N2LT,* RD 1, Box 246A, Stockton, NJ 08559; Ellen White, W1YL/4, 19620 SW 234th St., Homestead, FL 33031; Mark Wilson, AA2Z — Hq. Liaison.

Names in italics are advisory committee members up for reappointment.

Public Relations Advisory Committee

James J. Apsey, K8JA, P.O. Box 28, Sylvania, OH 43560; Thomas B.J. Atkins, VE3CDM, 55 Havenbrook Blvd., Willowdale, ON M2J 1A7; *Michele Bartlett, N1AGD/9,* 2109 Branch Rd., Champaign, IL 61820; Gray Berry, W4MGO, 41 Ellsworth Dr., Ormond Beach, FL 32074; John H. Brown, W7CKZ, 725 88th Ave., SW, Olympia, WA 98502; Reynold B. Davis, KØGND, 3437 Anaheim Dr., Lincoln, NE 68506; J. A. Doc Gmelin, W6ZRJ, 10835 Willowbrook Dr., Cupertino, CA 95014; Dee Logan, W1HEO — Chairman, 175 Fairmont Ter., Fairfield, CT 06432; *Stephen Mendelsohn, WA2DHF,* 64 Maiden La., Little Ferry, NJ 07643; *John L. Rouse, KA3DBN,* 2703 Bartlett La., Bowie, MD 20715; Robert A. Scupp, WB5YYX, 648 Marquis Dr. NE, Albuquerque, NM 87123; Stan Zak, K2SJO — Board Liaison, 13 Jennifer La., Port Chester, NY 10573; Andrew Tripp — Hq. Liaison.

VHF Repeater Advisory Committee

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VHF/UHF Advisory Committee

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Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Where No Ham Has Gone Before

One of the primary functions of this column is to present applications of the FCC rules to real-life situations. Through consultation with Commission staff in Washington, your conductor strives to present useful explanations of regulations in so-called "gray areas" — areas such as third-party traffic, business messages and the like — anywhere there may be uncertainty as to a rule's application. You, the reader, are often the source of inspiration in these areas by asking meaningful questions concerning rules, questions that do not readily lend themselves to simple, yes or no answers.

With the advent of exciting, new changes in the radio art, uncharted areas within the rules universe need to be mapped. Our mission is to explore strange, new rules; to seek out new life and new civilizations; to boldly go where no ham has gone before.

Q. Our repeater system incorporates a link by which an operator may have his 2-meter signals retransmitted on 10 meters. A Technician class licensee often avails himself of this function. Is it legal for his signals to be retransmitted by our repeater on frequencies not assigned to Techs?

A. In its comments in FCC Docket 80-419, the Amateur Satellite Service rules proceeding, ARRL requested clarification of the matter of an Amateur Radio station retransmitting radio signals on frequencies reserved for higher operator classes. The Commission answered that: "As long as the control operator of the transmitting station is authorized (see §97.7) for the frequency privileges being used, the fact that the station may retransmit from frequencies authorized to both higher and lower operator classes is of no consequence. For example, there is no prohibition, per se, for those types of operations where retransmission is permitted (repeater, auxiliary and space) to retransmitting the signals from a station with a Technician class control operator on frequencies not authorized for the Technician class." In a nutshell, the above clarification allows Technician class amateur signals to be automatically retransmitted by stations in repeater operation in the 10-meter sub-band not authorized to Techs.

Q. What are RTTY mailboxes; are they legal?

A. An RTTY mailbox is a system whereby an RTTY station is activated by a special code, and a message for the station licensee, or others, is left. Later, possible recipients interrogate the mailbox station and receive the stored message. Such operation is consistent with the rules only when a control operator is on duty at a control point of the mailbox station when it is transmitting (§97.79); *a computer is not a control operator and cannot perform the control function!* There are no provisions for automatic control because rules for such control have been adopted for stations in repeater operation only (§97.3n3).

This tends to dash a bit of cold water on some current operations, but is intended to help amateurs construct their mailboxes within the rules. Amateurs are encouraged to apply for Special Temporary Authority permits (STAs) by writing FCC Consumer Assistance, Gettysburg, PA 17325, to promote experimentation with mailbox activities such as packet radio or "digipeaters".

An Invitation

Got a question concerning FCC rules? Have a pet topic that you would like covered in "Washington Mailbox"? Consider this your cordial invitation to participate in the editorial production of this column. Transmit your ideas and suggestions to your conductor, Richard K. Palm (the "K" stands for K1CE) at ARRL Hq. Let's hear from you!

Q. Our club has been approached by a commercial broadcast station to supply it with election returns via Amateur Radio. Would this be permissible under the rules?

A. Yes, as long as the information was made available to all concerned, not exclusively to one party. For a single commercial station to use Amateur Radio exclusively to cover the event would give it a competitive edge, and would clearly be facilitating the regular affairs of its business. (§97.114(c)). Also, bear in mind the rules concerning compensation in §97.112(a). Your group must not accept any material compensation, direct or indirect, paid or promised, for its operation.

Q. A repeater club "charges" a special dues rate for use of autopatch. Is this legal?

A. Yes, with certain considerations. For example, a club may have a basic dues rate, then an additional dues for those members that use the club's repeater, and finally another dues rate for those repeater ops that use the repeater's autopatch function. Of course, the rules specifically prohibit any pecuniary gain (§97.3[b]) and operation of a station for material compensation (§97.112[a]), but having repeater users share in the cost of maintaining a repeater is fine. Often it is helpful to "step into the shoes" of an FCC Administrative Law Judge and make a judgment: Are the dues being charged by this repeater club providing financial gain to any individual? Are the dues completely inconsistent with services provided?

Simply use a little common sense when dealing in such matters. Amateurs should always be conservative and tread lightly so as not to endanger the valuable privilege of autopatch.

Q. Our Field Day group uses a member's Extra Class call sign. Does this mean that all operators may use Extra Class privileges at the FD station even though their own license classes may be lower than Extra?

A. In every case, a station control operator is limited to his or her own license class privileges. For example, say one of your FD operators is licensed as a General. Accordingly, he or she may operate the Extra Class FD station only to the extent of General class privileges. However, *any* person, amateur or nonamateur, may participate in Amateur Radio communication *as a third party*. This means that anyone may speak their third-party messages directly into the mike of the FD station provided a control operator is present to supervise and control the operation. And, again, the operation may be only to the extent of that particular control operator's license privileges regardless of the fact that the FD station is identified with an Extra Class call sign. Another example: A General class licensee may *participate* as a third party in the Advanced portion of the band provided a control operator of Advanced or Extra Class means is present to supervise the operation. The distinction here is one of semantics — the participant, although an amateur, is a third party, not a control operator. The fact that he or she is a General class licensee is irrelevant in this case (§97.79). Additionally, don't forget the third-party traffic notation for your log (§97.103[b]).

Q. May the third-party participant identify the station?

A. Yes — the station-identification requirements of the FD activity (§97.84) may be met by having the third party give the i-d. However, and this is important, a third-party participant may communicate only with U.S. stations (which is usually the case in Field Day) and other countries that have third-party agreements with the U.S. For example, a third-party participant may not communicate with a station in France (§97.114).

Q. How closely must the control operator control?

A. The control operator, and the station licensee, are both responsible for the proper operation of the station (§97.79). Although there is no specific rule concerning the physical proximity of the control operator from the station controls, he or she must be present at the control point — where the function of the station is performed (§97.79). Practically speaking, the control operator should not leave the control point with a third party engaged in communication. While it would be okay to allow the third party to press the PTT switch to transmit, the control op should make all adjustments to the transmitter.

The third party participation rules were never intended to allow quasi amateur operation by unlicensed individuals.

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

*Assistant Manager, Membership Services, ARRL

Correspondence

Conducted By Bruce R. Kampe,* WA1POI

160 POINTS OF VIEW

☐ I approve and will abide by the proposed 160-meter band plan as shown on page 56 of August 1981 *QST* if the ARRL Board of Directors approves it. — *Gil Hankins, W8RUU, Livonia, Michigan*

☐ I believe the specific plan shown on page 56 of the August issue of *QST* is excellent. A similar chart for all bands would be a useful operating aid. Please publish one in *QST*. — *W. R. Richardson, W3IMG, Baltimore, Maryland*

☐ Your discussion in August *QST* on the proposed 160-meter band plan sounds great. Go get it. — *K. A. Fichthorn, N1AB, Plantsville, Connecticut*

☐ Thanks again for your LEADERSHIP. It should make for more enjoyable and fruitful operating. — *Lonnie B. Daniel, W4YD, Birmingham, Alabama*

☐ I agree completely with the 160-meter band plan. Count on my cooperation. I believe you should decide on a timetable and announce a beginning time after your final plan is worked out. — *John Furr, K5MF, San Antonio, Texas*

☐ I support fully the 160-meter band plan as described in August *QST*! — *Greg Palfe, WAØBNX, Eagan, Minnesota*

☐ As a 160-meter operator, I would like to make a few comments in support of your proposed band plan. I think your proposal is sound and is fair for all modes of operation. One slight adjustment that I would insert is a 10-kHz bandwidth at 1825 and 1850 kHz for the DX window instead of 5 kHz. I believe the slightly wider window would encourage more DX contacts when the band is open for long-distance communications.

The wider band of frequencies that are now available to the 160-meter operator should make operation more enjoyable if we can occupy the band in an intelligent, sharing manner. Your proposal is certainly a step in the right direction. — *James R. Shank, W3CNS, Elizabethtown, Pennsylvania*

☐ I support the idea of a voluntary "gentlemen's agreement" for amateur usage of the new unrestricted portion of 160 meters, in lieu of mandatory sub-bands sanctioned by the FCC. However, I believe the proposed band plan as outlined in August *QST* would set aside a disproportionately large segment of the unrestricted frequencies for DX-related activities. Continuation of the existing 1825 to 1830 kHz DX window would seem adequate for a band that is primarily optimum for local and regional, rather than long distance, communications. To answer a question posed in the *QST* article, there *are* DX windows on the other amateur bands; these consist of the upper ends of the cw sub-bands, which are in actual practice occupied primarily by foreign phone stations, and have long been a source of controversy for those who would prefer to see the existing U.S. phone sub-bands expanded.

Except for occasional foreign contacts using phone, 160-meter DX is essentially a cw activity. Ten or more cw stations could simultaneously occupy the existing DX window, interference free, if equipment with state-of-the-art stability and selectivity were used. The League proposal (two DX windows, with the intervening 20 kHz reserved primarily for DX phone activity) would set aside a total of 30 kHz for DXers, 30% of the unrestricted frequencies. This would not represent the most effective use of this portion of the amateur spectrum. It would be vastly unfair to the majority of users of this band, and it is highly unlikely that 30% of the activity in this band will be devoted to working DX. Nor can we rely on the frequencies above 1900 kHz for additional space for phone operation until it is clear that we will not eventually lose these frequencies to radiolocation.

Let us not rush to establish specific boundaries dividing phone and cw before it becomes clear what proportions the activity on this band will take in respect to mode. Let us simply agree that cw will occupy the extreme low end of the band, in keeping with established worldwide amateur practice on the rest of our bands. If there is enough cw activity to fully occupy the bottom 25 kHz, then the DX window could provide a natural barrier between phone and cw. If this band plan is to be effective, it must be flexible as well as realistic. Remember the 50-kHz-wide Extra Class sub-bands initially adopted under "incentive licensing"? — *Donald Chester, K4KYV, Woodlawn, Tennessee*

NUCLEAR AFTERMATH

☐ *QST* is an international journal. Presumably the author of "Nuclear Weapons Effects on Communications Systems" (August 1981 *QST*) was addressing the global amateur community. Instead of discussing ways to harden our equipment, shouldn't we be discussing ways to "soften" the weapons before we're left with the appalling task of providing communications for mass burials? — *Michele Bartlett, N1AGD/9, Champaign, Illinois*

☐ In his article on nuclear weapons effects (August 1981 *QST*), AG3U has given us some very important information about the little-known EMP effects on electronic gear that would follow nuclear explosions. I am concerned that we should have a better perspective on what the real impact of nuclear weapons use would be on ham radio.

It's apparently true that a few high-altitude nuclear blasts could wipe out a large fraction of electronics in the U.S. Since the majority of even *military* gear is not EMP hardened, such an attack would gravely compromise our military "Communications, Command and Control" systems.[1] It's hard to see how there could be any response by our government short of the all-out launch of our ICBMs, and that's World War III.

While we should all take prudent technical precautions to be able to communicate in *any* disaster, let's not be overly optimistic about how much help we can give after the big ones drop. Many experts predict that there would be over 100 million Americans dead in the first 30 days after an attack. That's no hurricane or tornado!

If there ever were a problem where prevention was better than cure, nuclear war is it. We can do our part through another side of ham radio. We can, and do, build international goodwill through our DX contacts. Why not depart a little from our usual QSO topics and ask friends in other countries what their feelings are on the nuclear issue?

We as hams, of course, are usually concerned with radio techniques — that's our big common interest. Like most people, we'd rather not think about nuclear wars or how to prevent them. But when you look at the hard technical data on nuclear weapons effects, you have to confront the reality: *nuclear war means no more Amateur Radio.* — *Dr. Martin S. Ewing, AA6E, Altadena, California*

☐ Your article in August *QST* by Robert Hendrickson describing the nuclear weapons effects on communication systems is one that should be "must" reading for all amateurs. His recommendations about saving old tube-type equipment is a good one. If only a few amateurs survive a nuclear exchange, I am sure they will be of great value to our nation's defense.

I believe the time is present when we should seriously consider the measures involved in protection from nuclear explosions. I would disagree with Mr. Hendrickson's statement that private fallout shelters would be of value since the protection might be only for the initial blast and not for the fire storms and for the many years of lethal radiation that would remain from a nuclear blast.

We as Amateur Radio operators should prepare, but we should also, as citizens, encourage our leaders to proceed with discussions aimed at eliminating or reducing the possibilities of nuclear war. — *K. W. Covey, M.D., WØZQJ, Moorhead, Minnesota*

THAT'S THE TRUTH

☐ I really enjoyed your "Translating Hamspeak," in July 1981 *QST*. The section entitled "On the DX Bands" really hit home. There is more truth to that than we want to believe. — *R. J. (Whitey) Doherty, K1VV, Sandwich, Massachusetts*

*Membership Services Assistant, ARRL

[1] *Public Interest Report*, Federation of American Scientists, Vol. 33, No. 8, Oct. 1980.

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Travels West

One of the "perks" for doing work for the League is that sometimes you get to travel. This summer, the conductor of this column was able to combine a family camping trip with a visit to two Western hamfests. For this Ontario ham, it was an education.

There's no question about it. It's easy to feel isolated from the rest of the country when you live in Western Canada. This is especially true in British Columbia — the Rockies are not only a natural, but a psychological barrier.

Perhaps that's why the Okanagan Hamfest in Oliver, British Columbia was so different from other hamfests we've experienced. It's an international affair, held in Washington state one year, and in Okanagan Valley the next. Most of the 200 hams who registered camped right on the hamfest site. There was a registration trailer, a small flea market, a DOC van and our League booth. Things were handled informally, and a great weekend was had by all.

And that's what was surprising. It's not that we're unfriendly, but in Southwestern Ontario hams tend to go to hamfests to check out dealers' prices, or pick up parts for a project or perhaps a piece of used gear. The emphasis is on finding a bargain, and if you meet some of the friends you've made on the air, well that's fine too. But in the West, and particularly at Oliver, the emphasis was on meeting with friends. Perhaps that feeling of isolation makes friends more important. Whatever, we found the fraternal spirit of Amateur Radio alive and well in Western Canada.

We equally enjoyed the Northern Alberta Hamfest in Andrew. The Andrew area is populated with descendants of the original Ukranian settlers, and the hamfest featured Ukranian food and dancing. Early risers on Sunday morning were treated to a hot-air balloon launch, and a fly-in breakfast. A dozen pilots converged on the nearby airfield. Trophies were awarded for the first plane to arrive, the oldest plane, the oldest pilot, and so on. After breakfast, the pilots put on an air show, complete with acrobatics and parachute jumps.

Parts for projects and good surplus gear is difficult to find in the West. Alberta amateurs have developed some ingenious ways of overcoming this problem. ARLA, the Amateur Radio League of Alberta, acts as a clearing house. They advertise what's available in their monthly newsletter, and sell what they have at hamfests such as at Andrew. Everyone gets a chance to buy, not just the few who may have had an "in." Bill Gillespie, VE6ABC, runs the Alberta tube bank. Bill takes your extra tubes, keeps them in a central location, and when you need a particular tube, sends it to you.

Both at Oliver and at Andrew we had lots of help. Assistant Directors Bill Kremer, VE7CSD, and Bill Gillespie, VE6ABC — really, it was their show. The many hams who visited the League booths seemed to appreciate the fact that their League representatives and workers were there. For many, it was their first contact with the League, other than through *QST*: the first chance ever to leaf through a table full of ARRL publications, or have a first-hand look at the new CRRL training materials. Most knew that the traffic nets and emergency organizations operated under the League "umbrella," but many never realized that the entire incoming QSL bureau system in Canada is League-run, or that CRRL, the League in Canada, does extensive and effective representation of Canadian amateurs to Ottawa, and is a voice — a separate voice from ARRL — at meetings of the International Amateur Radio Union. So it was an education for them, too.

We had a great trip. We met some of the finest hams in the world, many of whom are now friends. We'll being going back West — I hope soon.

BERT ANDERSON, VE4AP: AMATEUR OF THE YEAR

Bert Anderson, VE4AP, of Winnipeg, Manitoba, is 1981 CRRL Amateur of the Year. First licensed in 1931, Bert is 73 years old. Over the years, Bert has kept a lively interest in the technical development of Amateur Radio. He is active on 160 meters to 23 centimeters. He runs one of the few mobile OSCAR stations in Canada. Bert is treasurer, publicity chairman, and EME project manager for CAARC, the Canadian Amateur Radio Research Club. He is an active builder, whose projects are award winners wherever they are shown. He has devoted much time to helping others, particularly beginning amateurs. Bert's efforts have not gone unnoticed. In 1979 he was named Manitoba Amateur of the Year and was made a life member of the Winnipeg ARC. The petition that nominated Bert for CRRL Amateur of the Year carried 91 signatures.

We're proud of Bert. You should be, too. Congratulations to a fine ham.

CRRL SUBMISSIONS TO DOC

CRRL has submitted comment to DOC on two important matters: Section 50, having to do with foreign amateurs operating in Canada, and the new, proposed TRC-24, the syllabus for amateur examinations.

On Section 50, CRRL noted that reciprocal operating in Canada and the U.S. is governed by a Convention of May 15, 1952. While the present Section 50 does allow U.S. Novices and Technicians to operate in Canada, it also restricts higher class U.S. licencees to the least common denominator of frequencies and modes permitted by the regulations of *both* countries. This prevents U.S. amateurs from operating in the "Canadian phone bands" while visiting Canada. When Section 50 is applied to amateurs from outside Region 2, it prevents those amateurs from operating in the 146-148 MHz portion of our 2-meter band. Yet, the Convention of 1952 states that ". . . the Amateur station shall be operated in accordance with the laws and regulations of the country in which the station is temporarily located."

CRRL recommended that DOC adopt the following guidelines:

1) Visiting amateurs, restricted to above 30 MHz in their own country, should be given full ADVANCED class privileges, above 30 MHz, while in Canada.

2) Visiting amateurs, restricted to below 30 MHz, with no phone privileges in their own country, should be given full AMATEUR class privileges, below 30 MHz, while in Canada.

3) Visiting amateurs, restricted to below 30 MHz, but with phone privileges in their own country, should be given full AMATEUR class privileges, below 30 MHz, while in Canada.

4) Visiting amateurs, with full privileges, including phone, above and below 30 MHz in their own country, should be given full ADVANCED class privileges while in Canada.

On the proposed TRC-24, CRRL advised DOC that most amateurs who were consulted found the proposal unacceptable. If implemented, the Amateur and Advanced Amateur certificates would be differentiated by subject matter rather than by levels of difficulty. This could result in new amateurs going on the air with insufficient knowledge to operate their stations properly. CRRL also pointed out that the amateur community had finally adjusted to the last change in syllabus and examinations. Another change at this time would only bring back confusion and discontent.

CRRL recommended that DOC retain the present system, under which the Amateur and Advanced Amateur certificates are differentiated by levels of difficulty. Requirements should be laid out in detail, perhaps using performance objectives, as generally agreed to by officials of CRRL, CARF and DOC at a meeting in Ottawa on January 24.

Here's Canada's youngest YL, Gracie Wong, VE7FJG. Gracie is 11 years old and just entering grade 7 at Thunderbird Public School in Burnaby, British Columbia. Gracie comes from a real ham family. Her father is Tom, VE7BMA, and brothers Darryl and Mike are VE7FFS and VE7FFT. Gracie studied for her license at classes offered by Burnaby ARC, and passed her DOC exams on June 15. Offering congratulations and pinning on the corsage is Marge Kremer, wife of Burnaby ARC President Bill Kremer, VE7CSD. *(VE7CVS photo)*

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On Line

Conducted By Stan Horzepa,* WA1LOU

Getting On Line

Selecting a computer is like selecting a transceiver. Each model is unique in that it has a bell or whistle that another model doesn't have, but each model is alike in that it performs the same basic function. That is, all transceivers transceive, and all computers compute. A computer, however, should possess certain bells and whistles in order to give its user satisfaction and enjoyment.

I am not going to recommend one computer instead of another. Rather, I will present a list of items that I consider necessary in a ham radio operator's computer. You can use this list to do some comparison shopping to choose the computer for you.

BASIC

BASIC is the most popular computer language in the microcomputer world. It is easy to learn and easy to use, and a creative programmer can make it do a lot of tricks. Some computers offer two levels of BASIC, a beginner's version and a more complete version. The beginner's version provides a good way of learning the language, but once you start doing some serious programming, you'll want to upgrade to the complete version. Don't get stuck with a machine that only has a beginner's BASIC (if such a machine exists).

RAM

The quantity of Random Access Memory (RAM) should be in the midteens (approximately 16 kilobytes, more commonly known as 16 K). Some computers start off with 4 to 6 K with the capability of expanding to the midteen range. Four to 6 K is fine for beginners, but for serious applications, the larger quantity of RAM will be needed.

Many computers may be expanded beyond 16 K. If big programs and/or disk drives are in your future, look for a machine with this kind of RAM expansion capability.

Program Storage

A machine with simple (inexpensive) means of program storage is a necessity. You want to be able to save those programs you toil over and unless you have an unlimited budget, initially you do not want to spend the big money that disk drives require. What you want is a computer with a cassette interface that permits you to use an inexpensive cassette tape recorder to save and load programs. There is nothing wrong with disk drives (I own a pair); they certainly expand the capabilities of a computer. For simple program storage, however, a cassette tape recorder will do the job, although at a slower pace than a disk drive.

When I got into the computer game, I thought that a cassette tape recorder would suit my purposes; I saw no need for disk drives. I did eventually purchase some drives, however, and seldom use cassettes today. Luckily, the computer I had originally purchased for cassette-only use also had disk drive compatibility, so when I made the unforseen switch, there was no problem. Keep this in mind: The disk-drive capability may not be important now, but in the future you may want that capability.

Printer Interface

I'm not saying you have to go out and buy a printer, but if you play with computers long enough, you'll eventually want a printer and will probably buy one. So, get a computer that will hook up to a printer.

Printers are getting more inexpensive every day. When I was looking for a printer, the prices were stratospheric. I ended up with a refurbished Teletype Model 33 for $300. The 33 was very reliable, but was also very slow. I eventually upgraded to a Paper Tiger for approximately $900, and I have been very satisfied with it. With the way printer prices are falling today, you can take the $300 I originally paid for the used 33, and almost buy a new line printer.

Outside-World Interfacing

If you plan to use a computer on the air, the computer must have the capability to interface with the rest of the world. Most computers have provisions for some kind of interfacing, so this shouldn't be a problem. But check it out anyway.

Software

Certain computers are more popular than others, and the more popular a computer, the more software is written for it. For example, there are probably more programs available for the Radio Shack TRS-80 Model I than all of the other microcomputers combined because more Model I's have been sold than the competition has sold. So, if you are considering purchasing a particular computer and want to buy some exotic software for it, make sure that software is compatible with that machine.

A Few Words About Used Computers

There are many used computers available at bargain prices. If you can find what you want and it's an operable machine, you can save some money buying used. Virtually every machine manufactured and sold before 1981, however, does not meet the FCC's Part 15 requirements, and this is a consideration if you want to use the machine on the air.

Computers are rf noisy. Turn on an hf receiver and turn on a computer and you'll hear the computer broadcasting everywhere (your computer will be on more frequencies than Radio Moscow, Radio Peking and the Voice of America combined). The FCC's Part 15 requirements attempt to diminish the rf generated by computer devices; computer manufacturers have had to clean up their machines to meet the FCC specs. As far as ham radio is concerned, however, Part 15 is not the definitive solution. If a computer meets the minimum requirements of Part 15, it is still capable of radiating enough rf to affect your receiver, but at a level that is less than the average non-Part 15 machine. So, whether you buy used or new, there still is a problem.

That's the list. It should give you some guidance in choosing a machine. If you have questions, I'll try to answer them. Have fun shopping.

PX

A primary purpose of "On Line" is to exchange ideas. Computer hobbyists often implement their best ideas in the programs that they write. So "On Line" will regularly conduct a program exchange, or "PX," in which readers may obtain listings of Amateur Radio related programs submitted to "PX" by other readers.

To inaugurate "PX," a program has been submitted by Gary Lippert, K7VBY, that calculates the bearing and distance from any point in the world to any other point. The program is written in BASIC and runs on the Atari 400 and 800 with a minimum of 8 K of RAM. If you are interested in a listing of this program, send a self-addressed business envelope (no. 10) with first-class postage to the address listed at the bottom left of this page. And, if you have a program that you'd like to exchange with our readers, send it to the same address, and I'll run it in "PX."

BASIC HANDBOOK

I recently received a copy of the Second Edition of *The BASIC Handbook* by David A. Lien, W6OVP. Published by CompuSoft (1050-E. Pioneer Way, San Diego, CA 92119), this book is a compilation of the various versions of BASIC used by 150 different computers, and is invaluable in translating BASIC programs from one computer to another. Both the novice and veteran programmer should consider adding this fine book to their computer library.

COMPUTER NETS

"On Line" is attempting to compile a Computer Net Directory to be published in a future installment of this column. If you are part of an on-the-air computer net, please let me include your net in the directory. Send me the following information: name of net, days and times of meeting, net frequency, geographic area covered, type of net (general purpose, devoted to a particular computer, program exchange, etc.) and the call sign of the net manager.

*72 Stiles St., Waterbury, CT 06706

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AOG, Donald F. Guptill, Medford, MA
K1APQ, Edwin W. Antz, Danbury, NH
W1HNB, Ernest W. Konopka, North Adams, MA
W1JDX, Herman R. Alley, Providence, RI
W1KHN, Karl H. Becker, Roslindale, MA
W1KVN, James Houldsworth, Pittsfield, MA
W1OFZ, Donald C. Shaw, Worthington, MA
W1PEC, Norman W. Stockellburg, Wellesley, MA
W1PZU, Ernest A. Harris, Manchester, NH
ex-K1QQH, Raymond C. Wisner, Chesterfield, MA
W1RV, Carl G. Ricker, Ipswich, MA
W1UZX, Carroll C. Ripley, Portland, ME
KA2AEB, James H. Harrison, Whitehall, NY
W2AZH, Frank Douglas, Schenectady, NY
ex-WB2CTP, Paul Morris, Troy, NY
K2CWU, Harold O. Baker, Warren, NJ
WB2EDC, Denis Bibo, Red Bank, NJ
*WB2EKR, Donald J. Woods, Kingston, NY
N2EN, Joseph Brandi, Carmel, NY
W2FH, Raymond S. Baker, Broadalbin, NY
ex-W2HK, Richard C. Gaine, Plainfield, NJ
W2HR, Stanley H. Rothrock, Lincroft, NJ
K2IVT, Charles Wainwright, Huntington, NY
K2JL, John F. Jones, Middle Village, NY
W2JXH, Harry L. Whiting, Toms River, NJ
W2KYQ, Leland Kathan, Rotterdam, NY
W2ODA, Carl V. Daniels, Rome, NY
W2ONK, William M. Casby, Red Bank, NJ
WA2QCK, G. Palmer Zink, Newton, NJ
K2RYG, Earl A. Verklas, Vestal, NY
K2SJH, Nellie Whitaker, Ballston Spa, NY
W2VJ, Howard P. Laessle, Browns Mills, NJ
W2VU, Samuel S. Kale, Trenton, NJ
K2YXJ, William C. Lewis, Addison, NY
WB3EVN, John F. Crowley, Cambridge, MD
N3GW, Joseph J. Wojcik, Philadelphia, PA
W3LHQ, Henry F. Heise, Cresco, PA
W3MAN, Robert O. Goettmann, Pittsburgh, PA
K3MAW, Oliver J. Smith, III, Millersville, PA
W3SPY, Edward B. McCaul, Quinton, VA
N4ADV, William B. Hopkins, Orlando, FL
KA4CQD, Aletta Gehres, Nashville, TN
WA4DKC, Erlene S. Bomar, Rutherford, TN
WB4DRN, George J. Hornaday, Asheville, NC
K4ERG, Benjamin L. Teeter, Huntsville, AL
K4GMU, John H. Polatty, Memphis, TN
WD4GVG, Clarence "Choppy" Hatchett, Glasgow, KY
WB4HHQ, M. Carter Greear, Orlando, FL
WD4HNI, William A. Hering, Cayce, SC
W4JK, Ellis Lee Marshall, Front Royal, VA
W4LZ, Edward Blevins, Arlington, VA
W4ODM, Robert B. Park, Leesburg, FL
W4PIR, George Keefe, Port Richey, FL
WA4QII, Horace R. Powell, Bluff City, TN
KA4SYP, Philip D. Lawrence, III, Atlanta, GA
W4TSS, Alfred S. Howard, Colonial Beach, VA
WA4VZD, Frank W. Forrestal, Gainesville, FL
W5AKA, David W. Amsler, Kerrville, TX
W5BRZ, Gerald Lyssy, Beaumont, TX
W5EZY, James M. Hicks, Llano, TX
W5FPB, Einar H. Morterud, Albuquerque, NM
W5HDS, Thomas M. Hoffman, Sam Rayburn, TX
W5IOO, James R. Campbell, Houston, TX
W5MGW, Joseph L. Coleman, Metairie, LA
K5OTZ, Billy M. Westberg, Houston, TX
ex-WB5PQJ, James A. Shaver, San Antonio, TX
WA5VBK, Aubrey D. Westmoreland, Jr., Marshall, TX
KA6AON, Ken B. Vernon, San Rafael, CA
KD6BT, Robert W. Dittmar, Dana Point, CA
KA6BTV, Franklin W. Scott, Hanford, CA
W6DBN, Leland H. Hagerty, San Fernando, CA
W6DLK, Harry E. Nord, Russian River, CA
WD6DVM, Seymour Weiss, Van Nuys, CA
W6EAH, Clarence H. Haas, Santa Paula, CA
W6EC, John E. Waters, Hemet, CA
ex-W6EXX, William R. Luebke, Redwood City, CA
KA6FCP, David H. Ross, Atherton, CA
WB6FND, Mildred Fox, Maywood, CA
W6HBL, E. G. "Doc" Blosser, Inglewood, CA
KA6HQQ, John W. Martin, Long Beach, CA
KA6JGJ, Frank H. Barstow, Laguna Hills, CA
W6KFU, Edward Cavoretto, Richmond, CA
WB6KHL, Roger L. Steltzner, Clearlake Highlands, CA
K6ST, Allen P. Sears, San Diego, CA
W6STD, Wilford Marlett, North Bonneville, WA
WA6TBN, Harold M. Radke, Rialto, CA
W6TSJ, Arthur Bitterman, Marysville, CA
WB6UIH, Noah D. Showalter, Westminster, CA
WB6YFT, Leon Saroff, Los Angeles, CA
K6YHK, Everett L. Beall, Santa Maria, CA
ex-WA6YIL, Grace Borden, Rialto, CA
W6YLO, Earle T. Brault, Visalia, CA
WA6YME, Chester E. Lee, San Diego, CA
*W6YP, Albert J. Ward, Jr., Santa Barbara, CA
WA6ZAE, H. Edward Olcott, Bishop, CA
KA7BXT, Joseph G. Lonner, Butte, MT
W7ETD, Forrest N. Clark, Medical Lake, WA
WA7FKK, Howard Ziebell, Marysville, WA
W7FQL, James J. Van Jura, Phoenix, AZ
KA7HZK, Edward W. Randall, Puyallup, WA
W7JEO, Ernest F. Shelton, Bonners Ferry, ID
W7JFI, John G. MacDonald, Twin Falls, ID
W7JWL, Thomas C. Chittim, Sun City, AZ
W7KZ, Willard Akins, Olympia, WA
W7LEG, Cmdr. Elmer L. Herndon, Aurora, OR
W7NPC, Henry D. Freeman, Colorado Springs, CO
WB7SLX, Russell N. Ross, Sun City, AZ
W7ZQA, Van J. Price, Ronan, MT
W8AQT, Russell F. Hardy, Dayton, OH
WD8CUI, Emwood J. Ridenour, Fairmont, WV
KA8EVE, Donald E. Ebbert, Ontario, OH
KA8GLB, William G. Blocher, Grayling, MI
KA8HFP, Lawrence Bilby, Dearborn, MI
WA8IJB, Frederick G. Loew, Seville, OH
W8JCN, Paul A. Garver, West Chester, OH
*W8JM, Donald B. Morris, Fairmont, WV
K8JQT, Charles A. Reitz, St. Clair Shores, MI
W9ASH, Roman R. Santangelo, Chicago, IL
W9CPY, Clifford M. Potter, Mt. Carmel, IL
ex-K9ELH, Robert L. Stonek, Cudahy, WI
W9ERA, Forrest W. Caswell, Fairview Heights, IL
K9HGG, Leonard J. Lynch, DeKalb, IL
K9ITK, Joseph T. Bordeaux, Farmersburg, IN
W9IZH, Robert J. Bohmann, McNaughton, WI
WA9MOU, Nicholas E. Basil, Rock Falls, IL
WB9NCD, Merlin Bernamann, Sparta, WI
W9SGL, Earl L. Hanson, Prophetstown, IL
W9UWP, Richard F. Hoffman, Belleville, IL
W9WQF, Frank J. Romadka, Momence, IL
KAØAWA, David O. Mac Farlane, Parkville, MO
KAØAZU, John T. Clark, Cedar Rapids, IA
WDØBAM, Claude F. Barnes, Lees Summit, MO
KAØBBR, Owen F. Graves, St. Peters, MO
KAØBGF, Kenneth Weber, Dittmer, MO
NØBGT, Melville E. Foster, Minneapolis, MN
WAØDQD, Raymond A. Krominga, Mora, MN
WØEQJ, David F. Kieffer, St. Paul, MN
WAØHLC, Joel B. Bennett, Raytown, MO
WØKFY, Harold C. Rice, Palmer, NE
WØUWY, John W. Hendren, Chesterfield, MO
WØZZY, Bertil D. Ekstrand, Rush City, MN
KH6HSN, Donald M. Thompson, Kailua, HI
VE2AKX, Pierre A. Deslandes, Granby, PQ
VE6DT, Raymond F. Keitges, Lethbridge, AB
VE7DB, William H. Sharp, Penticton, BC
VE7PH, Alfred D. Dane, Fulford Harbour, BC
VE7ZP, William J. Bowerman, Sidney, BC
G6VC, V. H. S. Curling, Kent, Great Britain
HC2RM, Melvin R. Watts, Guayaquil, Ecuador

*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*.

Club Corner

Conducted By Sally O'Dell,* KB1O

THE CLUB SURVEY

If you ran a survey last spring (as the Joliet, Illinois Amateur Radio Society did) and have compiled the data, you have a starting point for this season. Your club members have indicated their preferences regarding club policies and activities. Do the new officers want to continue the projects begun by the previous administration? Have these officers carefully decided for or against specific projects? The club membership expressed their desires and wishes last year with the survey, and now is *your* time to implement these ideas.

One comment from your club members might have been, "I forget when the club meets." Many clubs mail a reminder (from a postcard to a multi-paged magazine) listing meeting time, date and place. The more extensive newsletters have articles contributed by the membership and other items of interest to members.

Have you, as a club officer, met with other assistants who have not been elected but who will serve the club as well as you? What did the membership claim to be most interested in . . . public service, contesting, general hamming? What are your secondary club activities? How much participation can you expect? How much participation can you generate by your enthusiasm? When will new officers take the gavel?

If last year's survey covered a multitude of subjects, all related to the club, now is the time to implement them. Did you use a survey last year? Was one of the topics, "Are you pleased with the way the club is being run?" Your club is a volunteer organization — a group of people who are interested in what you are doing and have to offer. What do you have to offer your club? If you did not have a club survey last year, now is the time to plan one.

*Club Program Manager, ARRL

Alma Gordon, KA1CCG, newly elected president of Shoreline ARC (Connecticut) receives gavel from Mike Griffin, WA1WOM (past president) as Alma's husband, Lew, KA1CFO, looks on. *(K1UVR photo)*

QST Profiles

Conducted By Carol Colvin,* AJ2I

Amateur Radio Fever — This Ballplayer Caught It!

Most people only dream of living out their childhood fantasies, but for Joe Rudi, WA6PVA, the all-American dream came true — he is a professional major league baseball player. Now with the Boston Red Sox, Joe always had the feeling that he was going to play baseball. "I was crazy about it, ever since I can remember." Born and raised in the small California town of Waterford, his family later moved to Modesto where he signed up, right out of high school, as a free agent with the Kansas City A's (who later became the Oakland A's). Thus began his 12-year career as an outfielder with Oakland, then California and Boston. He has played in five Championship series, three World Series (with a .300 batting average) and three All Star Games (.333 avg.). Rudi has also won three Gold Glove Awards and earned national attention with his timely hitting and outstanding catches in World Series Games against the Reds, Mets and Dodgers. He emblazoned his name in the record books by achieving the highest fielding average (.991) by an outfielder, lifetime, for 1000 or more games, and he also led the American League in total bases (287 in 1974). Currently he leads all active players with 12 grand-slam home runs.

About the same time his batting and fielding were really getting hot, in the mid-70's, Joe discovered Amateur Radio — an interest that still hasn't cooled down. He recalls: "When I first got into Amateur Radio, I was like a kid with a new toy. I couldn't wait for the ball game to end so I could get back to my room and listen to code tapes, read the theory and get on the air."

Amateur Radio has become an important part of his life, providing him with relaxation from the mental pressures (". . . one day you're a hero, next day a bum") and from the grueling schedules of the major league lifestyle (". . . it's a great life, but disruptive toward the family"). For 7-1/2 months of the year he is on the go — at the home park for 10 days, on the road for 10 days. Ham radio helps combat the loneliness caused by being away from his wife and four children, and it also helps break the monotony of the "eat, sleep, go to the ballpark" routine.

An avid DXer, he also enjoys ragchewing and meeting new people on the air as WA6PVA, not as Joe Rudi, ballplayer. "Ham radio is that common bond; it opens the door," he says. "You can go anywhere in the world and relate to people." In his easygoing and affable style, Joe advises young and old alike to take a good, hard look at what they're trying to accomplish, and see if it's worthwhile to start with. "No matter what you do — baseball, Amateur Radio, whatever — if you're going to get ahead at it and become a success, it's going to take work."

Joe Rudi, WA6PVA, plays baseball with the Boston Red Sox and also enjoys Amateur Radio. It allows him to get to know people on an honest, one-to-one basis, dissolving much of the mystique the public tends to give a national sports figure.

QST: How did a ballplayer come to discover Amateur Radio?

Rudi: I do a lot of hunting, and I never really had any interest in electronics except for building a crystal radio in Boy Scouts. One time I was with friends who had walkie-talkie CB radios, and it struck me that the radios would be a useful tool for hunting. So I got started in the CB band. And, as it still is, it was a mess. About the same time, we moved, and my new neighbors were hams. When I saw the radios they had and that they were talking all over the world, my interest was kindled. They helped me to get started and gave me my Novice test. The code part wasn't easy or hard. To me it was totally a matter of work; you just have to do it and practice. I followed the format of what was written in the books. For example, I'd be driving down the road and see a sign for First St., and I'd say the code in my mind. I started thinking more and more in Morse. The code is very important to ham radio. It pulls out the people who don't really have the interest; it requires effort and perseverance.

QST: You do a lot of operating "on the road." What kind of gear do you use?

Rudi: I started out with an Atlas-210x, the most compact rig you could get at the time. I packed everything in a suitcase. Everyone else on the team carried one piece of luggage; I always carried two "monsters." I loved the facial expressions of porters when they'd pick up my suitcase — it weighed about 80 pounds! Now I carry the Kenwood TS-120 and power supply. For an antenna everyone said that a long wire works about as well as anything, so I bought some surplus airplane wire and a big old fishing reel plus a 10-foot collapsible pole. It used to be that all the hotels had windows that could be opened. So I'd put a sinker on the line, fire it out the window and take a couple of phone books, or whatever I could find that was heavy enough, to hold the pole down. I fed that through a tuner and a wide feed line. I also had to carry all my meters. Now my gear is more simplified. I use a Hustler antenna horizontally, plus a counterpoise, because the windows in hotel rooms don't usually open any more. I talked on the air to a guy who uses an antenna that way, and he talks all over the world with only 20 watts. He sent me instructions about how to cut it up to fit in a suitcase and about how to use it. It works even better than the wire.

QST: Does anything bother you about Amateur Radio?

Rudi: It's such a great hobby and has done so much for me that I hate to see anything tear it down, especially bootleggers and people in the CB band getting up and working the amateur bands, taking the easy way out. It also drives me bananas to hear people who have probably been hams for years being policemen, getting on a DX operation and saying that it is "closed" or a "list" or something. Then guys tune up on top of each other or send a carrier. Listening to some of the nets is unbelievable. What kind of satisfaction do people get out of doing nothing but disrupting others? If they want to do that stuff, why don't they go back to the CB band?

QST: How do you relax from the pressures of the game?

Rudi: I stay in shape physically, doing nothing really special, just running and the everyday-conditioning type of thing, and I don't smoke. With the mental pressures, Amateur Radio has been tremendously helpful to me. On road trips, I hated being away from my family in the first place, and after a game, I'd go back to my room and read, or watch TV or talk baseball with the other players. Now I go to my room and talk to friends on the air or work DX. I also enjoy just listening. My dream would be to have all the time I want to work radio. That's probably the one thing most hams don't have — enough time to do everything they want. There are so many facets to this hobby, and it's changing all the time, too. I want to save some Amateur Radio activities for later and not "burn out" all at once the way athletes can do in professional sports.

In baseball, the name of the game is "win." A losing season is a long one. I've been fortunate enough to play with a lot of winning clubs, but if I left here today and didn't play again, it would be okay. There are so many interesting and important things to do in life, like enjoying my family and having time for things such as Amateur Radio. I hope to have many more years to accomplish those things.

*Editorial Assistant, *QST*

How's DX?

Conducted By Ellen White,* W1YL/4

The DX Scene — In Three Acts

The advent of the fall season, interest-generating DX contests, improvement in conditions, reduction in noise, and so on, creates sort of an internal excitement — a little head-scratching while trying to recall what happened last year when we changed from daylight to standard time, some concern about still-to-do antenna work, and so forth.

Our topic this month has, as its scenario, an Act 1 review of what the "main band" is all about (seasoned DXers can skip *this* act), an Act 2 recap of what has been happening during the period the column was composed, and an Act 3 look via photos (including those in the DX Contest results) of who it is we've worked (and are still hoping to work!).

THE MAIN DX BAND — ACT 1

When DX is mentioned, most hams immediately think of good old reliable (well, most of the time!) 20 meters. During the solar cycle peak you can work DX 24 hours a day on 14 MHz. Every really serious DXer has good 20-meter capabilities, because sooner or later most of the really good stuff will show up there. Whether sunspot maximum or minimum (and in spite of day-to-day fluctuations) you can depend on 20 to open up, however briefly, to some DX location daily.

Early-morning and early-evening band openings may hold some surprises if you swing your antenna in the long-path direction. On the East Coast with your beam headed on VK you can sometimes find very attractive African offerings; likewise a beam heading on Africa late in the afternoons produces surprisingly booming signals from Down Under — always a thrill.

Interesting propagation on this band includes skewed-path signals, which are propagated when neither operator has his antenna in the long-path or short-path directions (when signals are being propagated in some roundabout route), and they are also fun to observe. Best bet here is to peak up the signal and stop worrying about the path — *then* give the guy a call.

Lots of good stuff along this line (interesting introductory material for those newly afflicted) can be found in detail in *The ARRL Operating Manual*.

EL MARITIME STATIONS

The Liberia Radio Amateur Association literally receives hundreds of QSLs monthly slated for EL maritime stations. The society is unable to forward these cards because all but two EL maritime operators are unknown to them. Those two known to the LRAA bureau are EL0AL, whose local QSL manager is EL9A, and the other is EL0AV, who provides the bureau with envelopes for forwarding his cards.

LRAA points out that most maritime mobile cards are for illegal operators. Their Bureau of Maritime Affairs has asked them to obtain the name of the vessel when contact is made with these operators. Accordingly, LRAA requests your cooperation by asking you to obtain the vessel's name whenever a contact is made and to include that information on the QSL, if forwarding via the LRAA bureau.

TL8RP/F1DCI

TL8WH reports the sad news of the tragic death of Pierre Rouyre, TL8RP/F1DCI, in mid-July. Peter was perhaps better known to European DXers and 2-meter buffs. He played a major role in all phases of TL8 operations from Bangui and was responsible for setup operations of TL8WH and TL8CN. Pierre was also responsible for several repair operations to TL8WH and TL8JM, preventing long delays in their operations because of lack of available replacement parts in the Central African Republic. Peter played a major role in the establishment of the first and only 2-meter network in the CAR. His death was the result of a terrorist bombing and, ironically, he was due to return to France the week following this sad event. His death is a tragic loss for all hams in Bangui, and for ham radio as a whole.

TIMELY TOPICS — ACT 2

☐ K3ZO now has the situation well in hand regarding the backlog of 1978-80 HS1ABD QSLs. With the aid of K3EST any cards still outstanding can be quickly replied to. If you're still missing your pasteboard, write to Bob Cox, 6548 Spring Valley Dr., Alexandria, VA 22312. Incidentally there appears to be a pirate using the call XZ2AD, giving Bob as his QSL manager. Neither K3EST nor K3ZO know anything about this particular bird. Listen for the ubiquitous Fred Laun soon from K3ZO/HK3.

☐ Thanks to K1WJ for making sure you're all aware of the annual New England DXCC Dinner (AKA "The Scrodfest"), which will be held October 10 at the Holiday Inn on Rte. 128 in Waltham, MA. There will be afternoon slide shows and DX presentations followed by the evening banquet. For further details don't delay contacting Bill Poellmitz, K1MM, 44 Sunset Dr., Framingham, MA 01701.

☐ Long-time QSL Manager W7OK handled many cards for many hams, and his departure for the land of silent keys is one we all deeply regret. His efforts will be carried forward, however, by N7YL and K7TRG. N7YL will be handling cards for: FK8CR FK8BG T3KA T3LA VR1AF VR1AG VR3AR VK4FJ/LH T3LAB and T32AB, while K7TRG will be returning QSLs for: P29DP VK4AK VK4AK/VK9 FW8AD VP2KN VP2KA and T3LAA. Valid cards may bear the signature of the DX station itself, W7OK, N7YL or K7TRG.

☐ Late summer saw plenty of activity from YO0WUG, a special station plenty QRV from the World University Games in Bucharest. QSL via YO3AC.

☐ The Wiesbaden ARC will be going to Luxembourg for the CQWW-Phone, Oct. 24-25, with probable operation before and after the contest. The call used will be DA1WA/LX; operation anticipated 10-80 meters. Stateside QSLs (with s.a.s.e.) go to Steve Hutchins, Box 4573, APO, NY 09109. All others go to Dr. Hugo Jakobljevich, DS0LC, AM Weinberg 10, 6200 Weisbaden-Auringen, West Germany.

☐ What's Niue? ZK2BGD can be found on the low end of 20 cw and (to quiet the howling masses) says he'll be there a year. QSL via Box 37, Niue Island, South West Pacific (via air for 3 IRCs).

☐ Reference material that is a must in your shack includes two items from the reknowned Geoff Watts, 62 Belmore Rd., Norwich NR7 0PU, England. For $2 U.S. his Radio Amateur Prefix-Country-Zone List will be winging your way with that special tabulation you've always needed (the list that gives you everything, and all on one line!). Included for each country are: DXCC status, normal prefix, special prefixes, ITU call-sign block allocation, continent, CQ Zone Number and ITU Zone Number. Additional information is included on the Antarctic stations, USSR club stations, obsolete prefixes, and so on. The other item (also $2 U.S.) is his 15-page Directory of Islands list, which delineates all islands that count for the Islands on the Air Award.

☐ K9VV operated from Andorra with the call C31WK from May 23-29, 1981. He shared the DX-pedition station with F6EXV who operated as C31VK. The brief stay netted 3170 two-way contacts with peak QSO rates topping 150/hour on phone and 125/hour on cw (thanks to the cooperation of those participating in the brisk pileups). QSLs for C31VK go to his home call, F6EXV, and cards for C31WK go to Bob Cicone, KB9AW, 3204 Ridgewood Dr., Champaign, IL 61820.

☐ KA8HSM reports her brother WA8FEN has gotten bitten by the DX bug and has developed a severe case of country-itis. He had two countries worked late summer of last year and within a year went to over 220 on phone. It's tough on the family, though; Helen says they can talk to him only between QSOs!

☐ W4PRO reports he was 100% current on cards for the W4GSM/W4PRO Easter operation as of midsummer — but he was awaiting the bureau avalanche to remedy *that* situation!

☐ DL7RT and DL7SP are planning to operate GD5DLV and GD5DLW in this month's CQ-WW, all bands, multi-single. DL7RT's June EA6 operation was quite successful, and he thanks the multitude for their patience with his slow cw. Past DXpedition-type operations have included HB0, OH0, EA6, 3A0, 4U1 and GD5. See you next from ?

☐ Record keepers take note! W1DV/DU2 submits his claim for what may be a new odd-ball record for QSL card delivery accumulating the longest distance traveled before delivery was effected. On Feb. 14 (this year) Dave worked JR2EEJ in Nagoya, Japan, from his Philippine QTH. Using his old address in the Callbook, JR2EEJ mailed his card from Japan to Dave's prior stateside address in VA. The card was then forwarded by the Postal Service from VA to Dave's current Subic Bay, Philippines, address. Since he maintains no cards there, he mailed it back to his QSL Manager, WA2RKX in Rochester, New York. When the transaction was finally completed and the card sent to JR2EEJ, approximately 48,000 miles had been traversed by QSLs for a QSO that spanned just a couple of thousand miles!

☐ A few items selected from the Northern California DX Club *DX Dictionary: stacked beams* — an awesome array where one beam is used to ionize the transmission path and the other to send the signal; *inductor* — a ductor accepted by the group; *exciter* — a BY or ZA station; *ionized layer* — a phenomenon caused by a DX Contest; *jammer* — a crazy who failed at CB radio.

☐ W9ALZ reports working U2Q on 15 cw during the summer who said to QSL via UK2GCF. A reminder — the ARRL DXCC List delineates the Russian prefixes quite well; generally, the letter following the number will pretty well clarify which of the Russian entities you've worked.

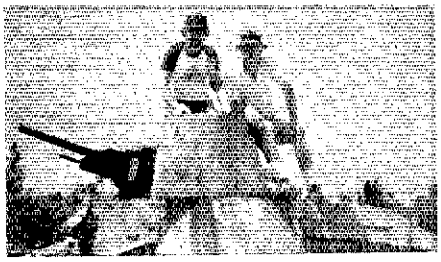
☐ W4LCL has returned to Indonesia and is soon to be on the air again as YB0ACL. QSL via Charlie Trice, WA4RRB, 50 N.W. 189 Terrace, Miami, FL 33169. Chas has all of the YB0ACL logs dating from Nov. 18, 1979, and will handle any requests for QSLs after that date.

☐ As usual your scribe finds K5FUV's words of wisdom in *QRZ DX* quite applicable to day-to-day problems of writers. We depend upon reader support. Without other ears out around the world we'd be out of touch, even when we personally are on the air a lot. Writers would rather have 100 reports of something happening than have everyone assume we already know it. Keep the mail rolling — we need your help.

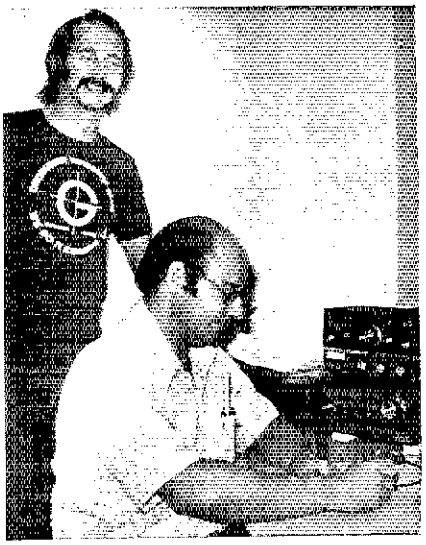
*19620 SW 234 St., Homestead, FL 33031

ACT 3

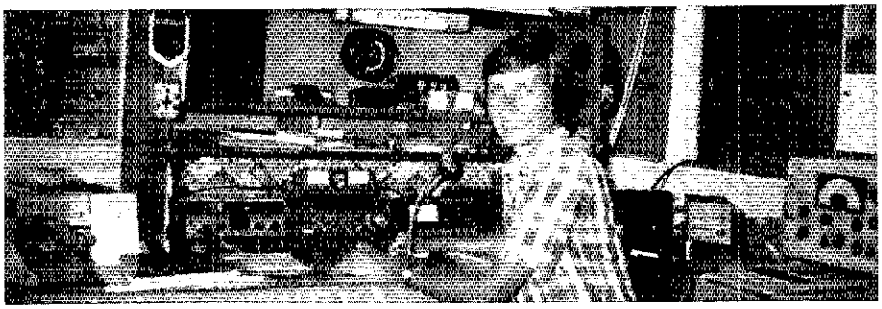
A pulse-rattling Asian twosome: JA8BI operating 9K2AH during his stay in Kuwait between Oct. 1980 and June 1981 — to the tune of some 5000 QSOs for Kunio-san!



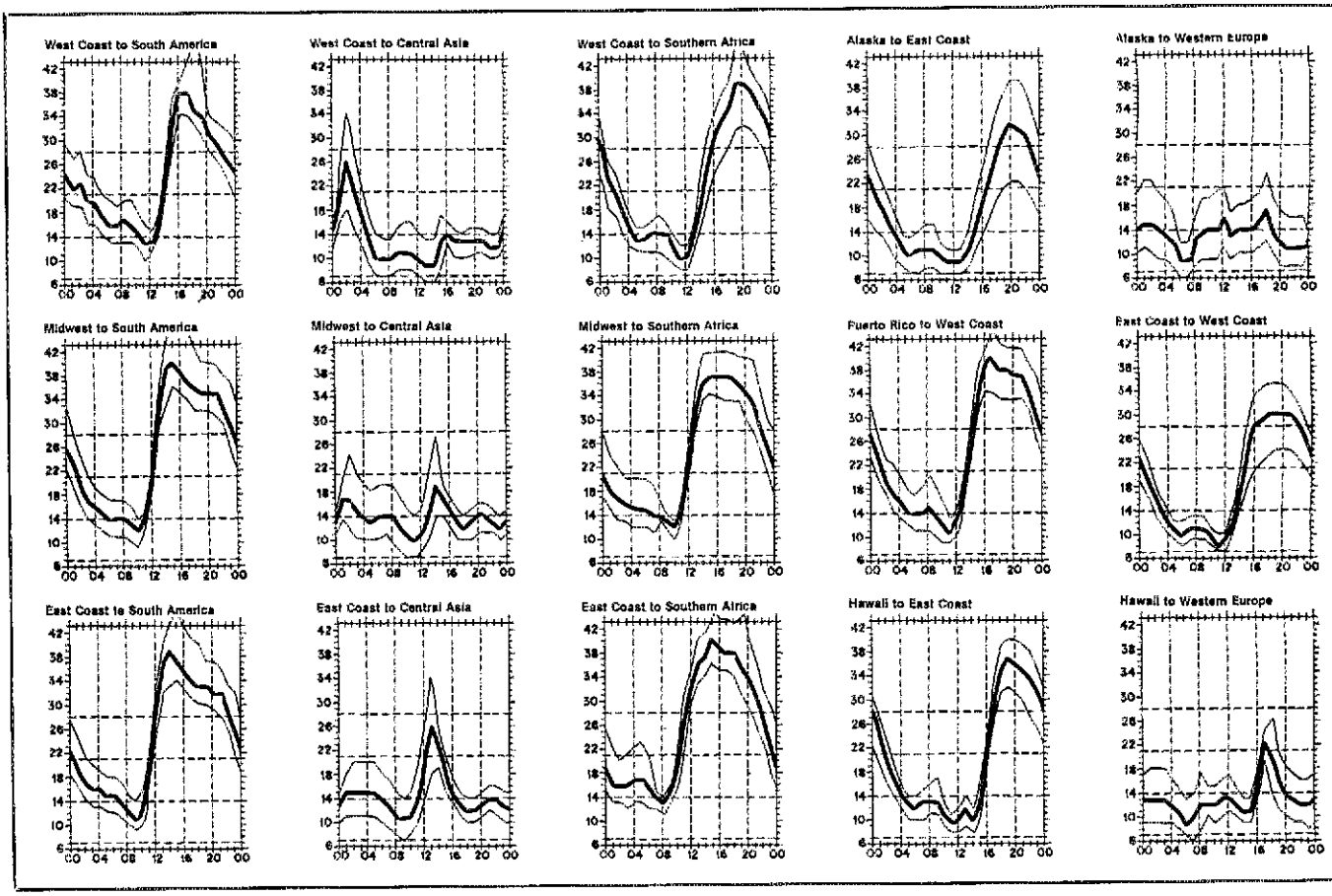
The late-March Minami Torishima operation under KA1AA was put on by "big guns" KA2AA (right) and KA2AK, operating from the USCG building. Cards, please, to WA4TKR and *not* to the W-issued KA1AA, who is sure to be sick of the whole thing by now!



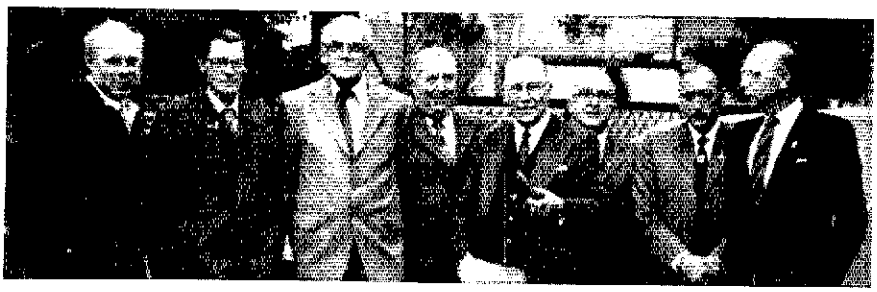
VK4NIC/3X (left) with K4YT operating Ian's station while Karl was on assignment in Conakry (7000 contacts phone/cw; all via W2TK). Recent visits of Karl have included 5T5DX, C5ACO, 6W8JO, VK4NIC/3X (Feb. 21-March 1, 1981 only), TU4BA, 5V7HL (April 6-9) and TYA11 (April 10-16, 1981). Upcoming soon will be some interesting pileups resulting from Karl's plans for ZE, A2, 7P8, 3D6, ZS, 5R8, 3B8, 5H3, 7Q7, 9J2, 9U5, 9X5, 5Z4 and 601. See you in the pileups!



P29NSF, YL Siegi, operates from Rabaul, PNG, QSL via Box 165 (thanks WØHYE).



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



DL7AA, an eminent DX personage in Amateur Radio, just recently attained his 70th birthday. Numerous old-time Berliners organized a very well-attended 40-meter birthday QSO Party for him. Always high in the ranks of both DXCC and spirited DX Competitions, Rudi is known as the founder of legal Amateur Radio activity in Berlin (post 1945) and is also known as the father of WAE and WAEDC. *(DD3OE photo)*

Bob Black, WA4SKE (left), visited many DX stations on a recent around-the-world trip. Here he is in the shack of Ismail "Ishee" Razak, 9M2FK, in Penang, Malaysia. *(WA4SKE photo)*

QSL Corner

Administered by Joan Becker

Here is some QSL 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.

A9XDD (K7DVK)
EL5G (K3RB)
FØGOP (KA1GC)
FO0RB (W8LCZ)
G3MUV/CEØ (WD4HMG)
HB9EU/S7 (HB9EU)
HP1XK (DL1HS)
OH2OT/OHØ (OH3CV)
OK6DX (OK2BKR)
PZ5DR (K3BYV)
PZ5JR (K3BYV)
T5TI (IØSSW)
VP2KAY (WA2IFZ)
VP2MMR (KL7IHP)
VP2MNQ (W9OEH)
VP2VDG (W4KA)
YBØACL (WA4RRB)
YS1GMV (W3HNK)
ZD7SE (KA1DE)
5NØPEE P.O. Box 2873, Lagos, Nigeria
5W1DH (VK2BKD)
5W1DI (VK2BJL)
7X5AH (AD1S)
8P6FX (WA4RRB)
8P6MU (WA3ZSR)
8P6NC (N4CTC)
9G1SD (WAØUOX)
9Y4CDR (WD5JOL)

QSL MANAGER VOLUNTEERS

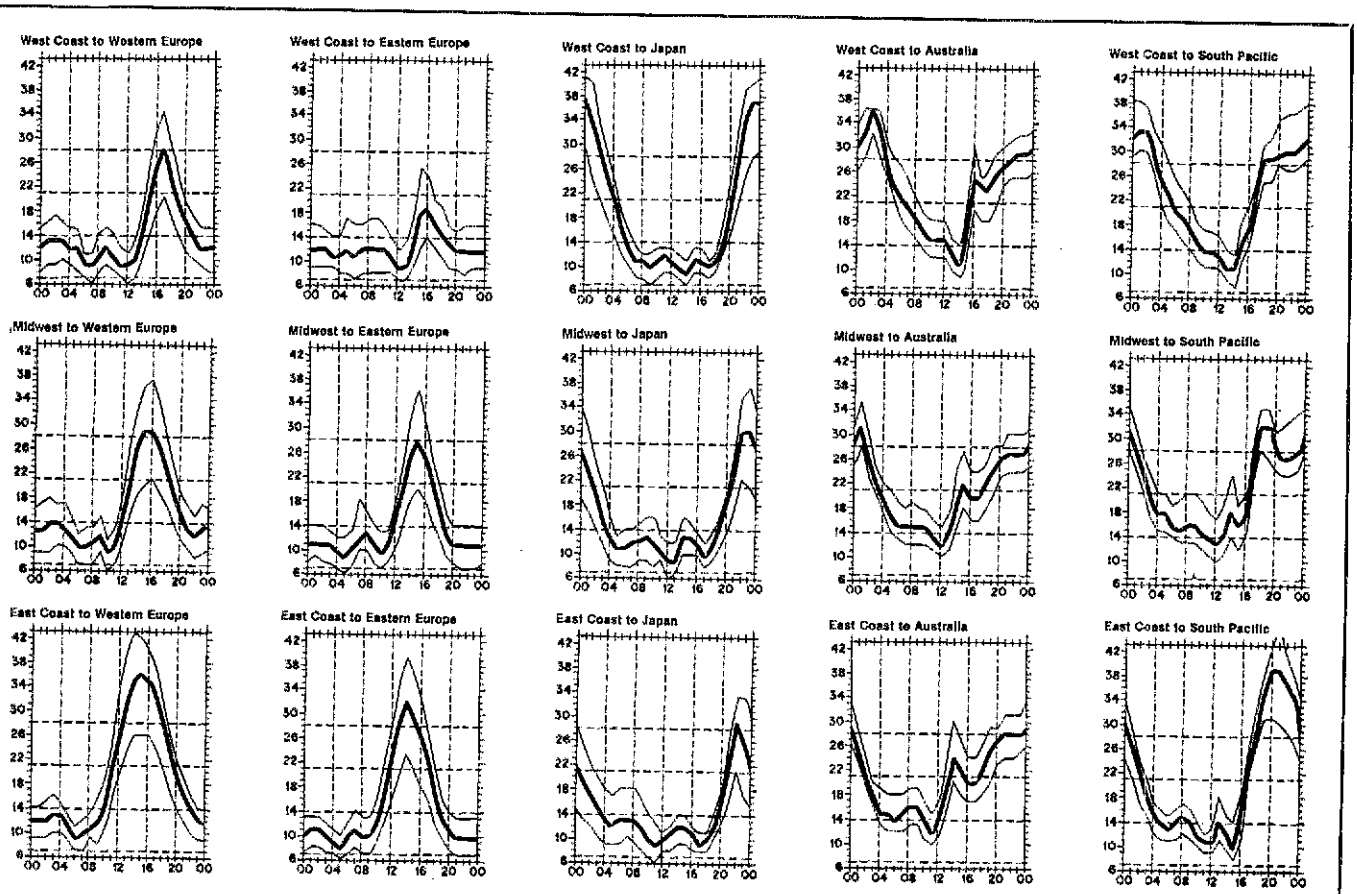
KB3OM
WD8RHP
KA4RSA
LA4YW
WD4JQD
CT1APF

QSL BUREAUS

"QSL Corner," September 1981, page 67, contains information about the ARRL-Membership Outgoing QSL Service.

In July 1981, page 63, appears a list of Incoming Bureaus and addresses.

For information about bureau operation (Incoming and Outgoing) send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.



lowest curve (optimum traffic frequency, or fot). See 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, 1981, to November 15, 1981, assume a sunspot number of 121, which corresponds to a 2800-MHz solar flux of 168.

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 June 19 through July 16, 1981. 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

DJ4EN/109 J6LLO/107 OK3KVE/103 KA1BEE/109 KA4CAP/105 W4MOY/212 KB6N/104 KB8QD/128 N9AMW/107
DJ6GK/165 J7DBB/105 ON5NT/320 W1SVR/101 KA4DJY/103 WA4TUU/100 KG6I/103 KB8XN/103 W9FI/159
DK5WP/102 JA1VDL/102 PA3AMT/101 W1WZQ/100 KA4LKZ/128 WA4VPH/103 KK6K/108 W8FN/132 W9JOP/105
DK6IB/102 JF1TEU/105 PAØFKP/110 WA1IZS/114 KC4IT/273 WA4YNP/105 N6OU/106 W8QGP/187 W9MMJ/110
DL7OU/122 JL1BLW/114 PP5AVV/115 K2KIQ/105 KC4YY/101 WB4GNT/283 W6UE/112 W8TWJ/135 WA9EOD/185
DL9CA/104 JA2APA/289 SL6DO/122 KB2CV/257 KD4BY/107 WB4UAM/102 WA6JDB/104 WA8FCH/110 WA9SUG/110
EA9IE/262 JA2NDQ/264 VE7YC/221 N2NW/108 KR4J/102 WD4CJU/105 WB6IYM/107 WA8WMC/113 WA9ZUC/115
F6EXC/127 JA2ODB/160 VP2KAH/108 WA2SXC/112 KT4M/218 WD4CVR/100 KA7APJ/100 WB8RUQ/113 WB9TNQ/100
F6GBH/103 JR2IEG/132 VP2SAX/102 KB3I/101 N4BLV/105 KA5FPK/102 KB7OA/102 K9QOF/111 AKØG/105
HB9BDH/110 JH5FTY/109 YO6AJF/105 KB3MC/102 N4EOF/110 KM5K/136 N7NF/111 K9VFE/215 KØZK/110
HI6XQL/105 JA7BVA/153 ZS5MY/102 W3WE/105 N4TL/111 KN5F/100 WB7DBP/120 K9XL/102 KCØDA/118
HK3TF/183 JA7EMH/207 AE1O/130 WA3VUQ/171 NJ4C/102 WD5ETI/105 AF8N/108 KB9LI/110 WØCZE/121
HK5JS/114 JA8DON/110 K1MNR/125 K4KKQ/154 W4GIO/159 K6TMB/141 KA8ELW/113 KB9PY/129 WAØMWZ/103
J3ABV/104 JAØBMS/130

Radiotelephone

AP2JL/108 JL1BLW/104 VK4FS/109 W2LSQ/103 N4TL/111 WD4LYQ/103 WA6SUV/101 N8BZA/100 WA9EOD/122
CT1LF/111 JA2NDQ/207 VK9NS/155 WA2BLO/106 NI4P/222 K5MZG/102 WB6BEL/190 K9VFE/205 WA9IAL/106
DK6GK/110 JA3AYX/103 YU1NAL/116 WB2OQY/103 NM4O/104 KC5KX/107 WD6EKO/154 K9VIQ/100 WB9TMH/103
DL9TD/103 JH5FTY/108 4X4AN/140 WB2SBO/108 W4MOY/161 W5LLU/104 KA7IJA/203 KA9ERX/109 KØHRF/103
EA3AGL/110 JA8DON/110 W1BXX/190 K3PPW/169 W4OVK/110 WA5ISZ/115 KB7NL/103 KB9PY/115 KAØDXG/109
EA6GK/103 ON5NT/319 W1FBG/119 KB3ED/109 WB4IYY/101 WB5ROW/104 W7HAZ/100 N9AMW/103 KAØHBD/110
EA7WD/154 OZ1BNZ/164 W1SIX/112 WA3KSA/106 WB4LCB/101 K6QGV/237 WB7DBP/120 N9AZK/105 KBØCO/106
EA9IE/262 OZ1BOD/164 W1ZT/110 WB3JEX/108 WB4UAM/102 K6TMB/131 AF8N/103 N9AZR/102 WØCZE/120
HC2RG/118 OZ3FC/106 WA1ZVI/104 KA4AJZ/102 WB4VMB/115 KD5WD/103 KA8ELW/111 N9LE/272 WØEXJ/130
HK3AFD/109 P29NRL/116 K2YVL/111 KC4CY/104 WD4CJU/104 KK6K/105 KB8XN/101 W9FI/154 WØWJ/104
JA1MJ/129 VE2FOU/101 KA2HTH/103 KD4BG/112 WD4IKI/167 KQ6H/216 KC8BK/160 W9IHB/109 WDØBOS/109
JF1TEU/105 VE7YC/213 KB2TN/102 KF4L/107 WD4KWI/141 W6KON/305 N8BDI/119 W9IU/248 WDØCFZ/153

CW

DL5FF/116 JA2EGM/105 JA7BVA/152 SMØBZH/180 KA4HWG/110 NN4B/100 W6SWM/104 KB8BS/121 W9IU/125
DL9TD/109 JA2NDQ/173 JH7QNG/103 AE1O/116 KV4F/102 W4MOY/137 W6TD/101 WB8RUQ/103 W9RKP/104
JA1GRH/106 JR2IEG/130 JAØBMS/111 WB1ATZ/100 N4VZ/231 WB4LFM/232 WB6FDQ/108 K9GX/100 WA9EOD/108
JA1MIN/220 JA3MNP/204 OZ8QW/108 K2LS/113 NA4D/106 WD4SII/101 K7RDG/208 KB9LI/107 WB9PIR/100
JA1VDL/101 JH4UVU/142 PAØFKP/103 WB3GPR/107 NE4F/116 K6ZUR/100 WA7OBH/100 KE9A/178 KØZK/106
JH1LME/100

RTTY

N4WW N4SF

5BDXCC

W9VA KG4W OA4OS LZ1FI JA1BK WA4TLI SP3KEY FM7AM K2OJD
NØNO WB6RSE JAØAFD LA6OT

Endorsements

Mixed

DF2HL/256 JH4UVU/158 YU2CAW/260 KA2CFH/126 KA4JMZ/130 W4JII/292 K5EOA/282 W6TC/319 K9BWQ/307
DJ1ZG/300 JR4OZR/314 YU2HDE/283 KB2EN/286 KC4FU/223 W4LSI/143 K5TA/270 W6TD/171 K9GX/290
DJ3GG/316 JA6CNL/310 YU2OB/300 KF2G/124 KC4FW/153 W4LVM/311 KG5J/171 WB6FDQ/138 K9NB/289
DJ4OP/252 JA7GLB/305 YU2ROZ/213 N2ATD/267 KC4FX/199 W4NBV/319 N5AN/315 WB6WKM/204 KB9BR/261
DK3SF/318 JA7ZP/284 YU3LF/197 N2LM/322 KC4PY/127 WA4DAN/295 N5XX/301 K7RDG/292 KB9JF/228
DK5IZ/160 JA9GPA/226 ZL1AMO/325 W2AXZ/280 KC4U/281 WA4FVT/286 W5CPI/309 K7ZR/315 KB9OX/131
DK8NG/302 JY5ZM/225 ZS6IW/344 W2HL/258 KN4B/300 WA4GFC/129 W5JC/335 KA7IJA/205 N9AMF/264
DL2QB/220 KH6BZF/276 4Z4DX/312 W2RQH/224 KS4C/153 WA4JTE/173 W5QN/301 W7DNY/284 N9ANR/191
DL6MK/335 LA4LN/212 9V1TL/209 W2UI/320 KV4F/290 WA4JZS/131 W5RJC/273 W7EDA/282 W9GN/206
DL7UX/295 LA5IU/262 AK1N/173 W2VYX/305 KV4L/279 WA4LOF/296 WA5WDB/136 W7JKA/197 W9IU/335
DL8BU/222 LA5WN/225 K1DP/280 WB2CJU/212 KX4R/272 WA4MDS/165 WB5ZAM/214 W7RV/333 W9NUD/209
DL9TD/179 LA8CJ/305 K1JA/265 AG3H/149 N4BFA/134 WA4MOQ/225 WD5JFM/204 AC8K/315 W9TA/298
EA1FD/308 OH2VZ/308 K1UO/306 W3DDG/175 N4BQD/200 WA4OPV/151 AA6AA/302 AC8R/211 WB9PIR/130
EA3WZ/148 OK1DKR/200 KB1U/227 W3HDH/222 N4CT/221 WA4TLI/311 K6OZL/325 K8HHZ/130 WB9VGJ/200
F2BS/333 OZ1CTK/293 N1AFC/202 WA3EEE/216 N4DA/279 WA4VDE/300 K6QGV/265 K8PCZ/286 WD9BHK/127
FR7BP/180 OZ4RT/306 N1AKX/230 WA3OFR/150 N4DSR/151 WB4EBX/233 K6WD/302 KB8BS/273 WD9CJG/150
GI3ZCK/125 OZ6ZZ/239 N1II/175 WB3KUH/187 N4DVW/143 WB4LFM/313 KD6GW/200 KC8BK/166 WD9GGY/202
HB9BLQ/224 OZ7NJ/229 N1YL/290 AA4DR/296 N4GE/301 WB4NDX/307 KD6LB/175 KK8K/131 KØAYO/124
HB9BZA/180 OZ8SS/347 W1DA/322 AA4RM/130 N4HH/310 WB4PAB/301 KM6N/202 N8AVK/150 KØGSV/311
HB9IK/325 PY6ABZ/134 W1DQH/300 AA4VK/292 N4IA/308 WB4VMB/119 KS6A/260 N8BC/206 KØHQW/164
HB9WZ/207 SM5CAH/131 W1LQQ/325 AE4Q/314 N4NX/308 WD4ARY/203 N6BTY/178 N8BRT/149 KØIEA/321
HI8LC/297 SM6CMU/312 W1MLG/294 AE4Z/310 N4OL/316 WD4FWE/200 N6CR/295 W8PBO/261 KØIIR/177
HK3AXT/221 SM6CTQ/306 W1PL/245 K4BYK/264 N4RR/310 WD4IKI/185 W6DPD/255 W8ZNH/149 KØPCG/196
HK3SO/131 SM6JAO/202 W1VV/308 K4NV/250 N4YO/276 WD4KWI/204 W6MUM/330 WA8JOC/215 KBØOE/230
IT9TNO/262 SM7BOL/292 WA1EOT/307 K4PHE/263 NA4D/265 WD4LRB/140 W6OKX/282 WB8VKL/208 KCØQ/230
JA1AIF/220 SM7TV/309 K2JT/180 K4SJ/168 W4CEB/257 WD4RCO/260 W6PLK/325 WD8KEO/126 NØBSH/200
JA1NTK/156 SMØBZH/260 K2LS/241 K4TIA/245 W4DMB/200 AA5C/226 W6PMT/291 WD8KKF/281 NØZA/250
JA1NVB/250 VE2AFU/286 K2OY/132 KA4BWD/152 W4DXI/296 K5AS/275 W6RQ/261 WD8OWM/221 WØBA/284
JH1OJU/282 YU1NOT/165 K2QF/260 KA4C/266 W4FL/207 K5BDX/201 W6SQP/352 AF9C/202 WØSMV/321
JJ1KUV/199 YU1NPG/227 K2TV/299 KA4DLC/152 W4JFL/143 K5DPG/153 W6SSC/250 AI9R/279 WØWJ/131
JA3ARM/145 YU2BOP/265 K2UPR/199

Radiotelephone

AH6AY/189 JA1DM/320 SM6JAO/198 N2BOS/199 KC4FW/152 WA4LOF/292 KM6N/153 N8RF/316 KB9JF/224
DF2HL/251 JA1JAN/319 SM7BOL/291 N2LM/298 KC4IT/269 WA4PPS/213 N6CR/294 W8NK/175 N9AMF/264
DJ4OP/206 JA1NTK/152 SMØBZH/174 W2IFK/175 KC4PY/127 WA4TLI/306 W6DPD/255 W8NVP/300 N9ANR/190
DK6KK/203 JA1NVB/242 YU1NPG/173 WB2CJL/186 KE4I/322 WA4VDE/298 W6LUR/200 W8SET/301 N9ABA/310
DK6XR/307 JJ1KUV/165 YU2CAW/228 K3RX/300 KF4M/160 WB4GNT/284 W6PMT/290 W8UVZ/219 N9IGK/224
DK8II/137 JA2APA/289 YU2OB/262 K3SGE/317 KN4H/197 WB4LFM/295 W6RGQ/250 WB8VKL/201 N9NUD/176
DK8JS/161 JR4OZR/303 YU2ROZ/200 W3DCT/154 KT4M/218 WB4NDX/206 W6SSC/246 WB8VZB/152 N9RKP/282
DK8NG/286 JA6CNL/281 YV5AJK/345 W3GNM/125 N4AYJ/125 WD4ARY/203 WA6CTX/208 WD8IPJ/231 N9TA/292
DL9DY/325 JA7GLB/300 YV5AXQ/340 AA4VK/291 N4NX/303 K5AS/186 WA6IJZ/270 WD8KEO/125 N9VNI/127
EA1FD/296 JA7ZP/273 AK1N/150 AK4T/260 N4YO/276 K5CON/180 WA6OEY/225 WD8MOJ/128 N9YRM/304
EI8DE/206 JH8GWW/231 K1CMI/308 K4BYK/257 W4LSI/124 K5HT/199 WB6KQI/176 WD8OWM/221 N9ZTD/304
F2BS/331 JA9GPA/175 K1RAW/305 K4ILX/137 W4NBV/303 KF5X/209 K7JNB/135 WD8QEO/201 N9ZTP/201
G4BAL/153 KG4DI/152 K1UO/305 K4PI/297 W4OWY/252 W5RJC/226 N7ABJ/230 AF9C/143 WA9JNM/150
HB9BLQ/201 KH6BZF/270 N1AKX/202 K4TO/304 W4RKN/251 W5URN/226 W7DNY/280 AI9R/259 WB9VGJ/200
HK3AXT/220 KP4AE/204 W1LQQ/296 K4URK/250 W4RNZ/219 WB5LSV/161 W7MSI/278 K9BWD/307 KØARY/178

HK3SO/130
HK3TF/182
I1HAG/302
I1HYW/271
I4WZK/296
I7RNH/310
IØPSB/179
JA1AAT/326

LA4LN/196
LA5IU/260
OH2VZ/231
PY1NCJ/200
PY5GA/292
PZ1BK/225
SM6CMU/295
SM6CTQ/266

W1NG/312
W1NM/230
W1VRK/271
WA1EOT/287
WA1IRN/239
KB2CV/250
KG2U/263
N2ATD/264

K4XG/310
KA4BWD/131
KA4MNS/151
KA4C/236
KA4D/299
KA4FQZ/174
KA4EKO/124
KB4IT/273

W4UWC/341
W4ZCB/290
WA4FHQ/279
WA4DAN/288
WA4FVT/274
WA4JTE/173
WA4HNU/244

WB5ZAM/149
WD5DBV/281
WD5JFM/195
AA6AA/302
AE6T/225
K6DQ/241
K6EDA/278

W7OM/314
K8CDM/270
K8LZ/312
K8PCZ/282
KB8BS/278
N8ANC/268
N8BRT/149

K9FYZ/300
K9GX/390
K9HDZ/300
K9LWT/199
K9VQK/283
KB9BR/261
KB9IS/270

KØGSV/280
KØHQW/162
KØPCG/171
KBØOE/225
NØCC/150
WØBA/284
WBØVLL/138

CW

DF2HL/126
DJ4OP/151
DK8NG/265
FR7BP/164
GM3YOR/187
HB9WZ/189
JR4OZR/292
JA6CNL/197
OZ1BII/161

OZ1CTK/267
OZ1DYU/202
OZ6ZZ/176
SM6CMU/253
YU2OB/194
YU7OQL/160
9V1TL/164
K1JA/234
N1YL/126

W1LQQ/194
W1MLG/262
W1ZT/126
K2JT/141
W2FP/284
W2NC/280
KA3P/133
W3ESU/151

W3GRS/296
W3HDH/197
K4JC/255
K4NV/250
K4XO/291
KE4I/290
N4HI/240
N4NX/278

N4RR/250
W4YDL/125
WA4DAN/255
WA4FVT/117
WA4LOF/161
WA4QLL/191
WB4EBX/145
WB4FOT/138

WD4AHZ/125
K5AS/252
K5BDX/179
K5EOA/227
K5OGX/202
K5WE/172
N5DX/259
N5XX/219

W5JW/262
W5SJ/249
AA6AA/294
K6WD/215
KM6N/128
W6MUL/176
W6OKX/233
W6TC/283

K7ZR/270
N7CM/227
N7RO/200
W7EDA/186
W8AH/302
W8NPF/150
WD8KKF/145
AF9C/157

AI9R/204
K9IW/239
W9DWQ/297
WA9EKA/200
KØGUG/176
KCØQ/203
WØOGJ/155
WØRJU/225

Honor Roll

The DXCC Honor Roll is comprised of those call signs which have been credited with at least 309 countries of the 318 current countries on the DXCC list.

Mixed

318
DJ2BW/357
DL1HH/349
DL1JW/352
DL1KB/360
DL6EN/355
DL7AA/360
DL7AP/353
DL7EN/356
DL9OH/351
G3FKM/357
G3FXB/357
GW3AHN/359
HB9MQ/357
IØAMU/358
JA1BK/347
LU4DMG/355
LU5AQ/354
LU6DJX/364
OE1ER/362
OH2BH/342
OH2NB/361
OK1ADM/345
OK1FF/358
ON4DM/356
ON4NC/360
PY2CK/363
SM7ANB/348
VE2NV/357
VE5RU/352
ZS6LW/353
4X4DK/358
4X4JU/355
W1AA/353
W1AFF/346
W1BIH/363
W1CKA/350
W1DGJ/344
W1DK/358
W1FZ/358
W1HH/351
W1HX/360
W1HZ/358
W1JR/356
W1NU/354
W1OO/339
K2BK/354
K2BZT/357
K2FB/347
K2FL/356
K2LWR/354
K2PXX/344
K2TQC/347
K2YLM/340
W2AG/360
W2AGW/364
W2AO/357
W2AX/355
W2BHM/353
W2BMK/351
W2BOK/356
W2BXA/364
W2CP/345
W2CR/357
W2DOD/358
W2FXA/352
W2FZY/353
W2GK/341
W2GQN/341
W2HTI/356
W2JVU/361
W2LPE/357
W2NUT/356
W2OKM/358
W2PV/342
W2QHH/360
W2QM/355
W2SSC/356
W2TP/349
W2TQC/353
W2UE/355

W2YY/348
WA2DIG/349
WA2RAU/341
WA2RLQ/341
K3MO/353
W3AFM/353
W3CWG/356
W3DJZ/346
W3EVW/360
W3GH/355
W3GRS/352
W3KT/363
W3MP/362
W3NKM/357
K4EZ/346
K4IKR/338
K4KQ/358
K4LNM/354
K4PDV/357
K4YR/356
K4YYL/340
W4AAV/361
W4AIT/363
W4BQY/362
W4DR/356
W4EO/354
W4EX/364
W4GD/360
W4OM/361
W4QM/347
W4QQN/341
W4SSU/347
W4UG/342
W4WV/351
W5AQ/351
W5HE/341
W5KC/363
W5MMK/361
W5NUT/353
W5PQA/358
W5QK/351
W5QKZ/346
K6DC/356
K6EC/354
K6EV/346
K6KII/352
K6LGF/352
K6OJ/361
K6ZM/345
K6ZO/364
N6AV/341
N6FX/347
W6AM/365
W6BA/359
W6BZE/360
W6EE/361
W6EL/345
W6ET/352
W6UF/339
W6FW/344
W6ISQ/347
W6KTE/342
W6KZL/356
W6PT/357
W6QNM/349
W6REH/346
W6RT/357
W6ZM/350
W7AQB/352
W7DX/348
W7GN/356
W7IR/359
W7JYZ/348
W7KH/363
W7LDC/358
W7MB/364
W7OF/357
W7PHO/358
K8DR/351
K8DYZ/340
K8FL/341
K8IFF/330
K8ONV/348

W8AH/356
W8ARH/343
W8CUT/347
W8DMD/361
W8GT/363
W8GZ/363
W8JBI/358
W8LKH/359
W8MPW/358
W8OK/351
W8PHZ/355
W8RT/358
W8ZCQ/353
K9AB/353
K9ECE/349
W9BG/365
W9CH/348
W9DWQ/353
W9DY/352
W9HB/354
W9JUV/358
W9RCJ/352
W9SFR/355
W9TKD/349
W9ZM/363
WØAX/360
WØBW/361
WØDU/362
WØELA/363
WØMLY/361
WØPGI/356
WØQGI/356

317
DJ7ZG/340
DL1BO/355
DL3RK/356
DL7FT/340
DL7HU/348
DL7HZ/345
DL8NU/335
G2BVN/356
G3AAE/358
G3HCT/350
I1ZL/351
I2KMG/339
IT9ZGY/354
JA1BN/344
JA1BRK/342
JA2JW/349
KP4RK/349
OH2QV/344
OH4NS/339
ON4IZ/344
ON4QJ/341
OZ3Y/353
PY1HQ/354
PY1HX/352
PY2PA/340
PY2PE/340
PT7YS/349
SM3BIZ/356
SMØAJU/351
VE7GI/362
VK4QM/362
XE1AE/348
YS1O/353
YV5AB/356
YV5ANF/344
ZL1HY/363
ZL3IS/352
K1YZW/337
W1CBZ/352
W1GKK/365
W1JNV/354
W1MIJ/346
W1MV/356
W1RLQ/346
W2AYJ/357
W2GC/353
W2GLF/352
W2GT/357
W2LV/358

W2NC/339
W2PN/340
K3GL/357
K4ID/341
K4JC/344
K4RPK/347
K4SM/357
W4BFR/347
W4EEE/355
W4EEU/340
W4IF/350
W4NL/334
W4TM/360
W4ZD/349
K5FJ/352
W5GO/352
W5IO/358
W5LCI/349
W5RDA/345
W5UN/353
K6JG/339
K6KA/334
K6QH/339
K6RN/348
K6WR/345
K6YRA/340
N6AR/343
W6BS/356
W6CHV/358
W6FF/352
W6KNH/335
W6KUT/358
W6MUR/351
W6ONZ/350
W6RGG/340
W6RJ/343
W6RKP/354
WA6GFE/338
W7ADS/357
K8EJ/338
K8FF/343
K8OHG/343
W8PR/341
W8QY/352
W9QLD/340
W9RKP/355
WØAIH/354
WØGKL/350
WØLWG/350
WØSYK/357

316
DJ5DA/339
DLØKQ/339
DL3BK/350
F3AT/349
F9RM/348
G5VT/357
GI3IVJ/352
HB9KB/351
HB9MX/348
HB9PL/348
I8KDB/351
JA1ADN/344
JA1DM/352
JA1MCU/335
JA4ZA/340
JA8ADQ/337
LA1KI/337
OH2QQ/351
ON4UN/334
PAØLOU/350
PY1APS/334
PY2BKO/339
SM3CXS/333
SM5BHW/335
SM6AEK/337
SM6CKS/334
VE3CLJ/335
VE3MJ/337
YV5AIP/347
W1PM/352
W1SD/345

W1WY/350
K2LE/338
W2GKZ/340
W2HZ/334
K3II/352
K4DJ/336
K4HJE/333
K4IEX/343
K4MQG/342
K4XO/332
N4TO/338
W4VPD/354
K5AAD/341
K5RC/335
K5YY/336
W5FFW/353
W5GJ/345
W5HJA/347
W5MMD/357
W5OB/348
K6GA/347
K6RQ/348
N6GM/341
W6BSY/354
W6FET/336
W6HYG/350
W6KG/350
W6TZD/358
W6YB/340
W6YK/355
WA6OET/337
W7CB/334
W7QK/351
W8JQ/338
W8KPL/354
K9BGM/338
K9RJ/336
W9BW/342
W9DC/335
W9FKC/357
W9GIL/355
W9GU/348
W9KRU/336
WØBN/342
WØDEI/349
WØWW/340

315
DJ7CX/338
DL1CF/341
F8RU/331
F9IE/333
G2FYT/348
HB9AHA/333
HB9DX/344
HB9TL/353
I5ARS/342
JA1IBX/337
JA1MIN/335
JA3DY/345
JA8ZO/334
KV4FZ/332
OK1MP/342
OK3MM/351
OZ6MI/332
PY2CQ/338
PY2SO/338
SP7HT/334
UB5WF/350
VE2WA/346
VE3WT/337
VE7SV/336
YU1BCD/340
YU2DX/333
YV5BBU/334
K1DFC/332
K1DRN/336
W1GX/334
W1YRC/332
K2CL/333
K2CM/331
W2MZV/337
W3LMA/359
AA4MM/333

AE4X/350
K4CEB/332
K4MPE/336
K4RA/326
N4EA/334
N4WW/333
W4JVU/335
W4MGN/345
W4ML/356
W4OO/348
W4YJ/357
WB4OSS/331
K5DX/354
K5LIL/335
W5IR/332
W5KGX/353
W5LZZ/335
W5SJ/333
K6CH/356
K6PU/340
K6RF/346
W6CAE/356
W6ID/356
W6KH/349
W6KZS/339
W6UQQ/349
W6YA/343
W6YO/335
K7ABV/336
N7RO/327
W7DY/337
W8DCH/334
W8GKM/331
K9KA/332
K9MM/332
W9BM/347
W9OA/337
W9TKV/352
W9ZR/330
W9ZRX/331
WØBK/345
WØBTD/349
WØSD/332

314
DJ1XP/331
G3JAG/331
GI3OQR/339
GM3ITN/344
I2DEZ/330
IV3PRK/331
IØJX/331
JA1JRK/330
JA1UQP/330
JA2AAQ/332
JA8JL/333
KH6CD/358
LA5HE/347
OE2EGL/332
OH3SR/331
OZ1LO/334
PY3CB/332
SM1CXE/337
SM6AFH/332
SM6CWK/334
UR2AR/347
VE3GMT/331
VE3NE/333
YV5BZ/344
ZL1AV/337
ZS6RM/350
ZS6YQ/345
K1RM/332
N1XX/336
K2AGZ/333
K2JMY/339
K2LGJ/335
W2FG/333
W2LNB/339
W2PPG/332
W2XN/350
WB2HXD/336
K3RS/328
WA3IKK/331

K4CIA/337
K4DY/333
K4KG/338
N4XO/342
W4AVY/347
W4BBP/343
W4BRE/334
W4XR/329
W4ZR/341
WA4WIP/335
K5UC/356
N5RR/331
W5EJT/341
W5TO/335
W5UR/342
K6MA/341
K6XP/330
W6HFL/342
W6HX/359
W6ZO/356
W7CG/352
W7CMO/346
N8DX/331
W8DAW/359
W8ILC/332
W8RCM/331
W8ZD/342
K9AWK/333
N9ZN/341
W9GRF/342
W9KNI/342
K9LT/343
W9ZTD/343
KØCD/345
WØPAH/333
WØZV/344
WAØQAH/331

313
CT2AK/327
DJ6RX/330
DL3OH/331
DL8CM/343
I5UA/349
I2LAG/329
I7ZPB/341
IT9TAI/351
JA1BWA/335
JA2HNP/330
LA8LF/338
OE1FT/346
OH2BC/335
OK2RZ/329
ON4PA/348
OZ5DX/332
PAØFX/354
SM6EOC/327
SM7ASN/330
UB5WE/324
VE1KG/330
VE3AAZ/348
VE3CTX/330
VE7IG/331
ZL1AJU/342
ZS6IW/343
W1AXA/352
W1OT/329
W1UU/341
K2SHZ/346
W2JB/320
K3ZR/327
W3CGS/353
W3GG/328
W3KA/339
W3PVZ/332
WA3ATP/331
K4BBF/330
K4FJ/338
KE4I/328
N4MM/331
N4WF/330
W4AUH/330
W4DRK/341
W4GTS/332

W4JD/326
W4NNH/347
K5UR/330
W5MQ/329
W5NW/353
W5NO/345
WA5IEV/330
K6AO/336
K6EXO/334
K6XW/337
N6ET/330
N6UC/329
W6BVM/348
W6GMF/343
W6QNA/345
W6TWZ/342
W6YHT/328
W6YMV/340
K7KG/330
W7AO/351
W7ETZ/326
W7JFO/330
W8CNL/330
W8EWS/358
W8YA/328
W8YGR/339
K9GM/329
K9JF/327
K9PPY/328
K9RA/329
W9HJ/344
W9HZ/342
W9KQD/333
W9PN/342
W9RF/329
WA9NUQ/333
KØBUR/332
WØMYN/329

312
DJ4PI/329
DJ5LA/335
DK3PO/329
DL1DC/346
DL7BK/343
F9GL/342
G2BOZ/351
G2FSP/343
G5RP/335
I7HH/326
I7WL/329
JA1EOD/329
JA1OCA/328
JA9BJ/329
LA9CE/330
OE1UZ/331
OZ3PO/336
UA1CK/339
UA9VB/341
VE3HD/347
VE7BD/323
YO3JU/329
ZE5JS/331
ZL1ARY/334
ZL4BO/342
ZS4MG/338
K1BW/325
W1JZ/329
W1KG/321
W1NG/327
K2BT/329
K2OF/328
W2FP/329
W2ZZ/330
WA2CBB/330
WB2NYM/327
WB2YQH/327
AB4H/325
K4AIM/344
K4AUL/329
K4EWG/328
K4SMX/323
K4XG/328
N4ZC/332

W4BAA/351
W4BYU/351
W4FPW/327
W4GXB/354
W4KN/340
W4OEL/332
WA4FFW/328
K5GO/326
K5JW/329
N5DX/333
W5DOZ/314
W6GC
W6KYJ/332
W6QL
W6XI/328
WA6DUG/330
N7NG/333
W7CSW/340
W7LFA/329
K8CH/328
K8MFO/330
W8DA/343
W8LBM/328
WB8EUN/327
K9RF/324
W9AZP/339
W9EB/339
W9HLY/341
W9NA/344
WA9LOT/327
WØBL/330
WØGNX/329
WØUD/331

311
DJ4AX/332
G3IOR/342
I1APQ/324
I3EVK/330
JA1CRR/329
JA1ELY/320
JA1FHK/328
JA1ZZ/333
JA2ADH/328
JA2JKV/327
JA3APL/327
JA7AD/343
JA8MS/325
OE8RT/328
OH2BCV/323
OH2VB/328
ON5KD/326
PY1DH/342
PY2DFR/328
PY2ELV/327
PY5ATL/324
SM5API/330
SM5DQC/324
SM6AOU/338
VE3BX/332
VE3GCO/328
VE4OX/335
VE6LU/344
VK3YL/345
YU3EY/327
YV5AHR/334
K1JO/323
K2UVU/343
W2SAW/349
K3KP/332
K3NL/326
K3SGE/327
W3LB/326
W3SO/326
N4CC/323
W4AXR/347
W4ORT/329
W4WD/330
W4YN/335
WA4DRU/325
W5HDS/348
W5JW/329
K6DT/336
K6LU/339

K6OJO/324
N6CW/331
N6DX/340
W6ABA/335
W6AE/326
W6GPB/354
W6MI/332
W6SQP/349
W7BGH/343
W7KR/337
W7OM/329
W7RV/330
W7TE/322
WB7ABK/336
K8VUR/333
W8AD/326
W8CFG/326
AI9J/336
K9OTB/335
K9SM/337

W9GB/341
W9KB/327
W9RN/323
W9WNB/338
KØAB/335
KØBS/326
WØTJ/351
WAØKDI/327

310
DJ2AA/340
DK3SF/317
DK5PR/320
G4CP/353
JA1AAT/328
JA1DFQ/330
JA1GTF/323
JA1JAN/325
JA7MA/328
JAØSZ/327

OE1FF/344
OZ8BZ/325
SM7EXE/325
VE3BWY/345
XE1KS/327
YV5CWO/320
W1ER/326
W1FJ/335
W1SP/341
K2KER/330
K2SB/326
K2UR/333
W2EQS/342
W2MJ/342
W2QK/336
W3AP/324
W3GE/335
W3ZN/325
WA3HUP/327
AA4S/323

N4KG/328
N4SA/323
N4XX/325
W4FLA/322
W4KFC/345
W4MCM/342
W5GC/340
K6LQA/325
N6AW/325
N6RJ/322
W6CF/332
W6EJJ/330
W6EPZ/353
W7JYX/338
W7LLC/342
W7ORH/325
K8IP/330
K8LJG/320
K8RWL/325
W8BSW/334

W8TA/325
N9AF/328
W9TKR/328
W9VNE/327
NØRR/321
WØAUB/339
WØNVZ/344

309
DJ1CG/326
DJ5JH/326
DJ8CR/321
DL6KG/328
F2IU/331
G3KDB/322
G3LLD/318
JA1AG/344
JA1IFP/325
JA1MJ/326
JH1CJQ/325

JH1EIG/325
JA2AH/324
JA2AN/326
JA3AQ/325
JA3BQE/321
JA8KB/322
KH6IJ/350
OE7UDH/328
OH8SR/322
ON5NT/320
PY7ZZ/318
SM5AZU/335
SM5FC/325
SM6CVX/325
SM7DMN/317
SP3DOI/326
VK6HD/326
YS1RRD/318
YU1NYP/322
WIAM/322

W1DA/320
W1FTX/339
W1HGA/326
K2KGB/325
K2VV/321
W2CNQ/326
W2IRV/346
W2SUA/327
W2VJN/334
W2VUF/328
K3HPG/325
AA4A/321
K4LSP/320
K4TO/322
K4XI/319
N4JF/327
N4KE/319
N4RA/322

W4FX/341
W4WG/324
K5AQ/327
K5LM/323
N5AR/335
W5EDX/324
W5FT/348
W5TIX/329
W5UP/323
W5ZWX/324
K6WC/321
N6EA/343
W6NJU/344
WB6APX/322
K7NN/323
W7CNL/319

K8RA/320
N8AA/328
W8KCJ/323
WA9WJE
KØGVB/323
KØIEA/320

Radiotelephone

318
DJ2BW/350
DL6EN/352
DL9OH/351
G3FKM/353
IØAMU/358
LU4DMG/355
OH4DH/355
OH4DM/356
PY2CK/362
VE5RU/351
ZS6LW/352
4X4DK/358
4X4JU/351
W1AFF/346
W1DGJ/344
W1ONK/355
W2BXA/362
W2HTI/355
W2OKM/356
W2PV/342
W2TP/346
W2YY/343
WA2RAU/341
W3CWG/354
W3DHM/354
W3DJZ/345
W3GH/349
W3KT/354
W3NKM/356
K4HEF/359
W4DR/352
W4EX/362
W4UG/341
W5ACE/353
W5JWM/350
W5LZW/347
W6AM/363
W6EUF/338
W6GVM/361
W6REH/342
W6ZM/345
W7DX/344
W7GN/346
W7JYZ/348
K8DYZ/340
W8AH/356
W8BF/361
W8GZ/363

W9NZM/344
W9ZM/351
WØBW/353
WØCM/357

317
IØZV/346
LU9DAH/350
OZ3Y/346
PY2PA/340
PY2PC/337
PY2PE/340
PY4TK/354
TI2HP/361
VE3QA/353
VK6RU/361
XE1AE/348
YV5AB/356
YV5ANF/344
ZL1HY/362
W1AA/352
W1JFG/354
K2FL/346
W2GLF/352
W2NUT/341
WA2EOQ/338
W3GRS/343
K4JC/340
K4YYL/337
W4EEE/355
W4OM/354
W5IO/357
W5PQA/353
K6WR/345
W6EL/342
W6RKP/348
W7ADS/352
W7PHO/357
W8CUO/343
W8MPW/348
K9ECE/347
W9DWQ/342
W9SFR/345
WØGAA/342
WØGKL/349
WØPGI/345

316
CT1BH/330

DJ7ZG/339
EA2HX/342
F9RM/348
G5VT/357
I8AA/336
I8KDB/351
JA1BK/343
OK1ADM/338
ON4UN/334
SM5CZY/341
SM6CKS/334
VE3CLJ/335
VE3MJ/337
VE3MR/341
VK5MS/357
YV5AIP/347
K2BZT/348
W2FGD/338
W3AZD/341
K4HJE/333
W4LMX/349
W4UWC/340
K5YY/335
W5SZ/336
K6LGF/347
W6FW/341
W6KNH/334
W6RGG/337
W9HPS/341
W9JT/337
W9KRU/336
W9QLD/334
W9RNX/353
WØMLY/350
WØQGI/344

315
DL1KB/349
DL7FT/338
DL7HU/344
EA4JL/332
F2MO/340
F8RU/331
G3JEC/334
G3NLY/335
GI3IVJ/349
HB9TL/352
I2KMG/336
I4ZSQ/331

I5WT/340
I6FLD/344
IT9GAI/333
JA1ADN/336
JA1BRK/334
ON4SZ/350
OZ3SK/342
SM3BIZ/353
VE3WT/337
YS1O/345
YV5AXQ/339
YV5BBU/334
K1DRN/336
W1FXD/332
W1FZ/349
W1HX/349
W2GK/337
W2GQN/338
W2LV/347
W3JK/336
AA4MM/333
K4MQG/337
W4BRE/334
W4SKO/351
W4SSU/341
W4YJ/354
K5DX/349
W5LZZ/335
K6JG/334
K6YRA/338
W6CHV/350
W6KTE/339
K8DR/335
W8JTD/332
W9DC/332
W9TKD/336

314
DL8NU/332
EA4LH/330
F3DJ/344
F9IE/331
HB9AAA/331
I2AT/333
IV3PRK/331
I5TDJ/339
I8YRK/333
IØJX/331
IØLLZ/331

IT9JT/332
JA1BN/332
PT7YS/346
UB5WF/333
VE3GMT/331
ZL3NS/335
W1ICU/331
W1JWX/334
W1MMV/352
K2JMY/339
W2YYL/342
W3RX/330
W4EEU/335
W4JVU/334
W4ZR/341
WA4WIP/335
W5HE/335
W5KGX/348
K6EC/333
N6AR/334
W6CCB/328
W6HFL/342
W6HYG/345
K8CFU/343
W8GKM/330
W8KST/333
WA8AJI/337
K9AB/333
W9WHM/353
WAØOAH/331

313
DK2BL/328
EA4DO/331
EA8JJ/328
F5II/330
G3TJW/327
I2LAG/329
I5FLN/327
I5UA/349
JA1IBX/333
JA1MIN/333
JA2JW/335
JA4ZA/335
KH6BB/334
KP4CL/338
OE2EGL/331
OH3SR/329
PY4KL/343

SM5BHW/330
VE3CTX/330
YV1KZ/329
YV5AJK/342
ZS6JM/350
ZS6RM/344
6W8DY/329
W3MP/335
WA3ATP/330
WA3IKK/330
K4BBF/330
K4IKR/332
N4WF/330
W4DPS/329
W4EPZ/332
W4QAW/330
K5JEA/342
K5UC/351
W5MQ/329
K6GA/330
W6ARJ/330
W6ISQ/336
W6KUT/339
W6PT/340
W6YMV/339
W6ZKM/332
W7JFO/330
W8VHY/330
K9LKA/331
W9BW/333
WA9NUQ/333
WØMYN/329
WØSFU/334

312
DJ2YI/348
DL1JW/334
EA7GF/339
G3UML/332
I7HH/326
JA1JRK/327
JA8QDQ/329
KP4CK/335
ON8XA/330
PY2DSC/327
PY3BXW/328
PY3CB/329
SM6AEK/329
UB5WE/323

ZL1KG/349
ZS6YQ/342
W2GKZ/335
W3GG/325
K4AIM/344
K4PDV/337
K4SM/344
K5UR/327
WA5IEV/329
N6UC/328
W6BAF/342
W6YB/331
W7LFA/329
K9KA/328
K9MM/329
W9HB/346
KØBUR/331

311
F5VU/324
G5AFA/326
I1APQ/324
I1GEA/324
I7SCA/331
IT9ZGY/336
JA1OCA/326
JA2AAQ/329
JA2ADH/328
KV4FZ/326
PY2CYK/331
SMØAJU/334
VE3NE/329
XE3EB/327
YV5AHR/334
W1GKK/341
W1SEB/328
WB2HXD/335
W3EVW/340
W3FWD/338
K4XO/326
N4WW/325
K5OS/326
W5HJA/341
N6NA/336
W6GR/331
W6KOE/327
W6KZS/330
W6XP/324

WA6AHF/327
W7EPA/334
W7KR/336
W9BEK/336
W9ILW/338
WØCSZ/337

310
CT1UE/324
D4CBS/324
DL1HH/332
DL7AA/339
EA1IY/323
EA7IR/328
F9GL/336
F9MD/335
HB9AHA/326
IX1BGJ/324
I2DEZ/326
JA1EOD/327
JA1UQP/326
JA9BJ/327
LA8LF/331
PAØHBO/347
SM6EOC/323
UA1CK/337
UR2AR/335
VO1CU/319
XE1KS/327
YO3JU/326
YV5CWO/320
ZL3QN/326
W1SP/340
W2FP/324
K2YLM/331
WB2NYM/325
N4MM/327
W4AVY/328
K5OVC/326
W5GC/340
W5SJ/328
W5TIX/330
W5UAW/328
K6OJO/323
W6LQC/324
N7RO/321
W7JYX/338
K8LJG/320

W8CNL/324
W8GMF/336
W8ILC/326
W9LA/326
W9HZ/337
W9ZRX/326
KØBS/325

309
CT1FL/326
CT1RM/317
DJ4PT/323
DK3PO/326
DL6KG/326
F6AOI/324
I1UW/321
I4LCK/323
IØMPF/312
JA2AH/323
JA3APL/324
JA7MA/327
LA5HE/341
OZ3PZ/320
SM5AZU/332
SM6DQC/322
SM5FC/325
VE3GCO/326
VE7WJ/317
YS1RRD/318
W1HGA/326
W2QK/333
W2QWS/335
W2SUA/325
WB2WOU/325
K4FJ/328
K4LSP/320
W4VQ/320
W5UR/327
K6TXR/333
W7EZ/322
W7KH/338
K8IFF/326
K8VUR/331
W8CFG/323
W8COG/323
WB8EUN/323
W9GU/323
KØCD/324

CW

307
W9KNI/312

305
K2TQC/306

304
N4RJ/307
N4WW/309

303
ON5NT/305
K6GA/307
K9MM/306

301
DL6EN/304

300
K2FL/301

K3FN/302
W3KT/302

299
JA1JRK/304

298
W1NG/299
K8MFO/300

297
K4PI/300
W6PT/301
W9ZM/299

296
SM5BHW/299

Strays

TRIVIA TIDBITS

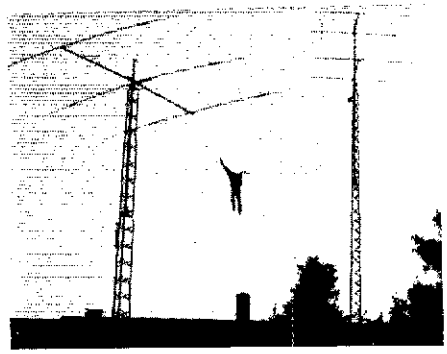
Kismet QSOs

☐ What is the probability of two newly licensed amateurs having their first QSOs with each other? It has happened at least twice. On June 20, 1967, WN7HRE called his first nervous CQ and was answered by WN7HGP. On May 8, 1973, WN4EOG made his first contact with WN2QIJ. It was the first QSO for all.

☐ Ray R. Heaton, WAØDYZ, sent his first CQ and was answered by WN6RRH — Ray's initials.

☐ WN1TIR was the first New Hampshire QSO for WB9LAU. A month later, in August 1974, 'TIR was again the first New Hampshire QSO, this time for WB9LAV who is the brother of 'LAU. — *John G. Troster, W6ISQ, 82 Belbrook Way, Atherton, CA 94025*

[Editor's Note: Please send all correspondence to the author at the above address.]



Some Minnesotans claim that their summers are so short that they only have time to wash and dry their long johns before the season is gone. With that in mind, John Jensen, WAØZVS, of Willmar, Minnesota, appears to have found uses for his antennas other than DXing! *(photo courtesy WDØHXW)*

I would like to get in touch with . . .

☐ amateurs in various occupations who would be *willing* to be listed in a directory of speakers to talk about their life experiences to Junior High School students on a 15-meter net. Rod Lopez, KA5DVO, 1055 N. 1st, Raton, NM 87740.

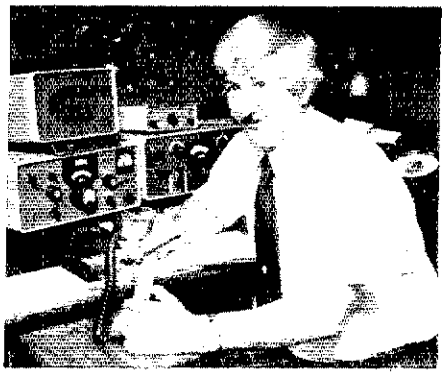
☐ amateurs interested in Esperanto, the auxiliary language, for the possibility of forming an international ham net. Ernest Black, K2REV, 1265 Reservoir Rd., Saugerties, NY 12477.

☐ Japanese amateurs to correspond with and to set up skeds with. Shelby W. Haukos, KBØJW, 1239 N. Baird Ave., Fergus Falls, MN 56537.

☐ amateurs who are collectors of political items and buttons as well as APIC members and traders. Will Klett, WB9MVB, 5-B N. Main St., Lombard, IL 60148.

☐ anyone interested in UFOs and the search for extraterrestrial intelligence. Michael H. Landwehr, KE7T, 54 Ivey Rd., Huachuca City, AZ 85616.

Strays



Warren Mulhall, WA2BPV, is shown operating at his station on the International Mission Radio Association net. The IMRA, now 18 years in existence, supplies Amateur Radio equipment to missionaries so that they can communicate with loved ones in the States, furnishes them with medical supplies for their missions and handles health-and-welfare traffic during emergencies. Anyone desiring further information about IMRA should write to Fr. Bernard Frey, WA2IPM, Box 192, Garrison, NY 10524. *(photo courtesy WB2GQW)*

SUCCESSFUL OPERATION BALLARAT (COVER PHOTO) SPAWNS PROJECT JOHANNESBURG

☐ Earlier this year, Amateur Radio linked the ghost town of Ballarat, California, with its modern namesake in Australia. Stressing complete self-sufficiency, the same group will use solar power and gasoline-driven generators at their communications headquarters, near the headframe of a century-old gold mine. Sponsored by Air Force MARS (Los Angeles Base 14), the operation will unite on the air the desert mining town of Johannesburg, California (population: 100) with its famous Republic of South Africa counterpart on October 23-25. Several dignitaries, including the mayor of the South African city and the South African consul general in California, will participate. (See the "Special Events" section of this issue, page 79, for details.) — *Paul M. Turkheimer, WA6NKL*

MOO-VING MOBILE!

☐ According to the July 24 *HR Report*, a recent FCC action authorized a Longmont, Colorado, dairy farmer to put 2.5- or 6-MHz rigs on his cows, for better herd management.

I would like to get in touch with . . .

☐ anyone interested in stamps/cancels with Amateur Radio as a theme. Ms. Liv Johansen, LA4YW, Kolstadtunet 4-C, N-7078 Saupstad, Norway.

ITALIAN-AMERICAN ROUNDTABLE

☐ Having recently held its 13th reunion on Staten Island, New York, the Italian-American Roundtable is an informal net for anyone wishing to join in for a friendly chat in English or Italian. They meet on the air nearly every day on 14,300 (±5) kHz from 5-6 P.M. EDT. Their members are from all parts of the U.S. and Italy, and new and former members are encouraged to participate. — *Amilcare F. Persichetty, W2NHB*

1981 JAMBOREE ON THE AIR

☐ Two important resources, Amateur Radio and Scouting, will be merged at the 24th World Jamboree on the Air, to be held Oct. 17-18. Suggested starting time is 0001Z local time on Saturday; ending time is 48 hours later. These are suggested times only; however, the World Scout Bureau says there is a better chance of finding overseas stations if those times are followed.

Scouts (Girl, Boy, Cub, Explorer, Girl Guide) are ready to participate in this international event. Interested hams are asked to contact their local scout troop and invite a group into their shacks for a specified period of time during this two-day event.

Certificates are available for all, whether they listen, talk or operate. Send an s.a.s.e. to: Harry Harchar, W2GND, JOTA Coordinator, 216 Maxwell Ave., Hightstown, NJ 08520. Hams and unit leaders are also asked to submit reports and photographs to this address for consolidation and forwarding to the World Scout Bureau. Operating details and frequencies are in "Contest Corral." — *Sally O'Dell, KB1O, Youth Program Manager, ARRL*

Jim Walden, WD4BHT (operating), shares Brightleaf (NC) ARC's club station with scouts (l-r) Michael Pearsall, Cyrus Blackwell and Garry Pearsall of Troop 131 in Greenville, North Carolina. *(photo by Gary J. Ambert, AA4CA)*

It's a bird, it's a plane, no . . . it's Nicholas W. Lalli, WB7UCV, of Tucson, Arizona, who enjoys Amateur Radio and parachuting. Shown here preparing for a jump, he previously made 24 2-meter contacts during a 5000-ft descent last year. That's a lot of fast talking! *(photo courtesy WB7UCV)*

MOVING? UPGRADING?

☐ When you change your address or call sign, be sure to notify the Circulation Department at ARRL Hq. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation Department, ARRL, 225 Main St., Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure your records are kept up-to-date so you'll be sure to receive *QST* without interruption. If you're writing to Hq. about something else, please use a separate piece of paper for each request.

***QST* congratulates . . .**

☐ Mel Granick, WA2SEL, who won the 1980 Writers Guild of America Award for Outstanding Achievement in a Radio Documentary. He was honored for the "Report on Medicine" broadcasts, which he writes and produces for WCBS Radio in New York City.

I would like to get in touch with . . .

☐ any DX station who has contacted K4FCR. All my QSL cards were lost in a fire, and I would like duplicates. Please QSL direct or via bureau. Fred Sheehan, K4FCR, Box 14033, Savannah, GA 31406 USA.

Hamfest Calendar

Conducted By Marjorie C. Tenney,* WB1FSN

[Note: Sponsors of large gatherings should check with League Headquarters 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.]

Connecticut: An auction co-sponsored by the SCRAMS and Tri-City ARC of Groton, will be held Saturday, Oct. 24, from 10 A.M. to 4 P.M., at St. Mary's Parish Hall, at the intersection of Rtes. 1 and 215 in Groton. Talk-in on 07/67 or 34/94. Admission is free, but 10% of the proceeds will be donated to the two clubs. For further information call or write Anne Hibbert, WB1GVL, 64 Giant's Neck Rd., Niantic, CT 06357, tel. 203-739-4970.

Connecticut: The Southcentral Connecticut ARC's (SCARA's) second annual electronics flea market will be held on Sunday, Nov. 8, indoors at the North Haven Recreation Center on Linsley Street in North Haven. Admission is $1, free for children under 12 with an adult. Seller's spaces are $5. Sellers may set up at 9 A.M., and walk-ins will be admitted from 10 A.M. until 4 P.M. Refreshments and prizes. For reservations send check or money order payable to "SCARA," P. O. Box 81, North Haven, CT 06473. Commercial exhibitors may inquire about special arrangements. Talk-in station is W1GB on 146.01/61.

Georgia: The 3rd annual Central Georgia Hamfest sponsored by the Central Georgia ARC will be held on October 17 from 8 A.M. to 5 P.M. and Oct. 18 from 9 A.M. to 4 P.M., in Warner Robins. Scheduled events include the Georgia Single Sideband Assn. Annual Meeting, ARES, MARS (AF), and Georgia CW Assn. Annual Meeting. Talk-in on 3.975 MHz, 146.25/85 and 147.90/30. For further information contact Jimmy Piper, 618 American Blvd., Warner Robins, GA 31093, tel. 912-922-0392.

†Georgia: The ARC of Savannah, Inc. will sponsor a hamfest on Oct. 24 from 9 to 5 and Oct. 25 from 9 to 3, at the Army National Guard Armory, Eisenhower Drive, Savannah. Advance tickets $2.50, $3 at the door. Flea market tables $7, $5 each additional table. Talk-in on 146.37/97 and 146.28/88. For tickets and information contact W. E. Queen, KA4CQY, P.O. Box 13342, Savannah, GA 31406, tel. 912-352-3389 or 912-925-6085.

Indiana: The Hoosier Hills Ham Club (W9QYQ) will hold its annual hamfest Sunday, Oct. 11, at the Lawrence County 4-H Fairgrounds, just south of Bedford. Food, refreshments, free flea market, prizes, vendor displays/sales, free camping available. $3 admission. Advance registrations welcome. Talk-in W9QYQ, 146.13/73. Further info contact HHHC, P.O. Box 891, Bedford, IN 47421.

Indiana: Fort Wayne RC presents its third annual "Funfest" on Saturday night, Nov. 14, from 7 P.M. to 11 P.M., at the Holiday Inn, Fort Wayne. This event, held prior to the Fort Wayne Hamfest, is just 5 minutes from the Coliseum Hamfest site. Prizes, exhibits, special slide show and social activities. Advance admission $3.50, at the door $4. Tickets and additional info from Bill Evans, KB9H, 2319 Timberbrook Tr., Fort Wayne, IN 46825 or Fort Wayne Radio Club, P.O. Box 15127, Fort Wayne, IN 46805.

Iowa: The 6th annual auction sponsored by the Sooland Repeater Assn. at the KD Stockyards Station, Sioux City, will be held on Nov. 1. Docks will open at 9 A.M., and auction begins at 11 A.M. We will have a huge supply of ham equipment. Come and bring your gear and take home a treasure. Talk-in on 31/91 and 37/97. For more info contact Roland Holder, WB0SFZ, Hinton, IA 51024, tel. 712-239-1749 or 712-239-3053.

Louisiana: The Twin City Ham Club will hold a hamfest on November 8 at the West Monroe Convention Center, from 9 A.M. until 2 P.M. Tickets are $1 each or 6 for $5. Dealers and plenty of swap tables and fellowship. Talk-in on 25/85 and 52. For information contact, Randy Cage, WB4VIR, 2005 North 7th, West Monroe, LA 71291.

Maryland: The Columbia ARA is pleased to announce its fifth annual hamfest to be held on Sunday, Oct. 11, at the Howard County Fairgrounds (15 miles west of Baltimore just off I-70 on Rte. 144, 1 mile west of Rte. 32). Doors open at 8 A.M. Admission is $3, tailgating and tables $6. Food available, prizes. Talk-in on 147.735/135 and 52. For table reservations and information write: Dennis Parra, 6955 Spinning Seed, Columbia, MD 21045.

Massachusetts: The Wellesley ARS will sponsor a tailgate flea market on Saturday, Oct. 10 starting at 9 A.M. The location will be the Wellesley High School, 50 Rice St., Wellesley Hills, just off Rte. 16. Admission $1, whether buying or selling. Talk-in on 63/03. For further information contact Nels Anderson, K1UR, at 617-323-5029.

Massachusetts: The annual New England DXCC Dinner (AKA the "Scrodfest") will be held Oct. 10 at the Holiday Inn on Rte. 128, Waltham. Afternoon slide shows and DX presentations followed by the banquet. For more details contact Bill Poellnitz, K1MM, 44 Sunset Dr., Framingham, MA 01701.

Massachusetts: The Framingham ARA will hold its 6th annual fall flea market on Sunday, Oct. 25 at the Framingham Police Station drill shed. Doors open at 10 A.M. (sellers may set up at 8 A.M.) Admission is $1, sellers $8/table prior to Oct. 15; $10/table after. Consignment table (for small items), food, bargains galore! Talk-in on 75/15 and 52 direct. Contact Ron Egalka, K1YHM, 3 Driscoll Dr., Framingham, MA 01701, tel. 617-877-4520.

Michigan: Central Michigan ARC and Lansing CD Repeater Assn. welcome everyone to "HAMFAIR '81" on Sunday, Oct. 11, from 8 A.M. to 3 P.M. at Grand Ledge High School, 7 miles west of Lansing, off I-91 near M-43 and M-100. Fun for the whole family, food available, free parking. Donation still $2.50. Talk-in on 34/94 and 22/82. For more information call 517-626-2237.

New Jersey: The Bergen ARA is holding a Ham Swap'n Sell Oct. 11 at Bergen Community College, Paramus. Tailgating only. Bring your own table. Sellers $3; buyers free. Thousands of spaces. For more info, contact Jim Greer, KK2U, 444 Berkshire Rd., Ridgewood, NJ 07450, tel. 201-445-2855.

New York: The Tu Boro ARC will hold a mini flea market and auction on Sunday, Oct. 28, 9 A.M. to 4 P.M., at the Odd Fellows Hall, 149-14 14th Ave., Whitestone. Admission is $1. For table space and other information, please contact Marty, WA2APT, at 212-359-6923, or Ed, WB2IBQ, at 212-746-4080, after 7 P.M. Talk-in on 145.62 simplex.

New York: The 1981 hamfest sponsored by the Radio Amateurs of Greater Syracuse will be held Saturday, Oct. 3, at the Art and Home Center on the New York State Fairgrounds, from 9 A.M. to 6 P.M. Admission is $3. Commercial dealers, indoor and outdoor flea market, YL programs. Talk-in on 31/91 and 90/30. For more info write: RAGS, P.O. Box 88, Liverpool, NY 13088.

New York: The Orange County ARC will hold its annual ham auction starting at 11 A.M., October 3, at Munger Cottage near Cornwall Town Hall, Cornwall. All amateurs and interested parties are welcome.

†North Carolina: The Western Carolina ARS presents "Asheville Autumnfest" at the Asheville Civic Center Oct. 10 from 9 A.M. to 4 P.M. Advance admission $3, at the door $3.50. Dealers, flea market, display, prizes, ARRL forum, Ted McElroy memorial

†ARRL Hamfest
*Hamfest/Travel Coordinator, ARRL

Coming Conventions

October 2-4
South Florida Section, Clearwater

October 2-4
Texas State, Houston

October 3-4
Midwest Division, Salina, Kansas

October 9-11
Southwestern Division, Scottsdale, Arizona

October 10-11
Delta Division, Memphis, Tennessee

October 17-18
Louisiana State, Kenner

ARRL NATIONAL CONVENTIONS

July 23-25, 1982
Cedar Rapids, Iowa

October 7-9, 1983
Houston, Texas

LOUISIANA STATE CONVENTION

October 17-18, 1981, Kenner (New Orleans)

A rare weekend FCC test opportunity for Gulf Coast radio amateurs to upgrade their licenses will be offered at noon Saturday, October 17, at "Amacom '81," the ARRL Louisiana State Convention and New Orleans hamfest-computerfest, at Airline Hilton Inn, 901 Airline Hwy., Kenner, across from New Orleans International Airport. Applicants should bring copies of licenses with them. "Amacom '81," sponsored by 25-year-old Jefferson Amateur Radio Club, will be open between 9 A.M. and 5 P.M. October 17 and 9 A.M. to 3:30 P.M. October 18.

Home made satellite television reception techniques will be described by Lindsey Riddle, W5JG, retired television station chief engineer. Sidney J. Levet, III, K5BQI, of Garyville, a broadcaster, will discuss Amateur Radio experimenters from ancient history to the future. Talks on computer topics and other issues are scheduled. Meetings with FCC, ARRL, Army and Navy MARS officials; special programs and prizes for women; an indoor flea market and prizes for radio amateurs and computer hobbyists are on the program, with social events Saturday evening.

The talk-in repeater will be 147.69/09. For details, call Gene Gaffney, WB5RNL, 504-737-6915, or W. D. "Bill" Bushnell, WA5MJM, chairman, 504-887-5022.

CW Copying Contest and many other attractions. Talk-in on 31/91, 16/76 or 52 simplex. Information and reservations from Dan Henderson, WA4QQN, P.O. Box 1488, Asheville, NC 28802, tel. 706-684-6339.

†North Carolina: The ENC Hamfest Group will sponsor the Maysville Hamfest Oct. 11 from 9 A.M. to 3 P.M. in Maysville. Flea market, downeast Bar-B-Q lunch. Talk in on 146.685/085 and 52 simplex. Further information from Grover Cook, WA4PID, tel. 919-467-0424, after 5 P.M.

†North Carolina: The Cabarrus ARC hamfest will be held at the Concord Boys Club from 9 A.M. to 4 P.M. Nov. 7 in Concord. Tickets in advance are 3 for $5, at the door $2 each. Bingo, flea market, dealers, prizes, food and refreshments. Talk-in on 146.65 and 52 simplex. Further information from Jim Austin, WD4KCM, or Brown Holbrooks, WB4COO, tel. 704-782-1798.

Ohio: The Marion Amateur Radio Club will hold its 7th annual "Heart of Ohio Ham Fiesta" on Sunday, Oct. 25 from 8 to 4 at the Marion County Fairgrounds Coliseum. Large parking lot, prizes, food. Tickets $2 in advance, $3 at door. Tables $4. Check-in on 146.52, 147.90/30 or 223.34/224.94. For information, tickets or tables, contact Paul Kilzer, W8GAX, 393 Pole Lane Rd., Marion, OH 43302.

Ohio: The 24th annual auction, Auctionfest 81, sponsored by the Massillon ARC will be held Sunday, Nov. 8, from 8 A.M. to 4 P.M. at the Massillon Knights of Columbus Hall on Cherry Rd., Massillon. The flea market opens at 8 A.M. with auction action to start at 11 A.M. Tickets are $2.50 in advance or $3 at the door. Dealer tables are $3 per 8-ft table. For further information or table reservations contact Steve Nevel, WD8MIJ, 1864 Massachusetts Ave. S.E., Massillon, OH 44646. Please include an s.a.s.e.

Ontario: The 4th annual London ARC swap 'n shop will be held at the Lord Dorchester Secondary School, Dorchester, on Sunday, Oct. 25 from 9 A.M. to 4 P.M. Prizes, huge indoor sales area, parking, cafeteria food service. Admission $2, under 12 free; tables $1 plus admission. Vendors must reserve and pay for tables in advance. Talk-in on 52 simplex or VE3TTT 147.78/18. Reservations and payments must be sent to: London Amateur Radio Club, Inc., c/o D. Reiber, VE3IBV, 417 Regal Dr., London, ON N5Y 1J8, tel. 519-455-3947.

Pennsylvania: Swap & Shop sponsored by the Irwin Area ARA will be held Saturday, Oct. 17 at the Circleville VFD, Robbins Station Rd., Irwin, just off U.S. Rte. 30, 3 miles west of Pennsylvania Tpk. (Exit 7). Plenty of indoor and outdoor space available. Flea market, vendors, prizes, food. Talk-in on 146.925/325 and 52. For further information write: Bill Stash, WA3AOQ, 421 Dailey Dr., N. Huntingdon, PA 15642.

Pennsylvania: The Foothills ARC will hold its annual swap and shop from 9 A.M. to 3 P.M. Saturday Nov. 7, at the St. Bruno's Church, South Greensburg. Registration is $2 each or 3 for $5. All indoor facilities. Many prizes. Talk-in on 146.07/67 and 52 simplex. For advanced table reservation phone Chuck Hamman, WB3HZM at 412-837-9194 after 5 P.M.

Pennsylvania: The R. F. Hill ARC will hold its 5th annual hamfest Nov. 8 in the Sellersville National Guard Armory, Sellersville. Doors open at 7 A.M. for sellers and 8 A.M. for buyers. Prizes, refreshments and heat. Talk-in on 28/88 and 52. For further information contact: R. F. Hill ARC, Box 29, Colmar, PA 18915 or Chet Pierson, K3TV, Box 336, RFD 1, Greenlane, PA 18054.

†Tennessee: HAMFEST CHATTANOOGA, a joint effort of area clubs, will be held Oct. 24-25 at Chattanooga State Technical Community College. Events will include dealer exhibits, flea market, forums, contests and ladies programs. Free admission. Flea market spaces $2/day or $3/both days. Talk-in on 19/79 and 3980. Dealers write or call for information on our new spacious indoor dealer area. Hamfest Chattanooga, P.O. Box 3377, Chattanooga, TN 37404 or call 404-398-3358. Rodeway Inn, I-75 S. and U.S. 41, East Ridge Exit, offers special hamfest rates.

Wisconsin: KMRA Hamfest '81, Sunday, Oct. 11 at the Waukesha Exposition Center, Hwy FT, Waukesha. Tickets $2 advance, $3 at the gate. Plenty of parking at our new larger indoor location. Talk-in on 146.52. For more info or advance tickets write KMRA Hamfest '81, 315 Morey St., Waukesha, WI 53186.

In Training

Conducted By Steve Pink,* KB2GG

NEW TRAINING MATERIALS FOR 1981

School is back in session and so are new fall licensing classes around the country. The ARRL training program is geared up to help you with your teaching. We are in the process of revising our material to keep the training program up-to-date. The FCC is now using its new examinations based on their latest Study Guides. The Study Guides are reproduced in March 1980 *QST* with a comparison of the old and new FCC Study Guides following "In Training" for May 1980. Let me brief you on what training materials are available from the ARRL.

The Novice Program

The core of the ARRL Novice licensing program is the 1981 edition of *Tune in the World with Ham Radio*, available from ARRL or your local dealer for $8.50. This new package contains an improved "Your Introduction to Morse Code" cassette tape and a new book with chapters on basic radio theory and amateur regulations reflecting the latest FCC Study Guide.

The *Novice Instructor Guide* is an outline and suggested lesson plan for a 10-week, 20-hour course based on *Tune in the World* and is available from the Club and Training Department for $1.50. The *Novice Instructor Guide* helps you prepare for each lesson and suggests methods and ideas for effective presentation of the material in *Tune in the World*. (A popular, frequently requested item at the Club and Training Department is a booklet entitled *How to Start an Amateur Radio Course*, sent free with the *Novice Instructor Guide*.) *The ARRL Novice Q and A Book*, used as a self-test to highlight those areas needing more review, will round off study for the theory and regulations part of the Novice exam.

General and Higher

The 78th edition of the *Radio Amateur's License Manual* is the main study guide for upgrading to Technician, General, Advanced and Extra Class. New instructor guides based on this latest *License Manual* are now being prepared, with the *General Instructor Guide* to appear soon. *The ARRL Technician/General* and *Advanced/Extra Q and A Books* will supply the review questions needed to prepare students for upgrading. We also recommend *Understanding Amateur Radio* and the *Radio Amateur's Handbook* (both ARRL publications) as supplementary texts for higher-level license classes. *Understanding Amateur Radio* can be helpful for General courses as a "junior Handbook" at the intermediate level. The *Handbook* itself is particularly important for the Advanced and Extra Class exams where a thorough understanding of the subject, as opposed to simple memorization, is necessary.

This brand-new edition of *Tune in the World with Ham Radio* is available now from ARRL or your local dealer.

Training Aids

The Club and Training Department also offers a number of audio-visual training-aids to help you with your classes. The *Novice Instructor Guide* divides each lesson into modules of code practice, theory and regulations. The code practice can either be sent by hand or by using four prerecorded cassette tapes available from Club and Training for a $10 refundable deposit. These tapes contain all the code practice in the *Novice Instructor Guide*. The code is sent at 5 wpm using the W1AW code practice method: The actual speed of the characters is 16 wpm, but the total rate is slowed down by increasing the space between the characters. These tapes will aid the instructor who wishes to supplement the code practice offered on the *Tune in the World* code cassette.

Also available is a set of 80 color, 35-mm slides, which may be shown as part of the Novice course. These are available for a $10 refundable deposit direct from the Club and Training Department, as is a set of slides for Technician/General classes, also available for a $10 refundable deposit.

Your Input

There you have a catalogue of instructional materials available from the League. Our aim is to help you make your licensing classes more successful, and we count on your input in designing these texts and training aids. Let us know in the months ahead how they are working for you and how we can change them to serve you better. Because we are also updating our instructor files with the new computer system at Hq., we would like to have the starting date, license level and enrollment of your classes. We can then refer others to your course and send you, in return, "graduation packages" for the students who successfully finish your course. We think the 1981-82 teaching season will be a banner year for Amateur Radio instruction.

*Training Program Manager, ARRL

The World Above 50 MHz

Conducted By William A. Tynan,* W3XO

Still More to Come

Hey, all you 6-meter F2 chasers! Don't be in a hurry to take down those beams that you put up with so much anticipation a few years ago, and get out those boxes you used to pack away that 50-MHz amplifier. Betting is that there is more to come this fall and early winter, and possibly into the spring of '82 as well. The 2800-MHz solar flux has been well over the 200 mark during much of July, as these lines are being written. If it is anywhere near that value in mid to late October more DX should be on the way. We now know from recent experience that mid-October to early December is the best time for 6-meter openings across the Atlantic to Europe and parts of Africa. Somewhat later, until the first of the new year, seems to be the right time for South American contacts. If 1982 behaves in a manner similar to 1980 and 1981, after about mid-January until March or April we will experience a dry spell followed by a pickup in openings to the south and southwest for the midsection of the country and the West Coast. Who knows, conditions may be even better than they were the last few years. Only time will tell.

Chances are, however, that the months to come will not be as productive as they were. After all, we are almost two years beyond the now assumed peak of Cycle 21 in December 1979, during which the smoothed sunspot number reached 164.5. It is also expected that some of the European activity may be absent, which will limit DX chances. It is understood that EI6AS and EI9D will not be on, but I don't know about EI2W. ZB2BL and ZB2GW should be holding forth from Gibraltar, though. Don't forget the PAØs on their new frequencies of 53.875, 53.925 and 53.975 cw only. Who will be the first to work them in that lofty part of the band? Then there should be the crossband activity. Certainly many of the old stalwarts of that pastime will be back for another shot at it.

Nevertheless, although we will probably experience some DX, let's not kid ourselves. Conditions are not expected to be as good this year as in the past two. We all must do everything we can to take maximum advantage of what opportunities are presented to us and to conduct ourselves in a way that enhances the chances of others to work the DX, too. Here are a few suggestions distilled from the many I have received over the past few years that, if followed by most 6-meter operators, should enhance the DX opportunities for everyone.

1) Keep calls short. Sometimes it is advisable simply to transmit your call once or twice without giving the other station's call more than every few times. Long finishes such as, "Calling and standing by," and, "What say, kay please, go ahead, go ahead." are definitely not needed. A couple of efficient operators can make one or two contacts while some are saying "over"!

2) If the DX station is quite rare or it appears that the opening may not last long, keep contacts short so that others will have a chance, too, and the DX station can make more contacts, possibly with a needed state. For snappy QSOs, it is not necessary to give name, QTH down to the spelling of the town and county, and a rundown on the equipment. If the person on the other end wishes such information, he or she will ask for it. In this case provide it as efficiently and expeditiously as possible. For it to be considered a valid contact, calls should be exchanged, along with some other piece of information such as signal reports or states. Remember that FCC rules do require that both calls be transmitted at the completion of each contact.

3) If you have already worked the station or country and it is rare, and you know that there are others on who are trying for a new country or state, don't attempt to work that station again just to see if you can get through on this occasion too, or express thanks for the QSL card for your first QSO. Of course, common sense should be the guide. If the station does not appear to be particularly busy, or indicates that he or she is not sure of getting out, by all means feel free to call and confirm that the signals are being heard. Otherwise, he or she might get discouraged and give up — then no one will work the station.

4) The 10-meter liaison frequency of 28.885 has served well to alert 6-meter operators to openings that may hit their areas next. It has also been invaluable in collecting general information about new stations getting on in various parts of the world, what DX was worked the day before and so on. But if the frequency is to serve properly its primary function, stations with information of immediate importance must be able to get access to it rapidly. Thus, if you transmit on 28.885, keep your transmissions short, taking frequent pauses for stations trying to break in with some hot information. If you want to hold a long-winded QSO, particularly if the subject matter has nothing to do with six meters, QSY to some other frequency and go to it. In addition, encourage the Europeans working crossband to do it on either side of the liaison channel. It is pretty hard to get information across while being QRMed by a strong station not even listening on 10 meters. On the other hand, like all "rules" these must be exercised with some thought. The surest way to lose 28.885 as a 6-meter information channel is not to use it. So we shouldn't QSY every time we want to conduct a five-minute QSO, particularly if not much is going on at the time. Just be sure to take a breath once in a while to see if anyone has something to say.

Let's hope we have another season of that most exciting of all DX, 50-MHz F2. Good operating practices by each of us can greatly enhance the results obtained by all. CU on the band!

CENTRAL STATES VHF SOCIETY SCORES AGAIN

Once again the Central States VHF Society has lived up to its reputation for putting on a top-notch vhf/uhf conference. This year's affair was held in Sioux Falls, South Dakota, under the stewardship of 1981 Society President Ed Gray, WØSD, and a fine crew of helpers including his wife Edith, WAØUFS, who put together a very interesting and informative series of events for women and junior ops. The program included a talk by W6XJ highlighting what can be done around the hamshack with programmable calculators such as the Hewlett Packard 41C, as well as larger "home" computers. Gary stressed the strengths and shortcomings of these two types of instruments. Calculators had it for size, cost and portability, as well as ease of programming. Computers got the nod for real-time applications, the handling of large programs and speed.

In a very interesting talk, Scott Marin, KØAG, outlined some potential techniques such as correlation detection and adaptive noise filters for copying weak signals off the moon or on terrestrial paths. I can provide a copy of his notes to anyone sending me an s.a.s.e. Emil Peacock, W3EP, gave a presentation about the types of weather conditions that often produce outstanding tropospheric DX over large portions of the country. His studies indicate that the subsidence type inversion, which takes place when warm, dry air is forced downward by large, stable high-pressure systems, is the best producer of this kind of opening.

W1JR showed a method of accurately predicting when the various meteor shows will peak. Joe's notes are also available from me for an s.a.s.e. Al Ward, WB5LUA, provided a look at what 23-cm operation is all about, including a description of equipment needed to accomplish credible terrestrial operation, as well as moonbounce on this rapidly developing band. Jim Mitzlaff, WB9SNR, discussed the subject of solid-state rf power-amplifier design with particular emphasis on units for 1-1/4 meters and 70 cm (an s.a.s.e for these notes also). AMSAT President Tom Clark, W3IWI, updated the group on that organization's projects including a status report on the Phase III B satellite and what it will be able to do for us. He queried the group as to preferences on specific orbits. A consensus favored an orbit that includes some coverage of southern hemisphere areas, at the expense of the loss of a small amount of northern hemisphere time. Tom also discussed UoSAT and its various scientific experiments. This English-built spacecraft is expected to be in orbit by the time these lines appear, and it should provide a source of interesting investigations for vhfers.

The Conference included the usual antenna-gain competition, and a noise-figure measuring session, both handled by Marc, WBØTEM. The 432-MHz antenna category was headed by a 28-element homemade original design on a 21-1/2-foot boom brought by W1JR. This monster exhibited a measured gain well over one dB better than the next entrant. The noise-figure measurements were enlivened by dry-ice cooling, bringing readings down to the 0.2-dB region for 432-MHz preamps. Next year it is planned to rate results in terms of noise temperature rather than noise figure. Categories for the new 902-MHz band are to be included in both noise-temperature and antenna-gain events.

The technical program was rounded out by a presentation by WB6NMT about several subjects dear to his heart such as both noise-figure and dynamic-range aspects of receiver performance and additional information on optimum antenna stacking. This conductor had the honor of addressing the group on the general subject of what new accomplishments we can look forward to in the world above 50 MHz in terms of propagation and techniques.

The banquet address was presented by Gar Anderson, KØGA, ARRL Director for the Dakota Division. This year's Chambers Award, in recognition of a Society member's outstanding contribution to vhf and uhf, went to Louis Anciaux, WB6NMT, for a myriad of accomplishments from the first 220-MHz EME

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 and record your message.

70-Cm Standings

For WAS holders, listing is WAS number, call, state and call areas. For others, call, state, U.S. states worked and call areas. Call areas are 10 U.S. call areas plus KH6 and KL7, plus each VE and XE call area, plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. Stations not showing some indication of activity or interest in remaining in the standings over the last two years have been deleted.

WAS Holders

1 WØYZS* MO
2 K2UYH*† NJ
3 K5JL*† OK

W1JR*	MA	47	12
AD1C*	MA	33	10
K1PXE	CT	25	11
K1FO	CT	23	8
K1LPS	VT	20	10
W1XJ	RI	15	5
W1GXT	MA	13	6
W1HDQ	CT	11	4
N1AIS	MA	10	4
K2RIW*	NY	28	12
W2VC	NJ	25	8
K2LGJ*	NY	24	10
W2BLV	NJ	24	7
W2DWJ	NJ	21	7
W2AZL	NJ	21	7
W2PGC	NY	20	10
W2CNS	NY	19	10
K2YCO	NY	17	6
WA2FUZ	NY	16	6
K2OVS	NY	16	5
N2EO		13	5
K2SHB	NY	12	6
WA2YWP	NY	11	5
WA2PVV	NY	10	5
W3RUE	PA	29	10
W3OZ*	MD	25	9
W3IP	MD	25	7
K3IUV	PA	19	5
N3AHI	PA	18	7
W3UJG	MD	16	6
K3HCE	MD	16	5
W3XO	MD	13	5
WA3DMF	MD	8	5
K4QIF*	VA	39	21
W4FJ	VA	25	8
W4ATC/4	VA	25	8
WA4CQG	AL	25	5
W4ISS	GA	24	5
N4CD	VA	18	6
WA4SBC	VA	17	7
W3IY/4	VA	17	7
WB4NMA	GA	17	6
WB4EXW	NC	17	6
K4GL	SC	16	7
K4QF*	AL	12	8
WD4MUO	VA	12	5
WD4CXU	VA	11	4
K4KAE	SC	8	2
WB5LUA*†	TX	49	34
W5FF*	NM	46	18
W5HN	TX	22	7
WA5HNK	TX	16	6
W5UKQ*	LA	15	8
K5JRH	TX	15	4
WØRRY/5*	TX	11	14
K5LLL	TX	11	6
WA5TBE	TX	9	3
W5DC	LA	8	—
WA5YOU	LA	5	2
W6ABN*		33	33
WB6NMT		8	7
W7JF*	MT	15	11
W7LUX	AZ	5	3
K7ICW	NV	4	2
WA7JUO	NV	3	2
K8WW*	OH	40	10
WB8BKC	MI	29	9
W8IDU	MI	27	8
WA8VPD	MI	22	8
K8AXU	OH	20	8
WB9SNR	IL	30	10
W9JIY	IN	28	9
W9UD	IL	28	9
WA9HUV	IL	27	10
W9AAG	IL	27	8
K9SM		17	7
K9XY	WI	13	5
KØTLM*	MO	42	21
KAØY*	IA	28	9
WØRAP*	IA	26	13
WØDRL	KS	24	9
KØDAS	IA	23	7
KØVXM*	SD	21	11
WØLER	MN	18	6
KØCJ	MN	17	6
WØOHU	MN	16	6
WØPW	CO	15	5
WBØIUT	NE	13	4
WØVB	MN	13	4
KØALL*	ND	19	8
KØWLU	SD	10	3
WØSD	SD	7	2
KL7WE*		8	6
VE7BBG*†		39	32
VE4MA*		23	28
VE2DFO		12	7
VE3AIB		9	6

†Indicates WAC

*Indicates some EME contacts

contact to the advancements in receiver preamps and solid-state amplifiers.

The large array of prizes required the better part of an hour to distribute to the 144 hams plus their spouses registered.

An outstanding feature of this year's Conference was the announcement by Awards Committee chairman WA1JXN of the Society's series of three separate challenging awards for accomplishments on 2 meters and up. An s.a.s.e. to me or WB5LBT will bring details and application forms.

There is another very worthwhile vhf conference coming up soon. It is the 1981 Mid-Atlantic States VHF Conference to be held October 3 at the Warrington, Pennsylvania, Motor Lodge. This fast-growing affair is sponsored by Mt. Airy VHF Radio Club, better known as the Pack Rats, and will feature talks on low-noise preamps, loop Yagis, solid-state power amplifiers, Yagi antenna patterns, and 1296 and 2304 transverters by well-known vhfers like W1JR, W3CXU, WA3AXV, K2RIW and WA3JUF. A social hour and buffet will follow the technical presentations. The next day, Sunday, October 4, is the Club's big Hamarama flea market at the nearby Bucks County Drive-in Theater. For more information, contact Ron Whitsel, WA3AXV, tel. 215-355-5730.

ON THE BANDS

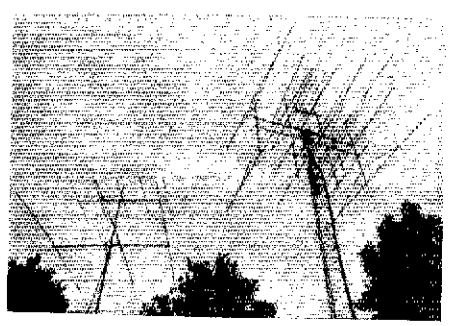
6 Meters — The summer Es season continued well into August with some very respectable DX reported during the first half of that month. W4CKD landed HP1XAT on the 6th. Later that evening (June 7, UT) Bob worked (on 50.187 cw) a station signing CO8CA/IS. The operator said that he was in Cuba. Does anyone have any information about this one? That same evening saw strong signals from VE1s here in the Washington, DC area. Bob also worked HI8DAF for the umpteenth time. Dom just wasn't getting any responses to his cw calls! Also on the 6th, about 2300Z, HKØBKX (San Andres island) worked a number of 3s, 4s and 8s. In addition, reception of the DL3ZM/YV5 beacon with very strong signals was reported. August 8 brought W4CKD a contact with XE1GE at 1527Z, and Wyoming and Nevada were in later that evening. On the 11th it was Montana, Kansas, Minnesota and Arizona, and on the 12th (about 0215) VE4AS was putting in a good signal. The next morning W4CKD worked K3SXA/MM near the Bahamas. Jim is a shipboard radio operator and sure gets around; on August 1 Bob reports working him off the Yucatan Peninsula. But the real surprise came at 1743 on the 12th when W4CKD worked LU8YYO (with S-9 signals) and a few minutes later heard, but could not identify because of the language problem, another Argentine station. Thus, almost every evening during the first half of August produced some kind of opening. Yes, it has been a good season!

One of the most interesting weekends of the summer was July 25 and 26. Saturday produced aurora virtually all day long. The following day some of the most intense Es of the year made the band into a very lively madhouse, with extremely short skip coming from all directions. This was the same day that VP9IB had a field day on 2 meters, and VP5D worked several stations on that band as well. (See the following section.) WA9AHZ took advantage of the super conditions on the 26th to participate in his favorite new sport, 6-meter SSTV. Jack exchanged pictures with Florida station WB4PFB. Two weeks later, on August 7, he hooked WA1KNX (Massachusetts) on slow-scan, and on the 8th had a partial with W7ID in Idaho. WA9AHZ pleads for more contacts via the picture mode. His ambition is to work 48 states "before he is old and gray." Why be satisfied with only 48, Jack? Back to the red-letter days of July 25 and 26. As an example of the varied and widespread propagation, this conductor worked two stations — KA1PE in Maine (formerly WA1DZJ) and WA4UKX in South Carolina — on both aurora and Es within the space of less than 24 hours. I can't remember doing that with one station, much less two. It was an interesting weekend, and there were far too many QSOs to attempt to report. I hope we get more like it.

G3WBQ writes a very interesting letter from Surrey, England. Trevor says that on June 23, at 1825Z he identified LU9AEA on 50.110 with a 5 × 4 signal. A few days earlier, on the 14th, at 1916Z, he heard the end of a call by a station he did not get a chance to identify. All he got in Spanish-accented English was "... WISKY CALLING CQ ON SIX METERS AND LISTENING." Can anyone help identify the mystery station? G3WBQ also reports hearing the FY7THF beacon July 13 from 1810 to 2034Z, and notes that this is one year to the day that he heard it last summer. Trevor ends by saying that he will be looking for us on crossband this fall. You can bet that W3XO will be in there trying with the rest, Trevor. I hope to work lots of U.S. and Canadian stations, as well as DX. Will be looking for the Ws and VEs on backscatter and direct, mostly around 50.2.

Good luck to all.

The Higher Bands — What can be said to describe the aurora of July 25 and the Es, which affected much of the country the following day, but "outstanding"? On Saturday the 25th, the 2-meter band sounded more like 20 except, of course, for the buzz on the signals. Many stations were S-9 and above. A frequent aurora reporter, K2QR (Western New York) reports working a total of 19 stations from Maine to Missouri during the two aurora sessions, one in the morning and the other beginning in the early evening. During the first session of the day, which Dick says was the best morning aurora he has heard in 10 years of operating, he held a ragchew with his brother Bill, WB9QBU, for almost a half hour until the QRM got too bad. A not-so-frequent aurora reporter, W2RS (northern New Jersey) notes similar conditions. The buzz started for Ray about 1400Z and netted him two new states, Kentucky and South Carolina. In his QSL card, the South Carolina station, N4TJ, commented on the rarity of aurora that far south. From out west, N7BHC (near Salt Lake City) says that the aurora was in for three hours in the morning and about five hours that evening. Dave picked up state number 15 as a result of a contact with WBØQMN (Colorado). He also worked a number of northwest stations QSOed before, including W7HAH (Montana) who was S-9 plus 20 dB for a time.



The antennas at W2PGC. Sam makes the best of the space available and puts out fine signals from the hf bands through 1296.

But the auroral propagation did not stop at 144 MHz. This conductor took one listen to 2 meters and proceeded immediately to 1-1/4 to be greeted by S-7 buzz signals from W9IP, K9KFR, VE3CRU, K1WHS and others. During the morning session, the 10-watts output on this end was not able to be heard, but about 2100Z I managed to work WA1UQC for my first aurora contact on 220 MHz. Those with more reasonable power were doing much better, however. W2PGC (western New York) is one example. Sam completed contacts with stations in 11 states and two Canadian Provinces, and his best DX was KØDAS in Iowa.

The following day, July 26, was a real banner one for many 2-meter operators in the eastern part of the country. The widespread Es opening that came on the heels of the aurora produced not only new states, but also new countries as well. The opening reached well beyond the shores of the Atlantic Coast, as others may have in previous years. But this time stations were there to work (VP5D in the Turks and Caicos Islands was one). Bob apparently worked a number of W4s, including W4GJO in north Georgia. The other DX tidbit was VP9IB, who was active from Bermuda with 80 watts to four 19-element Boomers. Tom took advantage of the opening to work 70 stations from Florida to Minnesota. The Minnesota contact was with a Minneapolis station (call not given) a distance of 1750 miles. This is quite surprising DX for 2-meter Es. VP9IB's address is P.O. Box 111, Southampton 8-05, Bermuda. I would expect that a few IRCs would be welcome. QSLs for VP5D can be sent via W3HNK. Because of space limitations, this short report will have to suffice as a synopsis of the hundreds of Es QSOs made that day. Tnx to all who submitted reports. Nor did 2-meter Es quit with that late-July spectacular. W5FF (near Albuquerque, New Mexico) reports that on August 8 between 1900 and 1920 he hooked up with WAØSJR and WØUX (Missouri), WD4EWT (Tennessee), and WB4REH (Kentucky).

The third WAS to be achieved on 70 cm goes to K5JL. Jay has been at it a long time, since 1963 as a matter of fact, and is certainly to be congratulated for a notable accomplishment. Activity by KL7WE gave him Alaska, and the final state was Nevada, now represented by WA7JUO. K5JL thus joins WØYZS and K2UYH as 70-cm WAS holders.

The Perseids is just over as this is being written, so only a few reports have been received thus far. K1FJM/4 (near Miami) picked up several new states as a result of contacts with W3EP/9 (Indiana), WA9YIB (Illinois), AIØL (Missouri), W5JTL (Mississippi), K5BMG (Louisiana), WA8MIL (Michigan), WBØVYV (Iowa), WA4CQG (Alabama) and three Maryland stations — KA1GD/3, K1HTV/3 and this conductor. Some long bursts were certainly in evidence. K1HTV/3 reports one that produced four QSOs. First he responded to a call from WØPN (Minnesota); then he worked KØALL (North Dakota). Then his son Andy, KA1GD/3, worked KØALL, and finally K9XY (Wisconsin). Sometimes it pays not to be long winded! N4CD (Lynchburg, Virginia) got his feet wet in the burst mode and has decided that "m.s. works." Bob hooked W5JTL (Mississippi), K5BMG (Louisiana) and WØCY (Kansas) for three new states. His neighbor, WD4CXU, brought his total to 36 as the result of a contact with WØRT (Kansas). From these first reports, it would appear that this year's Perseids was a good shower. More next month.

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

UoSAT Microwave Beacons

The following information on the UoSAT microwave beacons has been received in a letter from Martin Sweeting, the UoSAT project manager.

"The 2.401-GHz beacon will be modulated with 1200-bps telementry data using nbfm with a deviation of ±5 kHz, and with an output power to the antenna of around 125 mW. The antenna comprises a 3-turn helix with a gain of around 6 dB, right-hand circular polarisation.

"The 10.470-GHz beacon will not be modulated but will comprise a steady carrier with an rf output power to the antenna of around 125 mW. The antenna comprises a slot helix with a gain of around 8 dB, right-hand circular polarisation. . . . (UoSAT is) now scheduled for launch by NASA on 15 September this year (1981)."

Using this information in conjunction with the formulas given in this column earlier (Dec. 1980), it is quite easy to calculate the signal levels expected from these beacons at the earth's surface, knowing the expected orbital height of 328.6 mi (530 km). (In the following discussion we take the best case of the satellite being directly overhead; path losses when the satellite is near the horizon will be somewhat greater.)

Considering first the beacon on 2401 MHz, a path loss of 154.5 dB is predicted. With a power output of 125 mW (+21 dBm) and an antenna gain of 6 dBi, the ground-level signal strength should therefore be −127.5 dBm. Typical equipment for use at this frequency (adapted from 2304 MHz) might consist of a 2-ft dish or a loop Yagi (see last month's "New Frontier" column) having a gain of around 20 dB for linear polarized signals, or 17 dB for circular polarized signals. A simple diode mixer converter with no rf stage should show a noise figure no worse than 10 dB (and possibly as low as 5 or 6 dB). Such a system, 17 dBi gain antenna, 10-dB noise figure receiver in a 10-kHz bandwidth, should show an effective receiver sensitivity of around −141.4 dB. If the signal strength at ground level is −127.5 dBm as calculated, then using such a receiving system, the carrier-to-noise ratio should be around +13.9 dB, far enough above the fm threshold to give quite a solid signal.

Now considering the 10.470-GHz beacon, the path loss is this case will be 167.3 dB. With an output power of 125 mW (+21 dBm) and an 8-dBi gain antenna, this will result in a ground signal of −138.3 dBm. The only receiving system to which most amateurs have access at this frequency will be a Gunnplexer retuned to the beacon's frequency. Assuming a 12-dB noise figure and a 17-dBi linear polarized horn, and using a receiver bandwidth of 100 kHz (unlocked system), an effective receiver sensitivity of −126.3 dB is calculated. This would result in the received signal being 12 dB weaker than the noise level of the receiver; i.e., you won't hear it. If a 2-ft dish were used as an antenna and the receiver bandwidth were reduced to 10 kHz by crystal locking, then the signal should come up to 14 dB above the receiver noise level.

These calculations should give some idea of what is needed to receive the UoSAT microwave beacons. One point to be aware of is that as antenna gain increases, beamwidth decreases. Since the expected orbital period of UoSAT is 98 minutes, it will cross the sky slightly faster than OSCAR 8, thus tracking with a narrow beamwidth antenna may prove a demanding task.

Though there are no direct references to 2401-MHz converters, 2304-MHz designs should not be too difficult to modify using revised local oscillator chains. For some ideas refer to: W2CQH, "Interdigital Converters for 1296 and 2304 MHz," *QST*, Jan. 1974, p. 11; WAØRDX, "Twin Diode Mixers," *Ham Radio*, Oct. 1978, p. 84; N6TX, "L-Band Local Oscillator," *Ham Radio*, Dec. 1979, p. 40.

For 10-GHz information, you might get some ideas from the RSGB *VHF/UHF Manual* and *The Gunnplexer Cookbook* by Bob Richardson.

Regarding antennas for use in the reception of these beacons, right-hand circular polarization would be ideal, though linearly polarized antennas can be used with a 3-dB gain penalty. The easiest circular polarized antenna to build is the helix. To produce a gain equal to that of a linear 2-ft dish at 2.4 GHz a helix of about 26 turns would be required, which would be about 3 ft long. The best reference I have found on helix antennas is in the *IEEE Transactions on Antennas and Propagation*, March 1980, p. 291; "Characteristics of 1 to 8 Wavelength Uniform Helical Antennas," by Howard King and Jimmy Wong. Alternatively, see *The ARRL Antenna Book*, 13th ed., p. 260. Information on termination and impedance matching of the helix antenna is given in June 1981 *QST*, p. 28, in an article by K6ZMW.

TRANSISTOR DEVELOPMENTS

Of direct interest to amateurs is a new transistor from Motorola, the MRF 559. This device is specified as having 500 mW output, 8 dB minimum gain and a 50% efficiency over the 250-1500 MHz band. The device can be used in Class A (linear) service. One obvious application is in a 1296-MHz transmitter as a driver or low-power output stage. Quantity pricing (100 +) is $1.80, so the single-device cost should not be too high.

On a development note, a broadband GaAsFET amplifier has been developed in Japan for TV receiver use that has a noise figure around 2 dB over the 50-2000 MHz band, with a gain of 8-10 dB. If such an amplifier were produced in quantity for the TV market, its price would undoubtedly be well within the reach of amateurs.

Moving a little further away from amateur operation, Varian has announced a series of GaAsFETs at 10 GHz. Though such devices may be out of the reach of amateurs right now, they will without doubt filter down to the amateur population with time, just as GaAsFETs are in common use by amateurs on the lower microwave bands today.

Even more esoteric are new transistor structures such as the SIT (static induction transistor) and the related PBT (permeable base transistor) which are potentially capable of operation to over 500 GHz. SITs have been developed in Japan that can produce 100 W at 1 GHz and 20 W at 2 GHz. There is even reported to be a development program on 2.45-GHz devices for use as a replacement for magnetrons in microwave ovens. Though now is not the time to throw away your kV power supplies and planar triode cavities, the day may yet come!

VHF COMMUNICATIONS

An English language translation of the German magazine, *UKW Berichte*, is now available in the USA under the name of *VHF Communications*. For the benefit of those readers unaware of this magazine, it deals with the bands from 144 MHz through 24 GHz on a fairly technical (though still amateur) level. Detailed constructional information is given in most articles; however, some components, semiconductors in particular, may be difficult to locate through U.S. distributors. Fortunately, in many cases, parts kits are offered along with constructional articles. This magazine is, to the best of my knowledge, the only one available in the USA that regularly deals with circuitry for the higher microwave bands (including 2304, 3456 and 5760 MHz). Past issues have dealt with topics such as 10 GHz ssb, 5760 MHz receive mixers, 3456 ssb transmit mixers and receive converters, and many multipliers, mixers and amplifiers for 2304 MHz. The USA representative for *VHF Communications* is SELECTO, Inc., 372 D Bel Marin Keys Blvd., Novato, CA 94947.

10-GHZ NEWS FROM NEW MEXICO

Robert Suggs, KB5EZ, and Bradley Mauger, KB5QZ, of the New Mexico State University Amateur Radio Club (Box CC, Las Cruces, NM 88003) have written describing some recent 10-GHz Gunnplexer work they have been doing. Best DX to date is 35 miles, line of sight, between the NMSU Blue Mesa Observatory and Los Altures.

It is good to hear of microwave work going on in the less-populated areas of the country. Little amateur work has been done on investigating propagation over dry desert areas to date, and it seems the group at NMSU have interesting opportunities open to them.

1296 WEST COAST NEWS

Chip Angle has written to say that the KH6 beacon on 1296 MHz is now operational and is being listened for by West Coast stations. He also included a copy of his June contest log showing ssb/cw contacts from his portable site in Utah (N6CA/7) with Arizona (K7GNV) and Nevada (WA7JUO). Chip was running his 200-W single 7289, water-cooled amplifier (obviously to good effect!). These seem to be the first ssb/cw contacts between these states. How long before two-way ssb?

FOOTNOTE

Observant readers will have noticed that my address as listed at the foot of this column has recently changed because of a change of QTH. This disruption has caused me to lag behind in answering letters, so apologies to all those waiting for a reply. I hope I didn't lose any correspondence during my move, but if you did write with any important questions and I don't reply, try again!

*111 Reinman Rd., Warren, NJ 07060

Special Events

Conducted By Mark Wilson,* AA2Z

October

Vatican State: Radio Vaticana will issue an award commemorating its 50th anniversary to any station contacting HV1CN, HV2VO or HV3SJ *between Oct. 1 and Feb. 1, 1982.* For award, send photocopy of QSL card received to HV1CN, Radio Vaticana, Citta Del Vaticano, Europe.

Mount Clemens Train Depot: L'Anse Creuse ARC will operate W8LC from the depot, boyhood haunt of Thomas Edison, *Oct. 2-3.* Frequencies: phone — 15 kHz from bottom of the General phone band; cw — 65 kHz from bottom band edge; Novice — 15 kHz down from top band edge. Certificate for s.a.s.e. to W8LC, Box 72, Utica, MI 48087.

Spruce Knob, West Virginia: Parkersburg ARC will operate N8CDD starting at 1500Z *Oct. 3 through Oct. 4* from Spruce Knob in Randolph County, highest spot in West Virginia. Frequencies: phone — 3.935 7.235 14.335 21.360 28.535 52.150 144.190; cw — 10 kHz up from Novice band edge. QSL with s.a.s.e. to N8CDD, 902-23rd St., Vienna, WV 26105.

Vermillion, Ohio: Northern Ohio ARS will operate K8KRG from 1300Z-2000Z *Oct. 4* from "Dick Goddard 9th Annual Whollyhear Festival." Frequencies: phone 3.945 7.250 14.300 21.380; cw — 15 kHz up from Novice band edge. Certificate for large s.a.s.e. to K8KRG.

Edwards AFB, California: Special events station K6OX will operate periodically during the five-day flight of the space shuttle, now scheduled for launch *Oct. 5.* Frequencies: 3.935 7.260 14.275 21.360 28.650 MHz and 2 meters. Send QSL to K6OX, P.O. Box 1221, Lancaster, CA 93534.

Zephyrhills, Florida: The Zephyrhills Area ARC will operate WB4AOG from 1000Z-2200Z *Oct. 10* from the site of the 1981 World Parachute Meet. Frequencies: Phone — lower end of the General portions of 10-15-20-40 meters; cw — 21.150. Certificate for QSL and large s.a.s.e. (first 1500 requests only) to: ZAARC, 1312-13th St., Zephyrhills, FL 33599.

*Assistant Communications Manager, ARRL

Fort Osage, Missouri: Local amateurs will operate KØMAT and WBØMUU from 1700Z *Oct. 10* to 1700Z *Oct. 11* from this historic site near Independence. Frequencies: phone — 7.280 14.330 21.380 28.680; cw — 60 kHz up from bottom band edge; Novice — 21.110 28.110. Certificate for QSL to WBØMUU, 2913 Castle Dr., Blue Springs, MO 64015.

Chicago, Illinois: Hamfesters RC members will operate from 1700Z *Oct. 10* to 1700Z *Oct. 11* to contact amateurs interested in getting the Worked All Hamfester Member award. IL stations work 10 members; outside IL, 5 members. Exchange signal report, state and name. Frequencies: phone — General portions of 40 and 10 meters; cw — Novice portion of 10 meters. For award, send log data to Box 42792, Chicago, IL 60642.

DeSoto, Missouri: Jefferson County ARC will operate KAØIAR from 1700Z *Oct. 10* to 1700Z *Oct. 11* from Population Center of the United States as determined by 1980 census. Frequencies: phone — 25 kHz up from General band edge; cw — 50 kHz up from bottom band edge; Novice — center of band. QSL and large s.a.s.e. for certificate to KAØIAR, 3009 High Ridge Blvd., High Ridge, MO 63049.

Death Valley and Mount Whitney, California: Southern Sierra ARS, conducting a simultaneous, dual-site expedition from Badwater and Mount Whitney, will operate K6RL from 1900Z *Oct. 10* to 0100Z *Oct. 12.* Frequencies: phone — 146.550 MHz, simplex; cw — (QRP) 21.105 or 28.105 and 7.105 MHz. Certificate for QSL and $1 to SSARS, Rte. 2, Box 338, Tehachapi, CA 93561.

Moultrie, Georgia: Colquitt County Ham Radio Society will operate WD4KOW from 1300-2000Z *Oct. 13-15* from fourth annual Sunbelt Agricultural Exposition. Frequencies: phone — 7.250 14.300. Special QSL for s.a.s.e. to AA4P, Box 813, Moultrie, GA 31768.

Canton, Ohio: Stark RTTY Group will operate WB8RVM from 1400-0100Z *Oct. 16-17* and 1400 to 2200Z *Oct. 18* from the Mellet Mall Hobby Show. Frequencies: phone — 5 kHz from General band edge; cw — 3.540 7.040 14.060; RTTY — 3.620 14.090. Certificate for QSL and large s.a.s.e. to WB8RVM, 138 Page St. NW, Massillon, OH 44646.

China, Indiana: Kokomo ARES and Weather Net will operate KG9T from China (Indiana) *Oct. 17-18.* Frequencies: low end of all bands, 80-15 meters. Special QSL for s.a.s.e. to KG9T.

Fayetteville, West Virginia: Plateau ARA will operate W8OQC starting at 1200Z *Oct. 17* on the New River Gorge Bridge, the world's longest steel arch bridge. Frequencies: 7.275 21.385 14.285 28.575. Certificate for QSL and s.a.s.e. to W8OQC, 135 Daniels St., Fayetteville, WV 25840.

Johannesburg, California and Johannesburg, South Africa: Project Johannesburg, linking the old California mining town with its namesake in South Africa, will operate WA6NKL and ZS6AKV from 2000Z *Oct. 23* until 2000Z *Oct. 25.* Frequencies: phone — 14.200-14.350, 21.275-21.400, 28.500-28.700 MHz; cw — by request only. Certificates to those who contact ZS6TJ (SARL club station), one other ZS6 and WA6NKL. Send date, time, signal report and station contacted along with one IRC to Postmaster, Johannesburg, CA 93528.

Burlington, New Jersey: West Jersey Radio Amateurs will operate W2JUG for the entire 24-hour day of *Oct. 31* from the South Jersey Pine Barrens, home of the Jersey Devil. Frequencies: phone — 15 kHz from bottom of General band; cw — 15 kHz from bottom of Novice band. Certificate for s.a.s.e. to WJRA, Box 62, Burlington, NJ 08016.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding publication. For example, your information would have to reach Hq. by November 15 to make the January issue.

50 Years Ago

October 1931

☐ "Improving the Voltage Regulation of Rectifier-Filter Systems," by Ed Glaser, W2BRB, reviews the necessity for low regulation in the power supply of a c.w. transmitter. The author points out the advantages of mercury-vapor rectifiers and choke-input filter systems, and he also describes the use of the little-known voltage-regulating transformer.

☐ Don Wallace, W6AM, is a very *un*typical traveling salesman. In "The Traveling Man's Portable," Don describes the design and construction of the portable station, W6ZZA, that he carries on trips and uses to keep in touch with Mrs. Wallace, W6MA. The station is housed in a leather case that can be slipped under a Pullman seat; it consists of a two-tube, battery-powered receiver and a three-stage, crystal-controlled transmitter using '10s throughout (two in parallel in the final). Total weight is 64 pounds — no transportation problem for big Don, but it must have surprised a few porters and bell-hops along the way!

☐ In "The Vacuum Contact Key," Herman Kott describes how to use the German device imported by the Burgess Battery Company to key a transmitter. The vacuum contact consists of two copper contacts in a sealed glass cylinder; contact is made or broken by flexing an external glass extension. The movement required at the stem is only 0.02 inches, and operation speeds of 40 per second are normal at 6 amps and 220 volts. Manually-operated (mounted under a straight key) and remote-control (mounted on a relay) examples are shown.

☐ Paul Huntsinger reviews "The Mechanics of Modulation" and shows how modulation is measured. (Unfortunately, Figs. 6, 7 and 8, mentioned in the text, are not included, thus probably attesting to *QST*'s alleged pro-c.w. policy.)

☐ In "I.A.R.U. News" a letter from Robert Malong, W2BPY, reminds newcomers to 14 Mc. seeking their first European contacts that the Gs send TEST instead of CQ when looking for QSOs.

25 Years Ago

October 1956

☐ "The Monimatch," by Lew McCoy, W1ICP, is a description of the inexpensive and easy-to-build s.w.r. and output indicator. (This device and subsequent similar ones made "s.w.r." the No. 1 topic of conversation in ham circles for many years to come.)

☐ Long-time v.h.f. advocate Frank Lester, W2AMJ, tells how he stacked four 7-element Yagis to form "A 28-Element 144-Mc. Beam" and give him a big signal on 2 meters. Attention to mechanical details and the use of balanced feed contribute to the physical and S-meter strength.

☐ The "Novel Method of Matching to the Ground-Plane Antenna" of Walter Dauksher, W2OKX, involves a sliding short on a folded ground-plane antenna. The work was done with a model antenna at 435 Mc.

☐ For fans of the lower frequencies, Art Greenberg, W2CYK, gives tips on "Simple Trap Construction for the Multiband Antenna." With emphasis on physical details for strength and long life, the author uses readily available components throughout.

☐ Trying to get a little life into that almost dead-horse amplitude modulation, Ollie Allen, W4FHF, tells about "The Ultra Modulation System." The circuit prevents negative-peak flattening (and splatter and distortion) at audio-to-carrier power ratios of up to 5 to 1.

☐ The "4X250B Amplifier for 144 Mc." of W. J. Edinger, Jr., W6LSB, is a good, efficient design that permits 500 watts input. Forced-air cooling and simple construction make this an attractive amplifier.

☐ The ARRL Merit Award for 1955 goes to Paul Wilson, W4HHK, and Ralph "Tommy" Thomas, W2UK, for their pioneering work with meteor-burst propagation over a 940-mile path between Tennessee and New Jersey. Their work over two years attracted international attention among propagation scientists. — *Byron Goodman, W1DX*

48th ARRL November Sweepstakes Announcement

Well, it's almost November again. And you know what that means! Time to dust off the keyer paddle, check out the antennas and attach the splatter shield to the microphone. Lay in a fresh supply of coffee; you'll need it! Why? Because the 48th running of the November Sweepstakes is upon us.

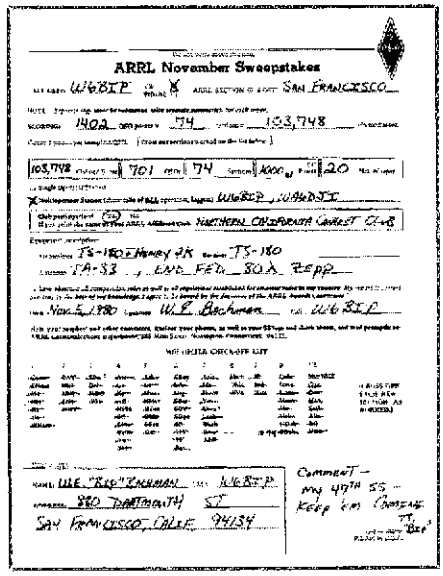
The rules for this year's contest are identical to last year's. The 30-minute time-out rule worked well and will remain. Also, remember that there is a three-QSO penalty for unremoved duplicate contacts and for miscopied call signs. Take a few seconds to make sure you have the call right before you move on. At four QSOs each (including the original QSO), bad calls reduce scores quickly.

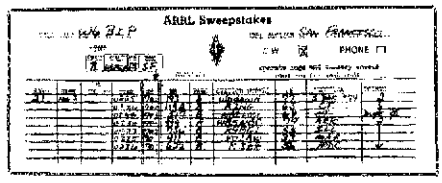
Another point to remember is that you must receive a *complete exchange* for each claimed QSO. If you get everything except the check, that's not good enough. You must copy it *all* for a complete contact. QSOs with stations "not in the contest" are fine, too — *if* you can get all of the required information.

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 (U.S.) for each five sheets requested. You'll need one summary sheet and one dupe sheet for each mode. Log sheets hold 100 QSOs each, so order accordingly. Order your official entry forms now; they not only make it easier on the log checkers, but also help make sure you submit all of the required information.

Logs must be postmarked by December 8, 1981. You should send them via first-class mail to ensure timely delivery. Entries arriving later than December 31 may not make the *QST* listings. If you want to make sure your entry arrived safely, include a self-addressed, stamped postcard. We'll return it to you when we get the log.

Club officers: Remember to send us a membership roster as detailed in the club competition rules (January *QST*, page 79). CU in SS!


ARRL November Sweepstakes


ARRL Sweepstakes

Suggested Frequencies

Cw	Novice	Phone
1800-1810		1810-1820
3550-3650	3710	3850-3950
7050-7100	7110	7200-7250
14,050-14,100		14,250-14,300
21,050-21,100	21,110	21,300-21,400
28,050-28,100	28,110	28,550-28,650

Contest Period

	Starts	Ends
Cw	Saturday, Nov. 7 2100 UTC	Monday, Nov. 9 0300 UTC
Phone	Saturday, Nov. 21 2100 UTC	Monday, Nov. 23 0300 UTC

Explanation of Exchange

	Number	Precedence	Call	Check	Section
Exchanges	Consecutive serial number	Power input more than 200 W dc	Send your station call	Last two digits of year first licensed	Your ARRL section
Sample	NR178	B	KN6M	55	EBAY

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 160 through 10 meters.

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 200 W dc or less, "B" if more than 200 W), your call sign, check (last two digits of the year you were first licensed), and your ARRL section. For example, KN6M answers W1AW's call by sending W1AW NR178 B KN6M 55 EB for QSO number 178, more than 200 watts, first licensed in 1955 and East Bay 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.

(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) times 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 should include dates, QSO times, exchange sent/received, band and mode. Postmark your entry within 30 days after the phone portion of the contest (December 8, 1981).

8) **Club Competition:** ARRL-affiliated clubs for club gavels and awards in the local, medium and unlimited categories as described in January 1981 *QST*, page 79.

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 1981 *QST*, page 79.

Results, 1981 ARRL International DX Contest

"The secret of success is constancy to purpose." — Benjamin Disraeli, Earl of Beaconsfield (1804-1881)

By Mark J. Wilson,* AA2Z and Bill Jennings,** K1WJ

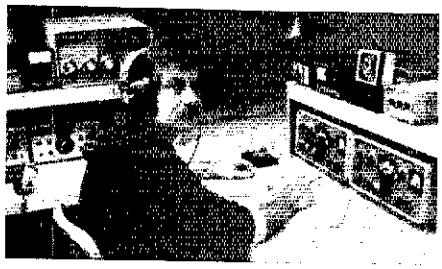
Bears do not bear radios, and that is all, says Ville, OH2MM, that kept him from being shot as a bear while he trudged through the snow to his countryside contest location. Ville was able to bear up under the competition and take the top 20-meter phone award for Europe and the 20-meter phone DX plaque.

Many thanks to the 4162 DX contesters who submitted 2175 cw and 1987 phone logs, helping to celebrate the return of *the* ARRL International DX contest. The February 21-22 (cw) and March 7-8 (phone) running of the contest signaled the end of the "world works the world" experiment conducted last year. Overwhelming opinion by contesters worldwide brought back the "world works W/VE" to the 1981 contest and brought it back to stay.

The great experiment of 1980 was far from a flop in terms of what it added to the contest, however. It gave us the popular single-band entry categories for single-operator stations, an expanded awards program (plaques) and a new philosophy for the multi-single category. Bertrand Russell was right when he said, "Change is one thing, progress is another." He might have taken that one step further and said, "Change without progress is change without purpose." We did gain something from the 1980 experiment.

Excellent band conditions both weekends apparently helped increase the number of logs received by 153 from last year's total of 4009. Activity was so good that the top two phone single-op stations and the top four cw single ops all managed to clear 2000 QSOs. K1KI also sniffed out 397 multipliers on phone, a total not seen since the days of two weekends per mode.

The Top-Ten W/VE single-operator scores came, for the most part, from the northeast (so what else is new?). Conditions were better for those farther west on phone, with W9ZRX, N7DF, VE7BTV and KD6PY all making the grade. Cw was a different story, however, as WØUA at KØRF was the only one outside the first three call areas to make it. K1JX, N3BB and N2LT showed their skill and endurance by appearing in the Top Ten on both modes. K1VTM, operated by K1JX, just narrowly squeaked past K1KI for the top phone honors, and both of these top contesters were a cool half-million points ahead of the nearest competition. On cw, N2NT put the W2PV antenna farm to good use and easily swept past the competition to fill the top slot.



K1JX operated K1VTM to a first-place finish on phone and second place on cw. This is the second year in a row that someone won on phone from K1VTM, but that won't happen again. thank God!

1982 ARRL International DX Contest

CW	*Phone*
February 20-21	March 6-7

Single-band competition, retained from last year, again proved popular as about 30 percent of the W/VE single ops chose that category. The attractions are obvious: some sleep is possible, it's easier to build a competitive antenna system for one band than for all bands and there is no worry about missing an odd long-path opening or a rare multiplier that only shows up for a few contacts. There were several outstanding single band operations that outshined even the biggest multi-multis. On phone, K1UO used his quiet location in Maine (a mere stone's throw from Europe) to run stations earlier and later than most other competitors on 10, while W7WA used K7RI's fabulous shot to Japan to rack up almost 2400 QSOs on 15 meters alone. On cw, W8LRL found the patience to track down 37 QSOs and 24 multipliers on 160 meters.

Although the western stations didn't fare too well in the single-operator category, they dominated the multi-single class. The K5RC group again walked away with the cw multi-single plaque by a healthy margin, while the gang at KØRF finished first on phone. Besides having big antennas and good operators, both groups took advantage of good European and JA openings to fill the log pages, while the multiplier station operators patiently waited for the East and West Coast aluminum curtains to open so they could work the rare ones. Of note is KØRF's QSO total of 517 on 40-meter phone. We didn't believe that number either, but we checked it out, and they really did work an incredible number of 20- and 100-watt JA stations.

The multi-multi competition is usually hot and heavy, with the big stations battling for the lower band edges until the loudest station wins and the loser slinks off to lick his wounds. The Frankford Radio Club crew at K2UA hung in there on code and came out on top for the first time, while the Yankee Clipper Contest Club teams at W2PV and K1OX slugged it out on phone.

N2AA deserves mention as winner of the QRP category on both modes. Using fairly modest antennas, Gene worked some really nice DX such as VS6 and KX6 on cw. Among the 91 countries he worked on 10-meter phone were 6W8, CEØA and D4. Not bad for 5 watts and a 3-element beam at 20 feet.

*Assistant Communications Manager, ARRL
**Communications Assistant, ARRL

United States and Canadian Plaque Winners

Phone

Single operator	*Winner*	*Donor*
All Band	**K1VTM (K1JX)**	Frankford Radio Club
1.8 MHz	**W8LRL**	ARRL
3.5 MHz	**W1CF (K8UR)**	Gary Firtick, K1EB/W1EBC
7 MHz	**K7UR**	David Thompson, K4JRB/K5MBX
14 MHz	**K3KG**	Richard Loehning, N9ACP and Mark Michel, W9OP
21 MHz	**K7RI (W7WA)**	Hamfesters Radio Club, W9AA
28 MHz	**K1UO**	Roy and Kathryn Tucker, N6TK and AA6TK
QRP	**N2AA**	Rockford Amateur Radio Assn.
Multi-Single	**KØRF**	Mid-Ohio Contest Club
Multi-Multi	**W2PV**	Buffalo Area DX Club

CW

Single Operator	*Winner*	*Donor*
All Band	**W2PV (N2NT)**	Frankford Radio Club
1.8 MHz	**N4IN**	W1TX Roy Fosberg Memorial (Connecticut Wireless Assn.)
3.5 MHz	**W1ZM (K1ZM)**	Northern Illinois DX Assn.
7 MHz	**W5UN**	DX Awards Guide — Ellis—Doucett Memorial
14 MHz	**K5IY (KA5CHW)**	Neenah-Menasha Amateur Radio Club
21 MHz	**K1RM**	Willamette Valley DX Club
28 MHz	**WØZV**	Mike Badolato, W5MYA
QRP	**N2AA**	Hollywood Amateur Radio Club
Multi-Single	**K5RC**	Mid-Ohio Contest Club
Multi-Multi	**K2UA**	North Florida ARS—Hollis Graves Memorial

The top DX scores came from the Caribbean, as usual, but all continents except Asia were represented in the DX Top Ten. On cw, veteran single-ops HH2VP, W1BIH/PJ2 and VP2VI vied for first place, with HH2VP the eventual winner. Only slightly discouraged by the results of last year's cw effort, K2YY again traveled to Montserrat, this time for phone. The results were a little more rewarding as John won the DX phone plaque by a good bit. Rounding out the DX Top Ten were some fine scores from Europe, Africa and South America, as well as several from Oceania. The Caribbean was also the site of an outstanding phone multi-single effort at VP2E. K8ND and friends put on quite a show, breaking 10,000 QSOs before dupes and working 330 out of a possible 342 multipliers. They *averaged* 214 QSOs per hour for the entire contest, made 326 QSOs the first hour and bought all the throat lozenges on the island of Anguilla.

There was in increase in the affiliated club competition this year, with 88 clubs meeting the criteria. The Frankford Radio Club won the Unlimited Class gavel again this year with a whopping 106 megapoints and 126 entries. There was, however, some serious competition from the Yankee Clipper Contest Club this time. Seems the YCCC was only about 9 million points behind after the cw weekend (traditionally Frankford's strong mode), and this led to some good-natured rivalry and joking among members of the two clubs. FRC managed to mobilize the troops and field a number of small phone multi-multis to win out in the end. Murphy's Marauders took the honors in the Medium Class for the third year in a row, with the North Texas Contest Club pack hot on the trail. Last, the Ill Wind Contesters used their big multi-multis to blow away the Central Virginia Contest Club in the Local Class. The club competition has grown over the past few years to become as intense as the competition among individual stations.

JAØNL — 15-meter cw competitor.

DX Plaque Winners

Phone

Single Operator	*Winner*	*Donor*
All Band—World	**VP2MP (K2YY)**	North Jersey DX Assn.
Africa	**EL2AV**	John Farrington, WA1TQP
Asia	**JA1ELY**	Lafayette ARC and Acadiana DX Assn.
Europe	**I6FLD**	Murphy's Marauders
North America	**N1GL/VP9**	Chod Harris, VP2ML
Oceania	**KH6NO**	Ray Stone, W5RBO
South America	**PP2ZDD**	Roy and Kathryn Tucker, N6TK and AA6TK
1.8 MHz	**HI8JAG**	Arkansas DX Assn.
3.5 MHz	**HI8PGG**	Robert Peterson, W3YY
7 MHz	**FMØFJE**	KN6M Contest Machine
14 MHz	**OH2MM**	Don Wallace, W6AM
21 MHz	**YU3TU**	*Worldradio*
28 MHz	**FGØFOO/FS (N6RA)**	Mike Badalato, W5MYA
QRP	**I5NSR**	William Shepherd, K3WS
Multi-Single World	**VP2E**	Delta DX Assn.
Africa	**EL9A**	Indy DXers
Asia	**JA2YKA**	Kansas City DX Club
Europe	**CT2ARA**	Roger De Busk, K8LSG, Memorial
North America	**NP4A**	Lynn and Rosie Lamb, W4NL and KA4S
Oceania	**ZL3BK**	Carl Smith, WØBWJ
South America	**W4PRO/CEØ**	Liga Colombiana de Radioaficionados
Multi-Multi World	**G4ANT**	Gloucester County ARC-SNJ
Africa	**EA9IE**	Randy and Sharon Stegemeyer, W7HR and WB7DBP
Asia	**JA7YAA**	Mike Badalato, W5MYA
Europe	**N2BVJ/LX**	Grosse Point Farms DX Assn.
North America	—	Southeastern DX Club

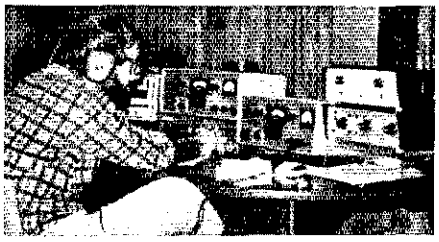
CW

Single Operator	*Winner*	*Donor*
All Band—World	**HH2VP**	North Jersey DX Assn.
Africa	**5T5CJ**	San Diego DX Club
Asia	**JA1BWA**	Sonoma County Radio Amateurs
Europe	**EA2IA**	Clarke Greene, K1JX
North America	**VP2VI (WØDX)**	Pete Grillo, W6RTT
Oceania	**KH6ND**	Ray Stone, W5RBO
South America	**W1BIH/PJ2**	Alamo DX Amigos—San Antonio
1.8 MHz	**OK3CPL**	Arkansas DX Assn.
3.5 MHz	**EA8RL**	Earl D. Merry Memorial (W8KI, donor)
7 MHz	**KP4EQF**	Art Boyers, K3KU
14 MHz	**OH5TQ**	Bencher, Inc.
21 MHz	**TF3YH**	Southern New England DX Assn.
28 MHz	**G4GIR**	West Jersey Communications Products
QRP	**G4BUE**	AJ7S—Nashua Amateur Radio Club
Multi-Single World	**JA7YAA**	Texas DX Society
Africa	**TL8WH**	Red Stick DX Assn.
Asia	**UKØQAA**	Red Stick DX Assn.
Europe	**DLØAA**	South Florida DX Assn.
North America	**FMØFOL**	The K5RC Multiop Crew
Oceania	**KH6IFY**	KN6M Contest Machine
South America	—	Mike Badalato, W5MYA
Multi-Multi World	**NL7M**	*QRZ DX*
Asia	**JF1ZRQ**	Colorado Contest Conspiracy
Europe	**OH1AF**	George Schultz, WØUA, and John Brosnahan, WØUN
North America	**NL7M**	Ventura County ARC, K6MEP

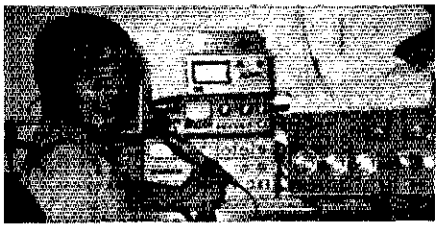
Special Plaque Winners

Single Operator	*Winner*	*Donor*
Republic of South Africa (phone)	**ZS6ABO**	Bill Jennings, K1WJ
Scandinavian Award (combined)	**OZ1LO**	John Lindholm, W1XX
W/VE Low Power (top, both modes)	—	Ken Bolin, W1NG
World Combined Score (both modes)	**KH6ND**	Yankee Clipper Contest Club
Israel (cw)	**4Z4RS**	Martin Hartstein, N6WW
Israel (phone)	**4Z4RS**	Martin Hartstein, N6WW
West Coast Big Gun (14 MHz west of Mississippi)	**WA7GVM**	Larry Pace, N7DD
Canada (cw)	**VE3IY**	CANAD-X
Japan (phone)	**JA1ELY**	Western Washington DX Club
Japan (cw)	**JA1BWA**	Tom Morrison, K5TM and Randy Thompson, K5ZD
W/VE Operator (combined)	**K1JX**	*National Contest Journal*
Europe 3.5 MHz (cw)	**EA2OP**	South Florida DX Assn.
U.S. 8th call area (phone)	**K8AZ**	Livonia Amateur Radio Club, Inc.
Japan (combined)	**JA1ELY**	Northern California Contest Club
Europe (3.5 MHz phone)	**CT1FL**	W3LKG Memorial—K3ND and Family
Poland (combined)	**SP3DOI**	Rich Assarabowski, K1CC
Dominican Republic (phone)	**HI8GB**	Jose Barecelo, HI7UP
Dominican Republic (cw)	**HI8LC**	Jose Barecelo, HI7UP
Reciprocal Operator (foreign in U.S.)	**LA4LN/W3**	Amateur Bilingual Radio Operators and DX
California (cw)	**K6NA**	Southern California Contest Club
California (phone)	**KD6PY**	Dave Bell, W6AQ
Texas (cw)	**K5NW**	Dennis Motschenbacher,KA5CHW
W/VE Low power (cw)	**N5AW/1**	Wireless Institute of the Northeast
U.S. Ø Call Area (phone)	**WØEJ**	Ak-Sar-Ben Amateur Radio Club, Inc.
U.S. 4th Call Area (cw)	**N4RV (N3TR)**	Tom and Jan Middleton, WB4CKY
Middle East (cw)	**HZ1HZ**	Herb Twitchell, W6BL
Japan (15 meters cw)	**JH1BBU**	Jess Guaderrama, W6LEN
Australia (phone)	**VK4VU**	Armond Noble, N6WR
Australia (cw)	**VK3AEW**	Jay Carr, W6FAY
Caribbean Resident	**HH2VP**	Arturo Gigante, HI8GB
Multioperator		
Caribbean (phone)	**VP2E**	W5QBM Joe Johnston Memorial
Caribbean (cw)	**FMØFOL**	The YASME Foundation, Inc.
Most Improved Club	**Murphy's Marauders**	Steve Place, WB1EYI
Contest DXpedition (cw)	**FMØFOL**	John Minke, N6JM
Contest DXpedition (phone)	**VP2E**	Long Island DX Assn. in memory of Howard Geberth, W2NUT/1

Gustavo, CT2CY, used his Swan 350 and a dipole antenna in a 20-meter monoband phone effort from Sao Miguel Island in the Azores.



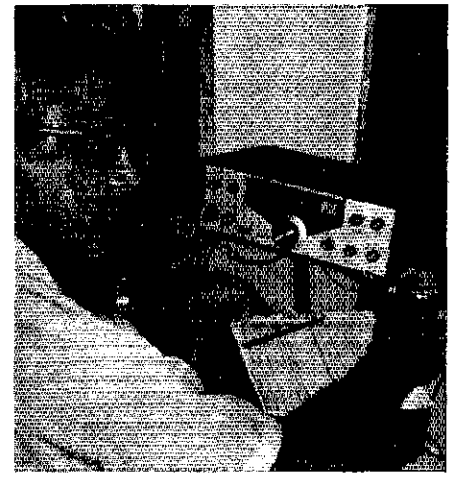
W3XU handled 15 meters for K2UA, who ended up at the top of the heap on cw for multi-multi stations.



4X6DX, Seth, put in 48 hours on 20 meters in the phone weekend and emerged as the top Asian 14-MHz operator.

SOAPBOX

DX — We ran into a little trouble during the contest on Sunday afternoon. It seems that we mixed up the feed lines on the 10- and 20-meter beams so that for about six hours we were on 10 meters with the 20-meter antenna beaming to the *Indian Ocean*. Unbelievable! (I3ON). We welcome back the old ARRL DX Contest rules . . . We are convinced that this is the number one contest for those who love to contest (JA3ODC/JA3YKC). At 14 years of age, I am the youngest Advanced class ham in Israel and also hold the call sign, N2BZQ . . . This was my first contest, and I hope that I did well (4X6DX). [You did real FB, Seth. You turned in the number one Asia 20-meter phone score. — Ed.] Conditions during the contest were good to the East Coast and spotty to W5 and WØ. Didn't hear anything from W7 though (DK8FS). I can boil down my feelings about this contest to this simple equation: FB condx + good rig + poor antennas = by best results ever (OK2BLG). Just running a vertical antenna and a barefoot rig, so couldn't keep the pile-ups going. Fortunately, there was a multi-single operation up on the hill that made about 3500 QSOs and helped fill the need for the Easter Island multiplier (CEØAE). Poor Hawaiian and Alaskan stations! Please include KH6s and KL7s as "new states" next year (YB2SV). As a longtime competitor, I am delighted that the old form of the contest has been restored, with W/VE stations at the focus of it. That has restored the unique zest and pace of this contest. By the second day, most competitors (including myself) were using the rubbishy 599. I urge you to replace the report with a serial number, irrespective of movement among the bands, starting at 001 and restarting after each 999. The exchange would then again have meaning (G2RO). A lot of you W and VE stations have very good ears — you had to to hear my weak signal (JF2BDK). See you next year from some other DX QTH. Once you get a taste of the other side, it's hard to quit (K8ZH/6Y5). We had a lot of problems with interference between stations at our multi-transmitter/multi-operator site. We will try to correct this for next year's contest (JH1CNT/JF1ZRQ). There is no electricity on my island so I can't use a linear amplifier. I do have an old generator that sometimes works and sometimes doesn't. This time I used only automobile batteries to power my five-watt rig. I try again next year and hope that the ice is thick enough to drive over to my island. This year we had to walk because the ice was only 2 inches thick (OHØPA). One of our operators (GW4DZE, Lin) worked 36 out of the 48 hours, surviving on a diet of curried beef, boiled rice and coffee (GW4KHQ). After spending a wet afternoon threading a 160-meter dipole through some trees, we were a little disappointed that we didn't even hear anything on that band. However we got some comfort from N6CW who said that we were the only Europeans he heard on 80 meters . . . Our peak



The Man, himself, HH2VP, number one score in the 1981 cw contest. That 2.5-million point score came from 200 watts to a trap vertical antenna and a 160-meter dipole — and from 33 hours of hard operating time.

K2YY (l) conducts a pre-contest strategy meeting with host VP2MF. John kept his composure throughout and turned in the top phone score, worldwide. FB!

Top Ten, Phone — Single Operator

W/VE

K1VTM (K1JX)	2,447,550
K1KI	2,443,404
W9ZRX	1,870,848
N3BB	1,847,055
W2YV	1,648,290
N7DF	1,555,245
VE7BTV	1,388,004
N2LT	1,298,232
KD6PY	1,292,004
K1LL	1,287,600

DX

VP2MP (K2YY)	5,449,095
N1GL/VP9	4,092,300
TG9GI	3,969,252
EL2AV	2,548,665
KH6NO	2,156,952
I6FLD	2,118,675
KH6BZF	1,948,089
KH6ND	1,920,702
SP3DOI	1,576,800
VK4VU	1,416,564

Top Ten, CW — Single Operator

W/VE

W2PV (N2NT)	2,007,936
K1VTM (K1JX)	1,832,436
K1BW	1,814,127
KØRF (WØUA)	1,762,713
K1AR	1,717,455
N2LT	1,669,221
K3LR	1,556,415
N3BB	1,550,640
W2RQ	1,448,172
AE2A	1,333,284

DX

HH2VP	2,564,298
W1BIH/PJ2	2,498,688
VP2VI (WØDX)	2,473,688
EA2IA	2,302,977
OZ1LO	2,010,663
KH6ND	2,003,637
9Y4VU	1,651,545
KH6NO	1,562,340
SP3DOI	1,461,438
5T5CJ	1,330,035

Division Leaders — Single Operator

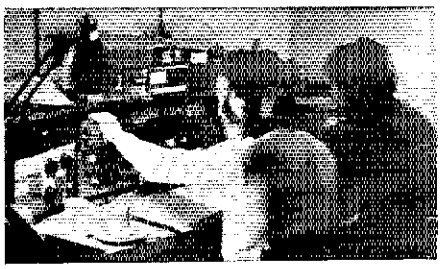
Phone	*Division*	*CW*
N3BB	Atlantic	K3LR
W9ZRX	Central	AI9J
KØDD	Dakota	KBØRC
W5XZ	Delta	K4XU
K8AZ	Great Lakes	WA8YVR
W2YV	Hudson	W2PV (N2NT)
WØEJ	Midwest	KBØRC
K1VTM (K1JX)	New England	K1VTM (K1JX)
K7WQD	Northwestern	K7NHV
KD6PY	Pacific	N6MG
N4UH	Roanoke	N4RV (N3TR)
N7DF	Rocky Mountain	KØRF (WØUA)
WA4FBH	Southeastern	K4BAI
N6AR	Southwestern	K6NA
N5IH	West Gulf	K5NW
VE7BTV	Canada	VE3IY

Affiliated Club Competition

Unlimited Class	*Score*	*Entries*	*CW Winner*	*Phone Winner*
Frankford Radio Club	106,823,216	126	N2LT	N3BB
Yankee Clipper Contest Club	87,012,597	99	W2PV (N2NT)	W2YV
Potomac Valley Radio Club	53,155,632	64	N4RV (N3TR)	N3RL
Northern California Contest Club	44,774,432	65	N6MG	N6BV
Medium Class				
Murphy's Marauders	21,572,634	25	K1VTM (K1JX)	K1VTM (K1JX)
North Texas Contest Club	20,435,845	46	K5NW	K5NW
Mad River Radio Club	18,342,981	13	K3LR	K8AZ
San Diego DX Club	11,387,442	13	K6NA	WA6EJL
Texas DX Society	10,245,975	16	KN5H	K5DX
Colorado Contest Conspiracy	8,039,529	9	KØRF (WØUA)	WØZV
Wireless Institute of the Northeast	7,827,522	17	W2RQ	W1GD
Kansas City DX Club	6,949,128	21	NØTT	WBØISW
Southern California DX Club	6,491,659	14	N6AA	N6AR
Western Washington DX Club	6,360,384	36	W6RR	K7WQD
Willamette Valley DX Assn.	5,836,818	12	W7NI	W7EJ
Northern Illinois DX Assn.	4,752,513	20	AI9J	AI9J
Northern California DX Club	4,630,179	35	N6AN	N6OJ
Flyweight DX Group	3,442,799	16	N4DW	AB4H
Eastern Iowa DX Assn.	3,247,526	20	WØEJ	WØEJ
Southeastern DX Club	2,806,836	19	AA4NC	WA4FBH
Michigan DX Assn.	2,609,772	11	K8GL	W8TWA
Northern Ohio Amateur Radio Society	2,542,242	28	K8US	N8ATR
Rochester DX Assn.	2,143,596	17	W2TZ	W2TZ
Gloucester County AR Club	1,832,916	13	W2YC	K2SNK
North Alabama DX Club	1,705,172	11	N4KG	WN4KKN
South Jersey Radio Assn.	1,490,889	23	WB2BYU	WA2NBM
Order of Boiled Owls—NY	1,465,512	5	K2LE/1	
Fort Wayne Radio Club	1,273,828	14	K9TUS	W9LT
Grumman Amateur Radio Club	1,025,361	12	WA2LQQ	W2INJ
Alamo DX Amigos	1,005,540	11	W5DV	W5DV
Four Lakes Amateur Radio Club	876,284	12	—	K9QXY
Columbus Amateur Radio Assn.	858,495	15	W8ELE	W8DWP
Local Class				
Ill Wind Contesters	12,093,828	9	AF9C	N9AEJ
Central Virginia Contest Club	9,348,468	4	—	—
Fraser Valley DX Club	4,319,349	10	VE7BTV	VE7BTV
Red Stick DX Assn.	4,041,897	8	WA5IGD	W5XZ
Central Arizona DX Assn.	3,233,814	7	N7MW	W9FI
Halifax Amateur Radio Club	3,117,441	5	VE1AIH	—
Point Radio Operating Society	3,084,285	7	K3MD	—
Mississippi Valley DX/Contest Club	2,874,396	10	K9BGL	KBØRC
Albuquerque DX Assn.	2,786,493	5	—	W5JW
Southern California Contest Club	2,739,057	3	W6AM (N6TJ)	—

came at 1500-1600Z on 10 meters on Saturday when our QSO rate climbed to 155 (GU4CHY, GU3MBS, N6RA/GU3HFN). When going through the logs, one can see that far too many dupes were worked (238 dupes in 3186 QSOs). We never call any stations but try to hold a frequency and work the pile-up. Therefore, it's the stations that are calling us who are causing the dupes. This situation has been getting worse in the last couple of years and applies mostly to W stations, not to JAs or any others. It used to be that you almost never duped a W station. I think it calls for a very strong reminder from the contest manager (SM2EKM/SL2Z7U). [Good point, Jim. Consider the reminder given. There is no reason that someone going around calling stations cannot keep up the dupe sheet. — Ed.] Our DXpedition to St. Vincent coincided with the contest, and we decided to give it a try. As a string of 600-foot hills surrounded our rented house on three sides, including the side toward the U.S., we borrowed a battery from VP2SQ (now J88AQ) and lugged it, the rig, antenna tuner and rest of the gear to the top of the ridge for the phone contest. With 90° heat, high humidity and that sun directly above our heads, you can only imagine the dedication needed to drag that gear and ourselves up the hill (WB1ABF, W1JP, K1IJU/J87BM). All W6s please QSL via the burau for NCDXC Award (GM4FDM). I was surprised that Mississippi should be the rarest one, had rather expected Nevada, N. Dakota or Rhode Island to be the difficult ones (DJØIV). Surprising what a pile-up one can get on cw from the Caribbean (K4LTA/ZF2EX).

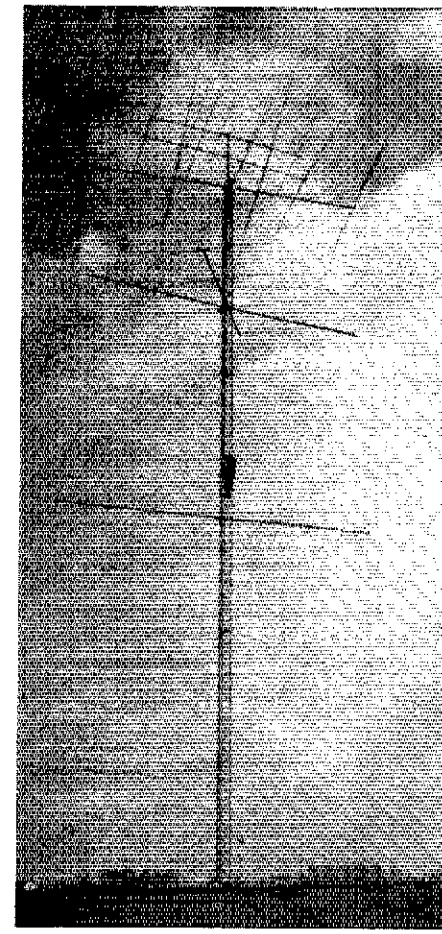
W/VE — I think that I burned a hole to JA land with only the 200 watts to a vertical (KA3FMH). The contest "bug" sure bites hard. A week after the contest, I was laid up for four days. Gave me time to do my logs (KB8PK). Never had this good a percentage before. Worked 39 out of 40 called (WA8FCH). Sorry



K1XA (front) and AA2Z at the K1XA multi-single cw effort. *(WB1EYI photo)*

G4GIR smoked the rest of the competition to win the 10-Meter CW DX Plaque.

Local Class	Score	Entries	CW Winner	Phone Winner
Greater Milwaukee DX Assn.	2,216,463	6	—	W9GIL
Overlook Mountain AR Club	1,834,822	7	—	WB2NFG
Milford Amateur Club	1,791,927	5	—	K8CMO
Lynchburg Amateur Radio Club	1,374,945	8	N4UA	NI4R
Neenah-Menasha AR Club	1,337,016	5	—	W9OP
Rubber Circle Contest Club	1,236,068	7	K7UU	N7ABJ
Long Island DX Assn.	1,130,118	9	K2MFY	KA1DS
DX Assn. of Connecticut	1,040,343	8	WA1CCR	K1WJ
Eastern Michigan AR Club	909,360	6	N8BKO	AC8W
Meriden Amateur Radio Club	775,917	4	W1KKF	—
Redwood Empire DX Club	619,506	6	N6OJ	—
Montgomery Amateur Radio Club	508,830	4	WA3NQJ	KC3H
Dauberville DX Assn.	475,923	9	—	KA3ARQ
Western Illinois AR Club	475,218	3	—	N9GB
Sheboygan County DX Assn.	463,950	4	—	KE9A
Split Rock Amateur Radio Assn.	423,900	7	KD2G	KD2G
Kansas DX Assn.	421,401	5	—	WAØTKJ
Northern Ohio DX Assn.	418,728	9	WD8MOV	WD8KKF
Hollywood Amateur Radio Club	363,687	3	—	—
Lincoln Amateur Radio Club	354,552	4	—	KØGND
Natchaug Amateur Radio Assn.	348,672	4	—	WB1CBY
Central Florida DX Assn.	297,528	4	—	—
Ventura County Amateur Radio Club	285,009	6	—	WA6DJS
Radio Amateur Club of Knoxville	283,821	6	—	KA4RJC
Mitre-Bedford AR Club	282,306	6	—	W1FM
Long Island Mobile AR Club	255,459	8	—	WA2JCX
Greater Lansing DX Group	250,778	7	—	WB8YQX
Ohio Valley AR Assn.	240,954	4	W8GOC	—
Southern New England DX Assn.	239,226	4	—	—
Winnipeg DX Club	197,490	3	—	—
St. Cloud AR Club	172,803	3	—	—
Motor City Radio Club	169,089	6	—	K8SIA
Longview Amateur Radio Club	168,198	3	—	—
Radio Association of Erie	158,277	3	—	—
Stamford Amateur Radio Assn.	156,321	4	—	—
Carbon County AR Club	155,589	5	—	WB3JYY
Lake Success Radio Club	132,039	8	WA2ISH	W2NBI
Saginaw Valley AR Assn.	103,281	6	—	WB8AYW
Arinc Amateur Radio Club	93,147	6	W3HVQ	W3PWC
Southington AR Assn.	72,948	4	—	WB1BVQ
Reading Radio Club	63,819	6	WA3JXW	WB3EPW
San Angelo Amateur Radio Club	47,688	3	—	K1DWQ/5
Chicago Radio Traffic Assn.	28,111	4	—	—
Columbus Amateur Radio Club	13,044	3	—	—
Rockford AR Assn.	11,847	3	N9UN	—
Larkfield Amateur Radio Club	9450	3	—	—



The multi-single cw station at AD8P includes: 5 elements on 10 meters at 115 feet, 4 elements on 20 meters at 110 feet, 4 elements on 40 meters at 105 feet, 4 elements fixed on Japan at 87 feet, 2-element delta loop on 80 at 85 feet, 6 elements on 10 meters fixed on Europe. A second tower (not shown) has 6 elements on 15 meters at 55 feet and is shunt fed for 160 meters.

DX Continental Leaders — Phone

	Africa	Asia	Europe	North America	Oceania	South America
All band	EL2AV	JA1ELY	I6FLD	VP2MP	KH6NO	PP2ZDD
28 MHz	ZS6HZ	JH7FMJ	IØMGM	FGØFOO/FS	ZL1AAS	ZZ5EG
21 MHz	S83T	JH1BBU	YU3TU	HI8GB	DU1EFZ	CE3TK
14 MHz	—	4X6DX	OH2MM	HT5JAR	ZL1AXB	YV4BOU/2
7 MHz	ZS6DW	JA2BAY	I5NPH	FMØFJE	—	OA4AWD
3.5 MHz	—	JA1BTB	CT1FL	HI8PGG	—	ZP5PT
1.8 MHz	—	—	—	HI8JAG	—	—
QRP	—	JAØBMS/1	I5NSR	—	KH6CP	OA8V
Multi-single	EL9A	JA2YKA	CT2ARA	VP2E	ZL3BK	W4PRO/CEØ
Multi-multi	EA9IE	JA7YAA	G4ANT	—	—	—

DX Continental Leaders — CW

	Africa	Asia	Europe	North America	Oceania	South America
All band	5T5CJ	JA1BWA	EA2IA	HH2VP	KH6ND	W1BIH/PJ2
28 MHz	EA9GT	JH1EDD	G4GIR	—	KG6DX	LU2KAK
21 MHz	—	JH1BBU	TF3YH	—	KH6JWK	PY8ZLC
14 MHz	EA9GK	UAØSAU	OH5TQ	HP1XPA	—	PY1BOA
7 MHz	ZS5VP	JA1KSO	YU4FRS	KP4EQF	K8CW/KH6	YV4BOU
3.5 MHz	EA8RL	JA1SJV	EA2OP	KP4EHP	VK3XB	HK3YH
1.8 MHz	—	JA1BK	OK3CPL	—	—	—
QRP	EA8EY	JA1MCU	G4BUE	—	KH6CP	OA8V
Multi-single	TL8WH	JA7YAA	DLØAA	FMØFOL	KH6IFY	—
Multi-multi	—	JF1ZRQ	OH1AF	NL7M	—	—

for late log. Parents say school comes first (KB7G). I live only 300 yards from K6RU — band overload for both of us. I actually got Cam Pierce (yes, *THE* Cam Pierce) to take notice of my measly little operation. Overload hurt both of us, but we tried to stay apart and bring the QRM down to S-6 . . . If any stations from Northern California do really well, I will be shocked. Low rates to JA and low multipliers really hurt me. The W1s and W2s should take this one — no sweat (N6BZA). It took a lot of calling to get my 37 QSOs, but it was all worth it when NØNO/CEØ on Easter Island answered my two-watt signal for my first QSO with Easter Island in 26 years of hamming (W8EAO). My only complaint in the whole contest is how the BIG GUNS try to edge you off the frequency to try to work the station that you just finished working. They just call right over you (WB1CNM). Contest highlights. WA8MEC answering a DX "CQ" then getting halfway through the QSO DE K8 B4 and K8B4 got a 599 200. Blowing the moisture off the quarter-wave 80/half-wave 40 vertical tuner with the SB-200. Better than a hair dryer. Beating K8LX in a 40-meter pile-up (K8DD).

FEEDBACK

Please note the following corrections to the 1980 ARRL International DX Contest on pages 76-89 of October 1980 *QST*. Add K3WS to the list of single-operator stations on cw, 15 meters only in the Maryland/DC Section. Credit Bill with 114 QSOs and 53 multipliers, running over 200 watts for a total score of 17,808 points. This makes K3WS the 15-meter monoband winner in Maryland/DC. WB8JBM (WB8DQP, opr.) should be listed as the phone winner for the Northern Ohio ARS. Finally, KØVUW, not KØWM, is the phone certificate winner for the Mississippi Valley DX and Contest Club.

W/VE Area Leaders (QSOs/Multipliers)

Phone

Single Operator	*160*	*80*	*40*	*20*	*15*	*10*
K1VTM (K1JX)	4/4	60/42	122/50	485/86	737/93	801/98
W2YV	5/5	60/38	82/50	388/80	593/80	517/81
N3BB	—	39/11	83/45	187/71	513/91	973/107
K4XU	—	13/13	24/16	230/75	217/80	626/91
N5IH	—	24/18	75/40	183/60	395/75	877/82
KD6PY	1/1	50/15	275/30	159/60	536/59	680/77
N7DF	7/7	27/19	178/26	195/62	855/69	771/72
K8AZ	2/2	22/22	45/37	265/73	291/76	481/80
W9ZRX	11/10	30/26	97/52	202/74	608/98	846/88
WØEJ	4/4	27/22	24/21	268/63	274/77	497/75
VE7BTV	—	21/11	23/16	230/57	1196/73	692/57
Multi-single						
KØRF	4/4	63/42	517/65	398/102	1335/100	797/102
Multi-multi						
W2PV	19/14	167/72	211/73	1379/136	1726/142	1269/125

W/VE Area Leaders (QSOs/Multipliers)

CW

Single Operator	*160*	*80*	*40*	*20*	*15*	*10*
K1VTM (K1JX)	3/3	108/41	392/46	676/69	477/61	510/62
W2PV (N2NT)	3/3	114/56	308/58	599/70	497/68	495/76
K3LR	6/6	45/37	318/60	445/69	376/62	615/71
N4RV (N3TR)	3/3	51/32	118/41	452/48	407/55	521/66
K5NW	1/1	21/16	163/52	286/69	296/61	319/60
K6NA	—	44/13	287/46	170/53	196/53	465/68
N7DF	3/2	25/17	273/36	280/56	628/51	486/50
WA8YVR	—	21/17	150/40	543/79	356/50	484/53
AI9J	—	53/31	110/39	446/59	318/53	495/67
KØRF (WØUA)	4/4	101/32	422/46	378/61	559/66	627/72
VE3IY	—	55/39	118/48	531/79	353/62	443/60
Multi-single						
K5RC	9/9	71/54	381/68	779/108	519/84	840/80
Multi-multi						
K2UA	20/18	240/71	792/97	1436/112	1180/89	985/97

DX Continental Leaders (QSOs/Multipliers)

Phone

Single Operator	*160*	*80*	*40*	*20*	*15*	*10*
EL2AV (no QSO breakdown)	—	/26	/34	/50	/55	/52
JA1ELY	—	87/21	162/39	392/52	500/54	759/57
I6FLD	—	34/12	100/25	1379/57	717/55	1215/56
VP2MP (K2YY)	25/14	381/53	459/53	834/55	2112/57	2474/57
KH6NO	8/4	284/46	235/46	514/53	418/50	1317/55
PP2ZDD	—	—	20/18	338/56	471/47	800/54
Multi-single						
VP2E	195/47	524/56	699/56	1394/57	2782/57	4196/57
Multi-multi						
G4ANT	—	109/22	499/44	1043/55	1328/56	2022/55

CW

Single Operator						
5T5CJ	—	294/45	366/50	312/47	442/51	441/46
JA1BWA	—	65/27	90/34	564/53	348/50	586/53
EA2IA	—	211/37	317/52	903/56	821/56	735/56
HH2VP	143/36	454/53	456/53	550/51	511/51	764/53
KH6ND	46/28	286/49	387/49	473/54	575/53	544/56
W1BIH/PJ2	64/26	368/48	338/49	678/56	641/55	803/54
Multi-single						
JA7YAA	9/4	171/37	457/52	941/55	952/55	996/55
Multi-multi						
NL7M	—	165/35	465/48	923/56	1124/56	1280/55

SCORES

The scores are listed by mode — phone or cw. Within each mode there are continent and country subdivisions for DX stations and ARRL Section headings for W/VE participants, single-operator stations only. Under each subheading, scores are listed in descending order by category, all band first, 160-meter monoband next, followed by 80-meter monoband entries, then 40-, 20-, 15 and 10-meter monoband scores, with QRP entries listed last. The individual linescore gives call sign of the station, the total score achieved by that station, number of contacts, number of multipliers, a letter that indicates the greatest level of power used by that station (where A indicates up to 10 watts of input power, B means greater than 10 watts but 200 watts or less, and C means that a power input of over 200 watts was used). A sixth column is used to indicate the entry category of the station (single-operator stations only). AB indicates single-operator, all band, 160 for 160-meter monoband, 80 for 80-meter monoband, 40 for 40-meter monoband, 20 for 20-meter monoband, 15 for 15-meter monoband and 10 for monoband operation on that band. QRP is for 10 watts or less of input power (5 watts output), of course. The sixth col-

Larry, K1UO, W/VE 10-meter plaque winner on phone.

W/VE Low-Power Leaders (200 W or less)

Phone

W2TZ	534,303
N2GC	366,378
N5AW/1	344,223
VE6MP	311,928
KA1O	303,510
WB2TCQ	282,150
AA4KT	253,308
VE1CCC	252,297
KX4R	247,464
W3ARK	245,784

CW

N5AW/1	698,000
W2TZ	644,170
N2GC	545,664
N4HI	538,740
K2MFY	439,587
WØUC	425,862
W7YAQ	356,706
W3ARK	349,641
K2PH	334,368
VE2WA	289,980

DJ1XT — all-band cw.

umn category indicator is listed only for the first occurrence of that particular category. All the entries that follow are assumed to be in that same category until a change is indicated in that sixth column.

Example: Let's take the W/VE-phone, single-operator listings in the first U.S. call area in the Connecticut Section. K1VTM, with K1JX as operator, is the first listing. He has a score of 2,447,550 points, 2205 total QSOs, 370 multipliers, runs "C" (greater than 200-watts input) power and is in the all-band category. Since there are no changes in the sixth column, all the following calls up to K1XA are also all banders. K1XA's score is indicated as a 40-meter monoband entry, as are all those below him until we come to K1RM, whose 141,960 points represent a 15-meter-only entry. The next change occurs with the K1TN (AA2Z, operator) 10-meter-only score. The next nine scores listed are also 10-meter monoband scores and end when we come to WB1CCH, the only QRP phone entry from Connecticut. Multioperator, single-transmitter entries are listed under U.S./Canada is descending order by call area only (with ARRL Section indicator in the last column of the score) and by continent and country for DX stations.

Multioperator, multi-transmitter scores are separated by country and listed in descending score order. W/VE multi-multis have an ARRL Section indicator tacked onto the end of the linescore.

SP2FAP home-built this 100-watt rig, coupled it to a W3DZZ antenna and made over 11 kilopoints in the all-band category on phone.

W/VE - PHONE

Single Operator

1

Connecticut

K1VTM(K1JX,opr)
2,447,550-2205-370-C-AB
K1KI 2,443,404-2044-397-C
N5AW 344,223- 549-109-B
W1WEF 281,052- 633-148-C
AK1N 274,482- 663-138-C
K1VDF 159,390- 385-138-C
KA1DS 150,639- 337-149-C
K1WJ 125,208- 296-141-B
K1DD 106,590- 323-110-B
AK1B 103,563- 311-111-B
KN1DPS 94,713- 241-131-C
N1JW 91,524- 263-116-C
K1BOF 68,100- 227-100-C
K1WB 64,614- 242- 89-C
WA1CCR 57,750- 175-110-C
W1VV 48,267- 173- 93-C
W1DO 30,000- 100-100-C
W1VH 25,523- 117- 73-C
WB1CRH 8640- 60- 48-B
K1CE 5400- 75- 24-C
K1VSC 5265- 45- 39-B
KA1AUC 4320- 60- 24-B
WB1FVO 3078- 38- 27-B
AB1U 2880- 64- 15-B
K1XA 37,620- 190- 66-C-40
WB1EAZ 10,350- 75- 46-C
W1BWS 1197- 21- 19-C
K1RM 141,960- 455-104-C-15
KA1JV 72,285- 305- 79-C
W1ICH 40,512- 211- 64-C
KA1OZV 36,720- 204- 60-C
WB1DTY 4464- 48- 31-B
K1WA 297- 11- 9-B
K1TN(AA2Z,opr)
503,904-1448-116-C-10
WB1CBY 137,448- 552- 83-B
WA1FCN 108,000- 450- 80-C
K1EFI 82,656- 336- 82-C
WA1LOU 63,279- 267- 79-C
WB1BVQ 49,140- 252- 65-B
WA2HXY 34,503- 217- 53-B
W1GVZ 10,464- 109- 32-B
W1HUE 240- 10- 8-B
W1CNU 144- 12- 4-B
WB1CCH 13,617- 89- 51-A-QRP

Eastern Massachusetts

KA1R 1,028,880-1429-240-C-AB
W1IHN 396,258- 626-211-C
KA1GG 178,263- 683- 87-C
W1PST 226,872- 548-138-C
W1FM 146,556- 354-138-B
K1XM 116,610- 299-130-C
AD1Z 83,385- 255-109-C
KB1Q 63,315- 201-105-C
N1ABX 38,148- 187- 68-B
KA1CEI 34,314- 133- 86-B
WA1YVT 17,250- 115- 50-C
KA1EKR 4371- 47- 31-B
WB1DFV 3690- 41- 30-C
W1ZFI 363- 11- 11-B
W1BB 60- 5- 4-B-160
W1CF(K8UR,opr)
41,736- 188- 74-C-80
W1FC(AD8V,opr)
32,028- 157- 68-C
AB1A 42,642- 206- 69-C-40
K1RB 3024- 36- 28-B
K1KSY 235,200- 800- 98-C-15
W1ZK 133,245- 423-105-C
WA1FRC 7770- 70- 37-C
KA1CY 103,200- 400- 86-C-10
W1PLJ 2100- 35- 20-B
AD1C 300- 10- 10-A-QRP

Maine

KA1CVM 188,088- 461-136-C-AB
WA1DIO 96,300- 300-107-B
W1GX 33,120- 160- 69-C
KA1CNI 3162- 34- 31-B
KA1CPN 300- 10- 10-B
KB1U 70,224- 304- 77-C-15
K1UO 605,694-1711-118-C-10
KA1AIF 7665- 73- 35-B
W1CTR 594- 18- 11-B

New Hampshire

K1LL 1,287,600-1480-290-C-AB
K1GQ(K1DG,opr)
1,160,352-1224-316-C
W1PH 652,944- 892-244-C
WA1TZV 406,386- 642-211-C
KA1O 303,510- 670-151-B
W1RR 158,256- 471-112-C
KA1IM 114,660- 294-130-B
K1NH 38,394- 158- 81-C
KA1BXN 18,972- 124- 51-B
W1ICU 6144- 64- 32-B-10
W1GMM 3588- 52- 23-B
N1BBV 274,500- 500-183-A-QRP

Rhode Island

WA1BYE 215,358- 502-143-C-AB
WB7NRE 84,042- 322- 87-C
K1VSJ 98,496- 288-114-B
W1RFQ 77,952- 232-112-C
KA1COW 101,088- 432- 78-C-10

Vermont

W1KQ 31,680- 220- 48-C-10

Western Massachusetts

K1ST 1,028,166-1102-311-C-AB
W2TA/1 792,480-1016-260-C
K1BW 549,822- 689-266-C
KA1BBO 22,557- 103- 73-C
N1ADX 6048- 56- 36-C
WB1HIH 3072- 32- 32-A-QRP

2

Eastern New York

W2YV 1,648,290-1645-334-C-AB
K2XA 940,155-1165-269-C
KB2CR 330,096- 529-208-C
K2OIX 199,398- 398-167-C
N2BIN 115,200- 320-120-B
N2IJ 95,106- 252-121-B
WB2NFG 60,720- 220- 92-B
W2DW 26,880- 128- 70-C
W2IB 19,305- 99- 65-C
KB2FC 10,320- 86- 40-B
K2MN 9792- 68- 48-B
N2FS 8772- 68- 43-C
WB2KHE 4800- 50- 32-B
KA2HZN 4050- 45- 30-B
K5NA 90- 6- 5-B-160
KF2O 11,340- 90- 42-C-40
W2KHQ 10,449- 81- 43-B-20
W2SZ(N2ALK,opr)
122,706- 401-102-C-15
W2SI 57,700- 229- 84-C
WB2THN 46,575- 207- 75-C
K2IBW 38,610- 195- 66-C
KA2DYG 4704- 56- 28-C
N2BJB 6426- 63- 34-B-10
WB2NXF 3120- 52- 20-C
W2CRS 143,748- 363-132-A-QRP

New York City - L.I.

WB2SJG 1,249,740-1310-318-C-AB
N2GC 366,378- 538-227-B
WB2TCQ 282,150- 550-171-B
W2MOY 261,660- 490-178-C
W2QL 100,224- 288-116-C
N2UN 80,073- 217-123-C
WA2JCX 54,945- 185- 99-B
WA2GUR 39,516- 148- 89-B
W2NBI 37,647- 141- 89-C
WB2PXA 34,188- 148- 77-C
WB2QEU 25,872- 112- 77-B
W2MT 22,875- 125- 61-B
W2INJ 22,572- 114- 66-C
W2JGR 17,226- 87- 66-C
W2NL 14,592- 76- 64-C
WA2OVG 13,356- 84- 53-C
WB2PUE 13,158- 102- 43-B
N2HH 11,322- 74- 51-C
K2TV 8733- 71- 41-B
K2HPG 5700- 50- 38-C
W2QAN 5310- 59- 30-B
W2III 2691- 39- 23-B
WA2TSF 2325- 31- 25-B
KG2A 1725- 25- 23-C
K2CMV 1425- 25- 19-B
WA2LTP 1242- 23- 18-B
WA2HLQ 768- 16- 16-C
WB2FZO(K1EB,opr)
41,520- 173- 80-C-80
WB2AMU 810- 18- 15-B-40
WB2DHY 93,996- 373- 84-C-20
KB2WS 209,790- 630-111-B-15
WA2SEL 12,600- 100- 42-B
N2RQ 35,292- 173- 68-C
WA2TQT 5742- 58- 33-C
K2LJH 1650- 25- 22-C
W2YIG 912- 19- 16-C
K2MFY 75,816- 351- 72-B-10
KA2AEV 65,280- 320- 68-B
KA2DFO 25,308- 148- 57-B
K2PE 21,924- 116- 63-C
W2AYJ 18,750- 125- 50-C
K2MZ 351- 13- 9-B

Northern New Jersey

N2LT 1,298,232-1482-292-C-AB
N7TT/2 1,265,682-1397-302-C
K2NJ 740,592- 888-278-C
W2IFK 686,880- 848-270-C
W2VJN 459,036- 622-246-C
W1GD 340,119- 513-221-C
KD2L 319,920- 620-172-C
K3OX 305,592- 476-214-C
KD2G 122,802- 422- 97-C
W2HN 80,598- 266-101-C
W2ZZ 54,432- 189- 96-B
WA2PID 50,652- 252- 67-B
AI2K 43,608- 158- 92-C
WB2PAG 41,280- 160- 86-C
WA2PQU 10,080- 84- 40-C
WA2IFS 6804- 63- 36-C-40
KJ2N 6195- 59- 35-B
WB2HJW 12,432- 112- 37-C
WB2ULI 137,100- 457-100-C-15
W2UL 2520- 35- 24-C
WB2FVT 147- 7- 7-B
K2TW 73,800- 300- 82-C-10
K4BNC 40,176- 186- 72-C
W9NTU 4125- 55- 25-B
N2AA 293,760- 576-170-A-QRP
WB2VYA 121,626- 466- 87-A
K2RF 16,932- 83- 68-A

Southern New Jersey

N2SS 1,054,800-1172-300-C-AB
WA2DPU 443,940- 755-196-C
KF2U 383,940- 711-180-C
K2SNK 247,416- 488-169-C
N2VW 241,344- 419-192-C
K2FL 327,891- 443-178-C
WA2NBM 191,511- 369-173-C
W2FGY 169,920- 354-160-C
K2QIL 151,248- 368-137-C
W2PAU 149,640- 290-172-C
WB2YOF 147,600- 400-123-C
WB2BYU 114,840- 290-132-B
W2SDO 77,952- 224-116-C
KN2QWO 75,705- 245-103-C
WA2AUV 48,870- 181- 90-B
W2BLV 43,452- 142-102-B
W2YC 35,862- 139- 86-C
WB2ERI 34,428- 151- 76-C
W2PFQ 28,470- 146- 65-B
KA2BEW 25,830- 123- 70-C
W2UB5 25,308- 111- 76-C
K2KA 24,024- 104- 77-C
K2JF 21,600- 100- 72-B
WB2SJA 15,900- 100- 53-B
KB2GI 14,976- 78- 64-B
W2XN 13,224- 76- 58-C
K2HPV 12,600- 100- 42-B
K2OSV 11,220- 85- 44-C
N3RG/2 10,032- 76- 44-B
WA2NPD 6834- 67- 34-C
K2TD 6042- 53- 38-C
AF2G 504- 14- 12-C
WB2VFT 2028- 26- 26-C-80
WA2WJL 47,652- 209- 76-B-20
W2GSN 7020- 60- 39-B
WA2AWS 21,150- 150- 47-A-QRP

Western New York

W3HKK 857,526-1091-262-C-AB
W2TZ 534,303- 771-231-B
AC2J 144,060- 343-140-C
WA2BDW 133,488- 412-108-B
W2RRP 65,805- 205-107-B
KB2SE 35,805- 155- 77-B
W2PHT 32,631- 149- 73-B
W2FUI 26,703- 129- 69-B
WA2EOQ 16,320- 80- 68-C
KA2CDJ 14,976- 96- 52-B
K3QJE/2 11,700- 75- 52-C
N2FI 147- 7- 7-B
N2AU 11,388- 73- 52-C-40
KB2SG 78,408- 297- 88-C
WA2RLQ 57,600- 200- 96-C
KB2NIJ 113,145- 397- 95-C-15
WA2PHA 37,584- 174- 72-C
K2VV 147- 7- 7-B
W2IIJ 243,600- 812-100-C-10
K2SPO 30,723- 133- 77-C
N2CBS 11,400- 100- 38-B

3

Delaware

W3GL 320,850- 465-230-C-AB
W3WD 156,087- 369-141-C
K3HBP 142,824- 541- 88-C-10
K3JL 43,011- 243- 59-C
AC3T 13,338- 78- 57-A-QRP

Eastern Pennsylvania

N3BB 1,847,055-1995-343-C-AB
K3ZUF 897,756- 947-316-C
W3AP 746,334- 918-271-C
K3FN 467,280- 590-264-C
WA3NHO 436,278- 817-178-C
WB3CIW 417,291- 641-217-C
W3GK 287,127- 523-183-C
K3OO 271,440- 464-195-C
N3HW 255,024- 528-161-C
W3DHM 251,220- 395-212-C
W3ARK 245,784- 539-152-B
K3HP 229,896- 412-186-C
K4JLD/3 205,296- 364-188-C
W3EVW 197,532- 372-177-B
W3KV 180,360- 360-167-C
K3KNH 177,975- 339-175-C
WB3EAG 161,406- 366-147-C
W3GRS 154,269- 281-183-C
WB3KIL 150,120- 360-139-C
K3II 147,339- 321-153-B
KA3ARQ 147,234- 463-106-C
K3IE 146,376- 321-152-C
WB3FYL 135,750- 362-125-B
AD3Z 133,620- 262-170-C
W3KFQ 124,764- 281-148-C
W3YFV 122,157- 277-147-C
AC3A 115,902- 282-137-B
W3MA 109,482- 257-142-C
W3ETB 63,600- 212-100-C
KA3BKY 61,692- 212- 97-C
WA3IMY 60,720- 220- 92-B
KA3DSW 58,650- 230- 85-B
WB3FPA 57,459- 179-107-B
WB3DNA 54,378- 171-106-B
WB3JYY 51,975- 231- 75-B
W3BNQ 49,590- 174- 95-B
K3RH 47,259- 177- 89-C
K3KHL 31,872- 166- 64-C
WB3CVK 31,110- 170- 61-B
WB3HYX 26,332- 132- 67-C
WB3EFI 25,842- 118- 73-B
K3DYX 22,176- 132- 56-C
WA3YTI 19,764- 108- 61-B
WB3EPW 19,716- 106- 62-B
WB3CAC 19,350- 150- 43-B
W3EAN 18,150- 121- 50-C
KB3NE 12,375- 75- 55-C
N3AMY 12,312- 76- 54-B
WA3ZGL 5220- 58- 30-B
KB3JJ 4140- 46- 30-B
W3EQA 3960- 44- 30-C
WA3VUE 1656- 24- 23-B
KB3FZ 5376- 56- 32-C-20
WA3JXW 6552- 78- 28-C-15
KA3BTG 5394- 58- 31-C
KA3ANG 95,499- 393- 81-B-10
WA3VPQ 55,476- 276- 67-C
WB3FXF 39,396- 268- 49-B
N3AHF 26,100- 145- 60-A-QRP

Maryland - D.C.

N3RL 863,760- 976-295-C-AB
W3UJ 773,604-1044-247-C
K2ITG/3 495,390- 674-245-C
K3TC 282,048- 452-208-C
W3JPT 205,587- 431-159-C
W3ICM 174,432- 316-184-C
KC3H 171,288- 366-156-B
W3AZ 155,673- 353-147-C
K3CN 132,354- 387-114-C
K3SA 131,856- 268-164-C
WA3YHE 81,000- 250-108-C
W3HVM 52,440- 190- 92-C
K3VY 27,594- 126- 73-B
WA3YKR 14,820- 95- 52-B
W3FQE 6660- 74- 30-C
W3TUX 6018- 59- 34-B
AG3S 396- 12- 11-B
WB3GCG 720- 16- 15-C-160
W3PWO 31,104- 128- 81-C-10
N3API 3726- 54- 23-B
K3DQ 2268- 36- 23-B
WA3JYV 1566- 29- 18-B
W3EXP 12- 2- 2-C
W3EWL 256,074- 469-182-A-QRP
K3WS 218,592- 414-176-A

Western Pennsylvania

WB3KKX 207,825- 425-163-B-AB
AG3H 160,881- 329-163-B
WA3FAL 62,730- 246- 85-C
W3DKL 58,782- 202- 97-C
K3HFB 51,156- 196- 87-C
K3TJM 40,455- 145- 93-C
WB3JZE 39,816- 158- 84-B
WA3UXP 30,954- 134- 77-B
W3HDH 9870- 70- 47-C
K3HWL 5220- 58- 30-B
LA4LN/W3 1575- 25- 21-C-40
K3RN 44,814- 194- 77-C-20
W3WZ 89,640- 332- 90-C-15
WA3PIX 43,326- 249- 58-B-10

4

Alabama

K4XH 54,944- 144-126-C-AB
KR4F 36,666- 126- 97-C
WA4VLB 34,920- 120- 97-C
WB4QXM 18,177- 83- 73-C
N4AJZ 3330- 37- 30-C
WN4KKN 391,776-1232-106-C-10
WA4MIT 89,628- 388- 77-C
WA4VEK 1710- 30- 19-C

Georgia

WA4FBH 576,081- 759-253-C-AB
K4GFH 339,885- 581-195-C
KX4R 247,464- 491-168-B
K4BAI 226,884- 511-148-C
W9KTB/4 151,152- 376-134-B
KC4GR 78,183- 219-119-B
AK4T 60,885- 205- 99-C
W4GBU 50,925- 175- 97-C
W4JFL 15,048- 88- 57-B
W4OMQ 2349- 29- 27-C
W8ZF/4 20,496- 112- 61-C-80
K4JPD 7308- 58- 42-C
N4RJ 33,408- 174- 64-C-40
K3KG 338,742- 918-123-C-20
N4TZ 4200- 50- 28-C
N6CR 193,200- 575-112-C-15
WA4TPS 11,484- 87- 44-B
W4DXI 53,361- 231- 77-C-10
K4BAM 43,188- 244- 59-B
WB4SLM 35,391- 251- 47-C
W4BFR 19,683- 81- 81-C

Kentucky

WA4QMQ 453,546- 681-222-C-AB
N4BS 407,592- 629-216-C
WB4OSS 276,705- 429-215-C
NA4D 125,250- 334-125-C
KA4IDW 55,620- 206- 90-B
WA4YOF 4650- 50- 31-C-40

North Carolina

N4UH 795,249- 971-273-C-AB
K4KZZ 577,584- 764-252-C
WD4AAM 416,070- 690-201-C
W6NWS/4 173,010- 365-158-B
N4BLY 80,370- 235-114-C
WD4MVX 40,851- 153- 89-B
W4ZZ 1026- 19- 18-B
WA4TLI 31,557- 157- 67-C-40
WD4AVY 39,600- 200- 66-C-20

Northern Florida

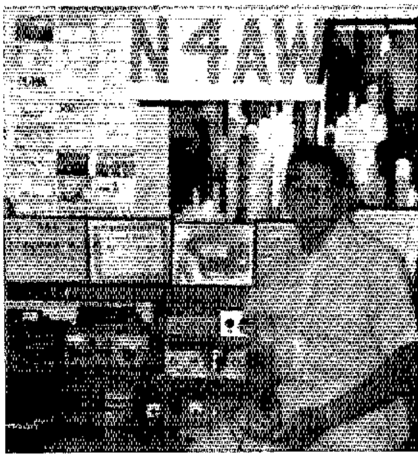
W4WKQ 210,222- 458-153-C-AB
KT4P 201,600- 420-160-C
AJ2E 171,180- 317-180-C
W4JAT 77,220- 234-110-C
WA4SVO 40,896- 192- 71-C-40
WB4KXF 75,870- 281- 90-C-15
W4IIR 25,929- 129- 67-C
NF4L 7560- 72- 35-B
W4VQ 2070- 30- 23-C
AA4NA 19,152- 112- 57-B-10

South Carolina

WD4NNP 61,776- 198-104-C-AB
WA4TNI 2448- 34- 24-B
W4NL 297,000- 825-120-C-20
W1WVL/4 19,398- 122- 53-C-15

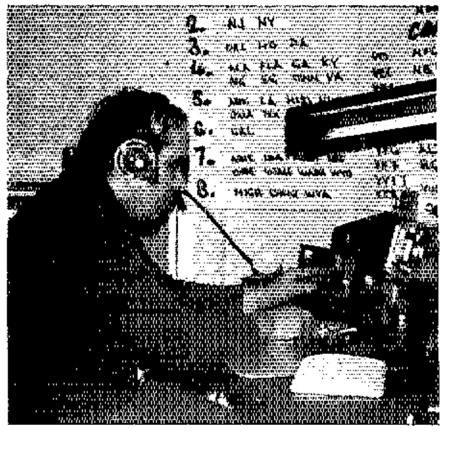
Southern Florida

K8UNP/4 328,020- 497-220-C-AB
WB4MAI 152,460- 308-165-C
W4PC 65,340- 198-110-C
N4TL 43,860- 172- 85-C
W4BV 41,292- 148- 93-C
W4KQ 35,298- 159- 74-B
K4JRF 29,760- 124- 80-C



N4AW, Albert went monoband (40-meter cw) from Southern Florida.

From the left — K8AQM, WB8ZFB and WA8ARS of the K8AQM multi-single on cw, managed to double their 1980 cw score.



OH5TQ submitted the highest 20-meter cw score from Europe and will be rewarded with a plaque for his efforts.

N4DMI	14,364- 84- 57-C
K4KUZ	12,060- 67- 60-C
KA4OCL	9768- 88- 37-B
W4PZV	243- 9- 9-B-160
W2SDB/4	1404- 26- 18-C-15
KC4VA	280,617-1051- 89-C-10
N4BP	13,392- 93- 48-A-QRP

Tennessee

K4XU	915,750-1110-275-C-AB
AB4H	477,015- 649-245-C
KC4OV	269,136- 504-178-C
AA4KT	253,308- 418-202-B
K4UVH	224,910- 441-170-C
KA4RJC	100,500- 268-125-B
W4ZWZ	64,728- 232- 93-C
AA4TN	59,700- 199-100-C
WA4MCZ	54,696- 212- 86-C
WB4GHZ	24,198- 109- 74-B
WB4JBP	18,666- 102- 61-B
KA4AHU	12,483- 73- 57-B
KA4FLP	3024- 36- 28-B
NE4G	10,557- 69- 51-C-80
KB4KA	61,503- 247- 83-C-20
W4JD	77,736- 316- 82-C-15
WB4VMS	78,660- 345- 76-B-10
N4IR	44,982- 238- 63-C
W4OGG	26,100- 145- 60-C

Virginia

AI2C	589,470- 802-245-C-AB
KC4UQ	517,440- 770-224-C
WA4NRQ	331,254- 717-154-C
W4RW	262,056- 488-179-C
N4MM	228,324- 359-212-C
KG4F	170,676- 431-132-C
N4DW	137,214- 297-154-C
NI4R	93,744- 248-126-C
W4YE	88,920- 247-120-C
K4TSU	68,142- 277- 82-C
WB4ZPF	58,101- 181-107-B
W4KMS	55,440- 176-105-C
WB4FIH	53,934- 198- 89-B
K4OAQ	5445- 55- 33-C
W3YY	241,512- 694-116-C-20
W4KFC	65,340- 242- 90-C-15
K4GKD	255,900- 853-100-C-10
K4CTY	102,090- 415- 82-C
WA4FHQ	90,720- 252-120-A-QRP

5

Arkansas

WD5HSX	159,588- 403-132-C-AB
K0VGB	71,286- 218-109-B
W5EIJ	12,474- 66- 63-C
WA5SOG	10,731- 73- 49-B
K5UR	330- 11- 10-B-160

Louisiana

W5XZ	1,235,970-1329-310-C-AB
K5KLA	1,084,542-1334-271-C
W5ZR	207,600- 400-173-C
WD5CGC	152,520- 339-150-C
KB5QA	106,110- 270-131-C
W5HEZ	85,281- 217-131-C
W5OB	68,373- 213-107-C
K5EOA	68,208- 196- 46-C
WB5HBR	64,974- 221- 98-B
WB5ZRD	59,502- 211- 94-C
K5WGO	57,597- 263- 73-C
K5LVZ	54,924- 199- 92-C
WA5JWU	6930- 55- 42-B
W5ASP	9660- 70- 46-B-10

Mississippi

WA5OYU	132,435- 327-135-C-AB
K5FC	174,096- 558-104-C-15
W5UCY	14,100- 100- 47-B-10
W5OSL	2736- 48- 19-B

New Mexico

W5JW	328,467-1063-103-C-10
K5JW	8190- 70- 39-C

Northern Texas

K5NW	786,201-1061-247-C-AB
W5FO	666,630- 823-270-C
W5LSF	251,853- 469-179-C
W5LKP	232,404- 428-181-C
K2SCU/5	208,656- 432-161-C
KC5EA	198,387- 469-141-C
W5LMG	131,208- 308-142-C
W5AE	112,200- 275-136-C
KQ5A	106,200- 300-118-C
KC5CP	96,000- 250-128-C
K5AQ	90,036- 246-122-C
N5UD	64,770- 254- 85-C
W5IFJ	22,848- 136- 56-C
W5ONL	16,281- 81- 67-C
KB5VF	18,360- 90- 68-B
W5DYH	9900- 75- 44-B
N5FW	2375- 31- 25-B
N5UA	1995- 35- 19-C
KA5W	1782- 27- 22-C-80
KN5L	456- 19- 8-B-20
WB5UDX	103,335- 415- 83-C-15
K1DWQ/5	24,384- 127- 64-C

K8TD	161,214- 554- 97-C-10
K5IID	129,000- 500- 86-C
KO5C	73,278- 354- 69-C
KA5BLQ	9945- 85- 39-B
W5VGX	124,542- 374-111-A-QRP
W5SYB	11,766- 106- 37-A

Oklahoma

N5IH	1,255,650-1522-275-C-AB
W5JME	220,008- 412-178-C
KM5H	32,736- 124- 88-C
W5VBE	9288- 72- 43-B-10

Southern Texas

K5DX	625,968- 828-252-C-AB
W5DV	108,174- 298-121-C
WA5IYX	32,760- 195- 56-C
W5KCR	25,773- 121- 71-B
N5HB	18,306- 113- 54-B
WB5BSB	9720- 60- 54-C
KA5N	3420- 38- 30-B
KC5DU	585- 15- 13-C
K5WA	1620- 30- 18-C-40
K5BZU	197,208- 664- 99-C-15
K5IY(WD5GXI,opr)	166,158- 543-102-C
K5SF	155,142- 507-102-C
W5GO	37,800- 168- 75-C
KB5FU	79,200- 330- 80-B-10
KA5HRU	65,880- 366- 60-B
K5RF	61,320- 280- 73-C
N5CIA	16,698- 121- 46-B

6

East Bay

N6CCN	269,514- 558-161-C-AB
AD6D	39,960- 148- 90-C
WA6BOB	35,028- 139- 85-C
K5GOE/6	38,400- 200- 64-B-15
K56H	9720- 108- 30-B-10
K56Q	1053- 39- 9-C

Los Angeles

N6AR	549,045- 747-245-C-AB
WB6ZHT	315,504- 626-168-C
W6CN	180,348- 452-133-C
KA6FZN	98,280- 280-117-C
K6YRA	51,156- 174- 98-C
N6DWW	7488- 78- 32-C
KA6LDU	390- 13- 10-C
K6SE	528- 16- 11-B-160
W6OK	28,260- 157- 60-C-20
N6AW	28,812- 98- 98-C-10
N6DHV	27,528- 148- 62-C
KQ6S	27- 3- 3-C

Orange

N6HR	21,000- 100- 70-C-AB
WA6NGO	726- 22- 11-C
WA6SUZ	2640- 55- 16-C-15
WD6EWG	17,292- 131- 44-B-10
KA6JHU	1608- 67- 8-B

Sacramento Valley

K6DR	75,945- 305- 83-C-AB
N6JM	23,433- 107- 73-C
WA6BRV	1980- 30- 22-B
WA9WAC/6	5112- 71- 24-A-QRP

San Diego

WA6EJL	284,400- 600-158-C-AB
W6TPC	169,575- 475-119-C
KT6V	50,445- 177- 95-C
WA6UFY	48,852- 276- 59-C
KD6BP	30,576- 208- 49-C
W6LAG	22,815- 117- 65-C
WA6VNR	56,250- 375- 50-B-10
K6GKU	26,400- 176- 50-C

San Francisco

N6OJ	607,728-1151-176-C-AB
K6ANP	398,592- 768-173-C
AF6F	129,276- 378-114-C
W6WB	89,964- 252-119-C
N6QC	69,255- 243- 95-C
WB6FCR	46,230- 230- 67-C-15
WD6ENZ	1320- 22- 20-C-10

San Joaquin

KB6AR	175,605- 509-115-C-AB
WD6FLB	97,776- 336- 97-B
W6BYH	71,595- 215-111-C
W6BVM	14,094- 81- 58-C
W6DPD	10,578- 86- 41-C-10

Santa Barbara

N6MB	437,850- 834-175-C-AB
W6SWM	413,220- 710-194-C
WA6DJS	178,182- 521-114-C
N6HK	59,280- 190-104-C
K6VMN	35,346- 137- 86-C
KD6LB	30,420- 156- 65-C
N6VR	525- 25- 7-C-80
AA6BB	7956- 86- 57-C-20

KA6V	32,580- 181- 60-C-10

Santa Clara Valley

KD6PY	1,292,004-1709-252-C-AB
N6BV	1,195,920-1661-240-C
K6WJ	570,600- 951-200-C
WB6GFJ	446,064- 708-210-C
W6OKK	279,390- 670-139-C
W6SZN	121,230- 449- 90-B
N6UW	45,630- 195- 78-C
WA6TKT	42,804- 174- 82-C
KA6DXN	25,668- 186- 46-B
W6ISQ	19,890- 102- 65-C
W6SC	19,200- 128- 50-C
KA6IEX	18,174- 233- 26-C
K6SMH	17,226- 99- 58-B
N7KA/6	12,672- 88- 48-C
W6ERS	1125- 25- 15-B
N6QW	52,875- 235- 75-C-20
N6GJ(WA6HCI,opr)	208,539- 799- 87-C-15
N6BZA	149,760- 624- 80-C-10
W6YVK	24,168- 212- 38-A-QRP
N6NF	6150- 82- 25-A

7

Arizona

W7FGT	19,458- 138- 47-C-AB
WA6LOK	13,932- 129- 36-C
WA7KPH	2394- 38- 21-B-80
W9FI	81,606- 469- 58-C-15
W7AVY	60,102- 378- 53-C-10
WA7KLK	19,890- 130- 51-A-QRP

Idaho

KB7TP	400,158- 946-141-C-AB
N7AOS	64,296- 376- 57-C-10

Montana

W7JYW	411,672-1009-136-C-AB
N7AQK	7437- 67- 37-C
KB7Q	3- 1- 1-B-15

Nevada

WA7CWM	272,226- 769-118-C-AB
AJ7S	103,488- 308-112-C
W7YKN	29,520- 123- 80-C
WB7VVH	28,026- 173- 54-C

Oregon

W7EJ	764,775-1133-225-C-AB
W7CB	503,316- 902-186-C
WB7EEI	139,695- 335-139-C
W7XN	87,567- 289-101-B
W7GUR	65,700- 219-100-C
W7YAQ	55,845- 219- 85-B
W7TWL	30,528- 192- 53-B
AD7I	7392- 56- 44-B
W7FP	119,280- 497- 80-C-10
W7MLJ	22,554- 179- 42-B

Utah

N7DF	1,555,245-2033-255-C-AB
W7CAV	89,376- 224-133-C
N7BRS	41,205- 205- 67-B
KA7OXM	33,495- 203- 55-B
W7KQZ	15,609- 121- 43-B

Washington

K7WQD	824,694-1417-194-C-AB
K7ZA	436,455- 915-159-C
W7BUN	376,992- 952-132-C
KQ5W	235,188- 564-139-C
WA7PVE	121,500- 450- 90-C
W7ISX	114,594- 269-142-C
WB7RFC	113,085- 359-105-C
K7NW	96,354- 303-106-C
WB7RYC	42,636- 209- 68-C
K7NF	13,200- 100- 44-C
KB7KE	7215- 65- 25-C
K7LZJ	6240- 52- 40-B
WA7RDJ	2592- 36- 24-C
AD7U	2475- 33- 25-B
K7LYT	1734- 34- 17-C
W7LUR	1170- 26- 15-B
K7IDX	75- 5- 5-B-160
N7EA	5760- 60- 32-C-80
K7UR	52,632- 408- 43-C-40
WA7GVM	115,104- 436- 88-C-20
K7RI(W7WA,opr)	760,338-2391-106-C-15
W7XR	696,570-2158-107-C
WB7AEX	15,456- 112- 46-B
N7ABJ	183,150- 814- 75-B-10
K7LXC	37,950- 275- 46-C
KB7G	12,000- 160- 25-B
K9OEW	4725- 63- 25-C
W7KT	2295- 45- 17-C

Wyoming

WB7RGN	81,534- 214-127-B-AB
KB8KW/7	58,986- 174-113-C
KB7M	4305- 41- 35-B
KA7FYB	1932- 28- 23-B

8

Michigan

WA8TBQ	928,359-1159-267-C-AB
W8UA	818,082- 967-282-C
K8SS	450,429- 623-241-C
AC8Y	334,377- 701-159-C
KB8PK	205,578- 486-141-C
K8BX	186,381- 351-177-C
N8AJF	152,847- 333-153-C
AC8W	108,120- 265-136-C
WB8YQX	74,124- 213-116-C
N8AFV	66,420- 205-108-C
K8PUJ	54,036- 158-114-C
K8SIA	53,298- 189- 94-C
WB8RNY	49,686- 182- 91-C
K8LJG	46,305- 147-105-C
WB8AYW	38,784- 202- 64-C
N8BRQ	33,060- 145- 76-B
KB8TE	31,365- 123- 85-C
N8AHA	31,098- 142- 73-C
KA8EEA	29,718- 127- 78-B
W8TJQ	28,638- 111- 86-B
K8DD	15,552- 72- 72-C
K8KM	11,016- 72- 51-C
W8SS	6630- 65- 34-C
WA8WMC	6300- 50- 42-C
N8MK	5472- 48- 38-C
WD8CRY	3780- 42- 30-C
K8IFE	3750- 50- 25-B
W8MAW	2394- 38- 21-C
W8UVZ	34,125- 175- 65-C-40
W8LQZ	20,130- 122- 55-C-15
W8TWA	232,654- 791- 98-C-10
KB8EC	222,363- 797- 93-C
KA8T	68,952- 338- 68-C
WB8JDA	51,027- 233- 73-C
WB8VCC	36,900- 205- 60-C
WB8VNP	14,700- 100- 49-C
KA8LPT	1980- 30- 22-B
N8BIB	1980- 30- 22-B
W8LCU	1173- 23- 17-A-QRP

Ohio

K8AZ	959,610-1103-290-C-AB
K8CMO	373,062- 641-194-C
N8ATR	324,174- 557-194-C
N8BJQ	323,190- 513-210-C
KD8V	186,354- 357-174-C
WD8KKF	176,352- 352-167-C
N8TN	175,770- 378-155-C
KF8K	156,870- 315-166-B
W8NXF	151,650- 337-150-C
WD8MRF	114,375- 305-125-C
K8DJC	81,270- 210-129-C
N8AXA	75,933- 177-143-B
K8DB	71,982- 186-129-C
WA8GMT	68,175- 225-101-B
W8ANM	67,932- 204-111-C
W8FQN	66,066- 242- 91-C
WB8PAT	44,100- 210- 70-B
K8WW	41,895- 147- 95-B
W8YGR	41,658- 131-106-B
WD8JBB	35,478- 162- 73-C
W8DWP	32,376- 142- 76-B
W8ZCQ	31,668- 116- 91-C
KB8XD	30,492- 121- 84-B
W8UPH	24,192- 126- 64-C
N8LM	23,460- 115- 68-C
WD8MOV	22,800- 95- 80-B
W8SQ	18,333- 97- 63-C
WD8IJN	22,008- 131- 56-C
N8BTT	19,716- 106- 62-B
N8BKX	18,960- 158- 40-B
N8AHK	15,990- 82- 65-C
WB8SIQ	14,946- 106- 47-C
K8US	13,617- 89- 51-C
WB8RBU	13,200- 100- 44-B
WB8NBA	12,150- 81- 50-B
K8MR	7350- 50- 49-C
W8NPF	5724- 53- 36-C
W8ELE	3828- 44- 29-C
WD8JTG	2835- 45- 21-B
W8LNO	2754- 34- 27-C-80
WB8DOD	504- 14- 12-C
WB8JBM(WB8DQP,opr)	38,688- 208- 62-C-40
AD8C	21,120- 128- 55-C
KB8AC	12,900- 100- 43-C-20
WB8JBM(AA8S,opr)	169,224- 641- 88-C-15
W8WPC(N9AG,opr)	353,745-1123-105-C-10
WA8DXB	136,323- 459- 99-C
WA8TNO	111,672- 396- 94-C
AD8P	52,206- 226- 77-C
WA8UNP	18,612- 132- 47-C
W8MH	18,414- 62- 33-C
W8BCE	4929- 53- 31-B
WD8KTM	3900- 50- 26-B
WA8AGH	29,097- 159- 61-A-QRP
WA8BIN	270- 10- 9-A

West Virginia

W8WVM	88,206- 241-122-B-AB
WD8CSG	5586- 49- 38-C
W8QHG	5148- 52- 33-C
W8LRL	1440- 24- 20-B-160
K8HUH	19,278- 119- 54-C-15
WA4HII	174,564- 746- 78-C-10
KB8FJ	56,322- 298- 63-C

WB8BMX	5814- 57- 34-B

9

Illinois

AI9J	1,170,900-1301-300-C-AB
K9MDO	350,268- 578-202-C
WD9AHJ	207,252- 404-171-C
K9JDV	140,700- 350-134-C
N9GB	132,675- 305-145-C
K9BGL	112,671- 321-117-C
KA9GRL	93,492- 212-147-C
KB9AW	81,744- 208-131-B
WD9DBC	76,560- 232-110-C
N9AEJ	63,270- 222- 95-B
K9HWU	61,182- 198-103-C
WD9IIC	58,194- 183-106-C
AG9E	56,112- 167-112-C
W9TNZ	47,430- 155-102-B
W9GSB	47,112- 151-104-C
K9BQL	27,495- 141- 65-C
N9BBM	25,872- 112- 77-B
WD9GGY	24,750- 125- 66-C
WB9IPX	21,216- 104- 68-C
K9BJM	19,998- 101- 66-C
W9HPG	7548- 74- 34-C
AA9F	1872- 26- 24-B
WD9DVJ	462- 14- 11-B
W9REC	352- 12- 11-B
W9CH	15,729- 107- 49-C-40
K9RF(KB9OF,opr)	200,928- 644-104-C-20
W9TA	21,285- 129- 55-C
W9BW	250,800- 760-110-C-15
WD9IIX	141,435- 449-105-C
K9QVB	117,978- 371-106-C
W9OFV	51,585- 181- 95-C
W9NUD	24,384- 127- 64-C
WD9DYR	1944- 27- 24-B
K4VUD/9	102,333- 443- 77-C-10
W9DWQ	84,303- 323- 87-C
K9SM	27,468- 218- 42-C
KA9AXY	756- 18- 14-C
W9PNE	20,160- 112- 60-A-QRP

Indiana

W9ZRX	1,870,848-1792-348-C-AB
W9LT	274,968- 536-171-C
WB8RNC/9	120,888- 292-138-B
KB9PT	75,570- 229-110-C
KB9H	50,172- 148-113-C
N9AR	47,700- 159-100-C
WB9UAO	44,352- 154- 96-C
KA9GKD	29,190- 139- 70-B
KB9MO	22,000- 200-110-C
K7NHK/9	11,100- 100- 37-B
K9WZB	5661- 51- 37-C-80
KB9C	3- 1- 1-B
AG9S	12,672- 88- 48-C-40
KA9ERV	34,410- 155- 74-C-15
KA9DOO	87,897- 353- 83-B-10
WB9STD	66,528- 288- 77-C
W9MOY	28,215- 171- 55-B
W9TC	8694- 69- 42-C

Wisconsin

W9OP	595,107- 837-237-C-AB
K9QXY	447,300- 700-213-C
W9GIL	357,243- 617-193-C
KE9A	356,562- 558-213-C
K9LWT	211,008- 448-157-C
W9UP	203,814- 338-201-C
K9KVA	89,040- 280-106-C
WA9TGL	75,492- 233-108-C
WA9BZW	32,868- 166- 66-C
WA9OAK	26,130- 130- 67-C
W9GXR	24,840- 115- 72-C
AG9G	12,495- 85- 49-B
N9BAF	7788- 59- 44-B
K9GDF	7749- 63- 41-C
W9YCV	768- 16- 16-C
WD9CWJ	13,500- 100- 45-C-40
K9YNF	26,640- 148- 60-C-20
W9AMM	57,519- 231- 83-C-15
N9ER	47,559- 191- 83-C
WA9LCU	5766- 62- 31-C
KB9US	122,577- 449- 91-C-10
N9ACP	74,736- 346- 72-C
WB9NOV	18,096- 116- 52-C
KA9BKS	11,093- 86- 43-C
WD9CPX	6528- 64- 34-C
WB9HRO	4293- 53- 27-B
WB9OAR	52,890- 205- 86-A-QRP

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Colorado

W0MYN(K0FX,opr)	635,916-1076-197-C-AB
K0ZX	131,028- 358-122-C
KA0FPJ	5952- 62- 32-B-20
W0ZV	536,328-1528-117-C-10
W0YK	489,402-1431-114-C
AG0L	20,664- 164- 42-B
N0BYP	13,920- 116- 40-B
KA0CLS	6324- 68- 31-B

Iowa

W0EJ	859,884-1094-262-C-AB

KBØPR 353,088- 613-192-C
WØWP 203,850- 450-151-B
KBØV 115,632- 292-132-B
WØVX 98,889- 277-119-C
WØPPF 77,826- 218-119-C
WØRU 72,885- 215-113-C
WØMJN 53,520- 223- 80-B
AKØM 31,992- 124- 86-B
KFØZ 29,304- 132- 74-B
NØCAY 23,598- 114- 69-B
KBØUE 16,740- 90- 62-B
KAØD 11,016- 72- 51-C
WAØDCB 9546- 74- 43-C
WA4VWV/Ø 1872- 26- 24-C
KØGT 10,332- 82- 42-C-40
AGØM 1536- 32- 16-B-10
WAØVBW 77,826- 238-109-A-QRP

Kansas

WAØTKJ 389,610- 585-222-C-AB
WBØISW 304,290- 490-207-C
W6FN 130,935- 301-145-C
WD9CCW 56,200- 200- 92-B
K9BLY/Ø 17,802- 86- 69-B
KØBJ 2415- 35- 23-C
ACØA 5814- 51- 38-C-40
ABØX 119,850- 470- 85-C-10
NØAVT 15,651- 111- 47-B
KBØBH 5760- 60- 32-B
WØYZL 1914- 29- 22-C

Minnesota

KØDD 552,972- 812-227-C-AB
KØTPF 203,373- 383-177-C
ACØW 143,031- 343-139-C
WØBF 75,600- 225-112-C
WØLP 37,599- 151- 83-C
WAØOTO 4182- 41- 34-B
KØIHG 168- 8- 7-B-80
KBØC 68,040- 270- 84-C-15
WØHW 13,950- 93- 50-C

Missouri

ACØN 244,956- 548-149-C-AB
KØRWL 175,350- 350-167-B
AGØU 129,000- 344-125-C
WDØGML 80,730- 207-130-C
WBØUXI 63,600- 265- 80-B
WØPKO 48,000- 160-100-C
WBØFCS 41,748- 196- 71-C
AFØK 19,602- 99- 66-C
NØTT 2349- 29- 27-C
KAØP 105- 7- 5-B
KØCS 792- 22- 12-C-80
KØGL 3600- 40- 30-B-15
KBØRC 311,163-1007-103-C-10
KØTLM 18,720- 104- 60-B

Nebraska

WØOLL 43,500- 145-100-B-AB
KBØQH 1241- 23- 18-B
KØGND 15,990- 130- 41-C-20

North Dakota

KØQQ 242,273- 467-173-C-AB
KBØVO 77,361- 241-107-C
KFØA 21,504- 112- 64-C
WØLHS 1368- 24- 19-B
WDØCHC 68,742- 402- 57-C-10
KCØW 48- 4- 4-B

South Dakota

WDØBHV 132,804- 372-119-C-AB
WØWUU 39,831- 187- 71-C
WØACT 74,934- 362- 69-C-10

VE

Maritimes - Newfoundland

VE1CCC 252,927- 471-179-B-AB
VE1ANU 38,394- 159- 81-B
VO1CA 36,252- 159- 76-C
VE1FW 23,598- 138- 57-B
VO1AW 7560- 63- 40-C
VE1DX 46,800- 300- 52-C-20
VE1BNN 342,804-1078-106-C-10
WB5UWI/VE1
93,528- 433- 72-C

Quebec

VE2DW 413,205- 845-163-C-AB
VE2AYU 408,000- 680-200-C
VE2DZE 5358- 47- 38-C-80
VE2DKK 12,090- 130- 31-C-10

Ontario

VE3GCO 881,244-1076-273-C-AB
VK3WA/VE3
828,900-1228-225-C
VE3FEA 136,890- 351-130-C
VE3GCE 41,208- 136-101-C
VE3GWM 6400- 50- 36-C
VE3BBN 108- 6- 6-B-160
VE3II 2553- 37- 23-C-40
VE3ICR 97,704- 354- 92-C-20
VE3JTQ 102,648- 364- 94-B-15
VE3KGI 73,098- 262- 93-C
VE3BMV 564,750-1506-125-C-10
VE3MFT 100,926- 782- 81-C
VE3SV 24,453- 143- 57-C
VE3CYX 3825- 75- 17-B
VE3KKB 162,060- 365-148-A-QRP

Manitoba

VE4RP 54,990- 235- 78-C-AB
VE4SL 912- 19- 16-C-80

Saskatchewan

VE5RA 723,357-1101-219-C-AB
VE5ADA 33,831- 179- 63-C-20

Alberta

VE6MP 311,928- 634-164-B-AB

British Columbia

VE7BTV 1,388,004-2162-214-C-AB
VE7VX 105,570- 510- 69-C-20
VE7AVU 14,892- 146- 34-C
VE7IN 491,892-1779- 92-C-15
VE7AWT 87,804- 542- 54-C-10

Yukon - N.W.T.

VY1AC 30,951- 181- 57-B-AB
VY1DD 600- 20- 10-C
VY1DV 297- 11- 9-C-20

W/VE - PHONE

Multioperator
Single Transmitter

1

N1TZ(+K1s IU,KNQ,SF,KA1ERF,
N1ACU,W1BR,WA1UZH)
2,711,703-2059-439-C-WM
W1OO(+K1SA,KB1U,N1AFC)
1,809,456-1639-368-C-ME
K1IK(+KA1s BBY,DE,WA1SVS,
WB1ELC)1,586,112-1502-352-C-VT
K1NG(+KA1s BRI,EQL,WA1TFF)
1,309,896-1356-322-C-CT
KB1T(+KA1ACC,W1s HCS,HNZ,
PH,WB1HJF)
1,199,448-1234-324-B-NH
AG1C(+W1YN)
1,132,911-1263-299-C-EM
K1GSK(+WB1FPF)
724,164- 932-259-C-EM
K1EM(+K1RM)
234,171- 531-147-C-CT
K1FWF(Multiop)
201,852- 356-189-C-EM
W1BK(+N1CW,WA1UAR)
135,474- 337-134-C-EM
K1GW(+K1KA)
123,750- 330-125-C-NH
KC1F(+K1IR)
114,318- 261-146-C-EM

2

K2VV(+N2JJ)
1,670,760-1785-312-C-WNY
W2REH(+K2BK)
1,424,595-1301-365-C-SNJ
W2RQ(+W2s PA,SQ)
1,382,763-1427-323-C-NNJ
AE2A(+K2JT,WA2ZZ)
1,226,148-1327-308-C-NNJ
KC2L(+WB1GGR,N2BHP,W2XL)
658,854- 882-249-C-ENY
K2OY(+W2YX,WA2STM)
643,188- 806-266-C-ENY
K2QF(+Net)
591,084- 842-234-C-ENY
WA2LQO(K2s DOD,OB,UAT,N2CAX,
W2DKM,WA2PFF,WB2FMP)
520,455- 785-221-C-NLI
W2UI(+N3KR)
349,524- 532-219-C-SNJ
N2COV(+KA2s AAY,BPC,CUS,
WB2s KQN,OGU,ZOO)
114,243- 337-113-B-NLI

3

W3BGN(+KC2X,N3ED)
2,924,220-2119-460-C-EPA
KB3AG(+WB3IXG)
1,395,108-1626-286-C-EPA
K3HPG(+WB3FOG)
1,173,690-1242-315-C-MDC
WA3VUQ(+N3AUE,WB3AVN)
895,965-1127-265-C-MDC
W3GG(+N3TO)
814,452-1013-268-C-MDC
W3GNQ(+N5AIL)
705,159- 861-273-C-MDC
WA3EKL(+K3ON,KA3EJJ,N3CW,
WA3BDF)
645,516- 774-278-C-MDC
WA3EUL(+W3ILG,WB3s AGC,EKV,
FUR) 426,384- 658-216-B-EPA
WB3CZK(+N3US,WB3JRU)
420,357- 541-255-C-MDC
K3AO(+K4FJ,WB3LNV)
322,230- 467-230-B-MDC
W3IQS(+Net)
298,566- 513-194-C-EPA
KB3KE(+KA3BQS,N3s ANW,BBG)
280,245- 595-157-C-EPA
KA3BKW(+K3RUQ,W3OSZ,WA3KXV,
WB3s CCZ,CMF,FTN,JTS)
165,075- 355-155-B-MDC
W3KT(+Net) 84,609- 237-119-C-EPA

4

W4QAW(+K3s EST,RV,W3ZZ,
K0DX) 3,535,020-2395-492-C-VA
N4RV(+AI3C,N4RA)
2,503,488-1888-442-C-VA
N4HB(+KB4GX,N4ND,WB4BVY,
KB8HN) 2,462,805-2027-405-C-VA
KB4/4(+KA3BRS,W4FCA,
WB2CMV)
1,458,126-1373-354-C-VA
N4TJ(+WB8TCT)
571,362- 787-242-C-SC
N4AJZ(+WA4ITB)
307,026- 461-222-C-AL
KA4NEC(+KA4DJI)
298,302- 599-166-C-GA
W4RX(+Net) 5880- 56- 35-C-VA

5

K5GA(+K5s GN,LZO,RC,TU,
KA5CHW,KN5H,WB5WHR)
3,758,637-2667-437-C-STX
K5TA(+AA5B,K5HUI,KN5D)
2,221,632-2204-336-C-NM
W5VX(+K5s BDS,TSQ,W5MCO)
2,039,500-1878-362-C-STX
K5QY(+N5EG,WB4RG,WB5NQH)
855,819-1093-261-C-NTX
KM5K(+N5BQQ)
520,671- 881-197-C-NTX
W5AC(KM5L,N5s APR,BTO,CIY,
CUK,WB5s PYI,WOH,WD5BIK,
oprs) 272,580- 649-140-C-STX
KA3BER/5(+WD5EAE)
4140- 46- 30-B-LA

6

K6HNZ(+Net)
1,167,264-1544-252-C-SCV
AA6DP(+N6DFY,W6CCP,WB6SHL)
1,124,280-1617-240-C-ORG
AA6T(+N6s BSU,RZ,WA6s HKP,OCV)
1,177,488-1768-222-C-SCV
K5KT/6(+AE6T,K6s OKW,SVL,
KV6I) 1,017,084-1294-262-C-ORG
K6HIH(+KB6XN)
842,400-1440-195-C-EB
W6GO(K6s HHD,ZBV,oprs)
745,332- 934-266-C-SV
K6SG(+KV6H)
690,624-1199-192-C-SV
W6YX(N3ER,N7MH,WA6s ESI,
ITV,oprs) 500,340-1076-155-C-SCV
W6TPH(Multiop)
437,400- 900-162-C-SV
W6BIP(+K6SMH,WA6s DJI,PYN)
415,584- 666-208-C-SF
W6UE(N6s DLU,LN,WB6YTU,
oprs) 114,597- 357-107-C-LAX
W6DU(+Net) 95,400- 300-106-C-SCV
AJ6V(+Net) 90,252- 276-109-C-SCV
WB6RWJ(+KA6ING)
78,000- 250-104-C-SCV
KB6JK(+Net)
61,254- 246- 83-C-EB
WD6BZS(KB7FX,WD5JMC,oprs)
60,078- 323- 62-C-SB
KK6X(+Net) 41,580- 154- 90-C-SF
N6ST(+Net) 36,378- 129- 94-C-SCV
AC6V(Multiop)
32,435- 159- 68-C-SCV
K6CSL(+Net) 6831- 69- 33-B-EB
AK6P(+Net) 5580- 62- 30-C-SCV
K6FO(+Net) 3885- 37- 35-B-SV

7

K7SP(+K7s JVR,NO,KB7s FF,HH,
N7s AJI,BJX,CW,US,WA7NIY,
WB7FDQ)
2,537,115-2555-331-C-AZ
W7NI(+AI7B,K5MM)
2,156,616-2723-264-C-OR
N7RO(+AI7P,KA7AUH,W7s DQM,
EKM,WA7ZWG)
1,196,620-1534-260-C-WA
K7GEX(+WB7BNP)
424,080- 744-190-C-WA
WA7YCZ(+WB7VXR)
421,074- 942-149-C-WA
WA7JTC(KB7EO,WA7ZTN,
WBØWPY,oprs)
227,520- 474-160-C-WA
WB7CLU(+WB7WQE)
214,929- 501-143-C-WA
W7DK(AD7S,AE7X,AJ7P,K7s ETU,
GYP,QLC,KA7JAU,N7ARO,W7DWW,
WA7s ENB,FUS,ZSR,WB7s AQC,
CFH,OXA,RAX,oprs)
171,360- 544-105-C-WA

8

WD8DEL(+K4VYU,KB8EI,W8s CEF,
USM,WA8SJV,WB8s IFP,RSA,RRR,
ZJY,WD8s ALG,DEL,MCH)
1,405,458-1531-306-C-OH
W8NGO(+K8s ZE,ZZU,N8s BKF,
BLX,W8KR,WD8s JTJ,JTK)
592,032- 881-224-C-MI
WB8UCW(+KB8V,KA8CTE,
WB8HOO,WD8MKC)
456,975- 677-225-C-OH
KB8LM(+N8s AYW,CEU,CFC,CHC,
WA8OYG,WB8BHK,WD8DLK)
185,724- 462-134-C-MI
WD8ECA(+N8BOJ)
131,460- 313-140-C-OH
WA8FNY(+K8BHS,KB8RK,N8ANR,
W8WYT,WA8s OWB,SSZ,WB8s
BCM,BHE,NVJ,WXG,ZNM,WD8CDP)
62,415- 365- 57-C-MI
KB8DAC(K8s OT,WS,KA8IOX,N8s
BZT,CAV,CAW,RW,WD8s JSQ,
RIN,oprs) 41,022- 159- 86-C-MI
WD8POG(+KA8s JCB,KFU)
25,245- 165- 51-B-OH
WD8OFP(Multiop)
14,523- 103- 47-B-OH

9

K9BN(+K9JF)
1,240,053-1471-281-C-WI
WB9GGD(+K9RX)
685,692- 907-252-C-WI
AF9C(+N9ANP)
482,664- 676-235-C-IL
W9AWE(N9GB,W9s HQW,QQ,
WB9RGA,WD9DVJ,oprs)
342,081- 573-199-B-IL
KB9BR(+N9LE)
319,725- 525-203-C-IL
KB9Z(+AK9U,KA9s,IQQ,JFY,
WD9IRW) 273,294- 482-189-C-IN
AG9V(+AL7AA,K9QYC,KA9HFA,
N9AOX,W9OBJ,WB9GXB)
271,410- 545-166-C-WI
WA9RCQ(+KA9s FDV,GEW,
W9GYN,WA2QQC,WD9IQQ)
153,450- 341-150-B-IL
KA9L(+KA9FUL,N9AYC)
78,177- 253-103-B-IN
WB9BIL(+KB9VA,WB9NDV,
WD9FWY) 42,864- 152- 94-C-WI
WB9TXJ(+WB9TXI)
30,798- 177- 58-C-WI
W9MOK(+W4JKC,KA9BYE)
3900- 65- 20-C-IN

Ø

KØRF(+KØGU,WØs UA,UN,
WDØDSW)
3,878,175-3115-415-C-CO
WØRR(+ABØI,KØUAA,KAØs AQZ,
GNA,GTZ,KBØs U,WD,NØCKW,
WAØDGX,WAØZHY,WBØs LFY,
ZHY)
2,148,660-2070-346-C-MO
WØKEA(+NØs AFO,BRI,WDØASM)
1,290,642-1714-251-C-IO
KFØP(+KØSR)
486,576- 654-248-C-MN
WBØUFL(+WDØDTO)
295,046- 502-196-C-IA
WAØYPY(+WAØASM)
240,192- 576-139-C-NE
WØSW(+KNØKCW)
217,620- 390-186-C-MN
NØAN(+AIØZ)
145,926- 363-134-C-IA
WBØYUC(+NØAMS,WDØFOF)
34,185- 215- 53-C-MN

VE

VE1DXA(Multiop)
1,830,921-1811-337-C-MAR
VE6OU(+VE6s KW,WQ)
1,286,409-1889-227-C-ALT
VE3UOT(VE1BCZ,VE3HTT,oprs)
497,652- 734-226-C-ON
VE2CUA(VE2s RAB,DFH,DUB,
EHI,EWQ,FEW,GDJ,WS,oprs)
99,756- 326-102-C-QUE

W/VE - PHONE

Multioperator
Multi-Transmitter

W2PV(+AJ1J,K1s AR,OME,K2s EK,
NJ,N2NT,WA2OVE,K3s LR,UA,
W3AZD,WB3ANE)
8,043,906-4771-562-C-ENY
K1OX(+AK1A,K1s EA,HI,RX,VR
XR,XX,ZM,KA1O,W1s FJ,HD,HNZ,
K2DM) 7,459,986-4546-547-C-NH
K2UA(+K2BU,N2s MR,ME,W2BHK,
WA2HGM,KA3BKR)
6,917,226-4262-541-C-SNJ
KX4S(+K4WHN,KA4EVH,KG4W,
N4s BLX,CFL,NB4A,W4s BAI,DR,
MYA,PDL,WA4s HOT,BKD,IZK,
WB4UKW,WD4s IKD,IMC)
6,587,757-4059-541-C-VA
N5AU(+AF5K,K5s FUV,HM,RX,
ZD,KA5W,KM5s R,X,N5s AJW,
CR,TP) 5,495,120-4365-496-C-NTX
W3LPL(+N2FB,AE3Y,K3s DI,KU,NA,
RA,W3MR,WA3UXU,WO4AXM)
6,434,649-3837-559-C-MDC
N6RO(+AA4KB,KN6K,N6s BT,KB,
NE,TU,W6OAT,WA6DIL,WA7LQO,
K9LBQ,N9NC)
5,997,420-4660-429-C-EB
AI6V(+K6KLY,KB6F,KD6FW,
N6KT,W6s EEN,QEN,XX,WA6s
NTG,VEF)
5,718,114-4506-423-C-SV
K9DX(+K9s GL,HDE,HMB,KM,NO,
RS,PPY,PW,WA9EYY,WB9CAS,
WD9DCL)
5,511,501-3667-501-C-IL
K8LX(+AA8U,K8s GM,MD,NA,
N8EA,W8TA,WA8s YVR,ZOT,
WB8ALP,WD8s BDK,BWN,SBJ,
WN8PEE,WD9HFW)
5,510,817-3819-481-C-MI
K1CC(+K1s TO,ZZ,KA1s BMB,
EKY,W1GNC,WA1s YEC,ZDW,
AK4L)
5,135,088-3596-476-C-CT
W3MM(+K3s GM,NZ,OO,N2BA,
N3VV,W3BI)
5,121,024-3334-512-C-EPA
K3WW(+K3WJV,KA3BLP,KB3GJ,
N2ATX,N3EC,WA2BFW,WA3VLB,
WB3s FTP IXG)
4,878,738-3246-501-C-EPA
W3FA(+KA1GD,K3s ZJ,ZZ,N3GB,
WA3ZAS,N8II)
4,257,264-2932-484-C-MDC
W6RDF(+WB5CSO,K6XT,N6s ND,
NR,ZI,W6s UQF,ZUM,WA6DBC)
3,744,729-3477-359-C-SDGO
K6RU(+AA6s AD,G,UO,K6s SEM,
XO,KA6CUG,W1ARR)
3,676,881-3251-377-C-SCV
N2RM(+N2MM,WA2SFB)
3,593,808-2832-423-C-SNJ
N6SV(+K6NA,KM6J,N6RJ,W6XI,
K7JA) 3,471,251-3053-379-C-SDGO
W3RJ(+K3s RL,UC,VW)
3,447,360-2520-456-C-EPA
N3RD(+N3AMK,W3XU)
3,328,668-2499-444-C-EPA
W3GM(+AJ3H,K3s FD,GQJ,ND,QA,
KA3EAP,W3FV)
3,143,559-2273-461-C-EPA
K2TR(+K2WR,WA2SPL)
2,787,536-2554-368-C-ENY
K1RQ(+W1s GG,ZT,WA1ZAM,
WB1GZD)
2,286,900-1980-385-C-WM
K6ZM(+AK6T,WA6JCZ,WB6DSV)
1,564,110-1931-270-C-EB
N3AD(+N3s AW,DA)
1,550,250-1590-325-C-EPA
K3IU(+K3s RT,TM,K4YEP)
1,219,434-1217-334-C-MDC
N6AA(+N6s NI,TR)
1,037,136-1394-248-C-LAX
N5JJ(+K5AAD,N5CDO,WD5ABR)
856,254-1073-266-C-STX
AD3V(+W3NX,N8NA)
996,636-1058-314-C-DE
W4EI(+N4MQ)
853,062-1069-266-C-VA
KB3HE(+KB3NQ,WB3s DJF,LNZ)
567,909- 709-267-C-EPA
W3GU(+K3CY)
351,286- 747-246-C-EPA
N1AU(+KC1F,WA1WZJ,WB1DFV)
300,940- 690-242-C-EM
K1ORB(+N1s AMU,AMW)
56,169- 237- 79-B-WM
WD5GUP(+WD5JNC)
38,934- 206- 63-C-MS
WA2AAZ(AB2F,KA2s HCX,ILH,
WB2s AUW,CBX,TGU,oprs)
19,947- 109- 61-C-WNY
WB9SMC(+K7NHK,WD9HTN)
1620- 27- 29-B-IN

DX - PHONE

Single Operator

Africa

CT3BM 130,536- 777- 56-B-AB
EA8LS 1,270,710-2017-210-C-AB
EL2AV 2,548,665-3915-217-C-AB
EA9EU 17,253- 213- 27-B-15
FRØFLO 1,027,374-2063-166-B-AB
W5JMM/SU 319,176- 858-124-C-AB
ZD8RH 82,836- 531- 52-B-AB
ZS6ABO 356,928-1144-104-C-AB
ZS6PI 313,800- 836-125-C
S83W 305,532- 828-123-B
ZS6DW 12,078- 132- 33-C-40
S83T 20,736- 192- 36-B-15
ZS6HZ 164,916-1018- 54-C-10
ZS6OX 57,669- 409- 47-C

Asia

EP2TY(JA3AEV,opr)
44,940- 214- 70-C-AB
HM1PW 189,216- 584-108-B-AB
HL9RD(WB4ZMK,opr)
83,076- 322- 86-C
JA1ELY 1,271,100-1900-223-C-AB
JA3CZY 691,893-1303-177-C
JA1JKG 469,476-1134-138-C
JF1SEK 339,888- 776-146-B
JI1QPU 328,482- 869-126-B
JA3HTT 241,152- 628-128-B
JH2CJW 165,933- 537-103-B
JA3IWA 158,172- 538- 98-B
JA1KF 107,892- 324-111-C
JA6BIF 99,198- 334- 99-C
JA1AOD 96,654- 362- 89-B
JA4ESR 80,580- 316- 85-C
JA7JWF 73,272- 284- 86-B
JA6LDD 62,826- 283- 74-C
JH1UUT 59,640- 280- 71-B
JR3WXA 48,006- 254- 63-B
JA6AZQ 44,676- 204- 73-B
JA1BGW 41,856- 218- 64-B
JF3CEC 38,979- 213- 61-B
JR3IOT 36,036- 182- 66-C
JE3DVW 35,979- 179- 67-B
JA3BLN 30,672- 144- 71-B
JH7AJY 26,640- 148- 60-B
JA4AO 25,704- 153- 56-B
JA4JKD 22,440- 170- 44-B
JA6LYV 21,528- 156- 46-B
JR3XEX 19,737- 153- 43-C
JA1KFX 15,621- 127- 41-B
JF1YDF(JR8AJM,opr)
15,120- 105- 48-B
JA8SW 13,332- 101- 44-C
JH2XTV 13,200- 100- 44-B
JH2IJC 12,402- 106- 39-B
JR7IJD 10,368- 96- 36-B
JA8SPZ 9690- 95- 34-B
JA4PA 8946- 71- 42-B
JH1MTR 7440- 80- 31-B
JM1AHX 6474- 83- 26-B
JA1AAT 5400- 60- 30-B
JH1LSS 5580- 62- 30-C
JK1NSR 5040- 80- 21-B
JA1RL 4020- 67- 20-B
JA6EZF 2451- 43- 19-B
JR7HNF 1833- 47- 13-B
JR3QCT 1530- 34- 15-B
JF2PKI 693- 21- 11-B
JH6HXX 240- 16- 5-B
JA1BTB 13,755- 131- 35-B-80
JA2AAQ 6300- 100- 21-C
JE2BAY 76,752- 533- 48-C-40
JA9UX 35,640- 264- 45-C
JR2TWA 990- 30- 11-B
JF3CCN 837- 31- 9-B
JG3CKF 792- 33- 8-B
JA1BOK 48- 4- 4-B
JAØJHA 123,144- 733- 56-B-20
JH1PBR 46,671- 331- 47-C
JH1HGC 45,594- 298- 51-B
JA1KKA 624- 16- 13-C
JH1BBU 179,088-1066- 56-C-15
JA7BJS 94,605- 595- 53-C
JL1PKX 84,402- 521- 54-C
JK1OPL 77,112- 504- 51-C
JI1LLD 45,000- 300- 50-B
JG3KAB 31,122- 247- 42-B
JI1QLB 27,810- 206- 45-B
JA8UJY 24,108- 196- 41-B
JJ1LBJ 19,656- 168- 39-B
JA3FZI 18,081- 147- 41-B
JA1DCO 17,199- 147- 39-B
JM1FHM 16,920- 141- 40-B
JF1ULD 15,540- 140- 37-B
JF3PLF 11,253- 121- 31-B
JE2UFU 9504- 96- 32-B
JA1HYU 7134- 82- 29-B
JF2AFJ 4956- 59- 28-B
JK1UFF 4950- 66- 25-B
JM1CPA 4212- 78- 18-B
JH8TDZ 1935- 43- 15-B
JF2IWL 1440- 40- 12-B
JA1IT 1260- 28- 15-B
JR6RKG 792- 24- 11-B
JAØGZ 780- 26- 10-B
JH4NHF 504- 21- 8-B
JH7FMJ 238,203-1393- 57-B-10
JA1WSK 192,225-1165- 55-B
JA1YXP(JH4OWG,opr)
180,306-1113- 54-B
JA1SGX 173,040-1030- 56-B
JE1PGW 159,954-1006- 53-B
JH1EDB 144,828- 894- 54-B
JA7BSK 130,221- 819- 53-B
JL1CGL 121,992- 782- 52-B
JA7GLB 115,056- 752- 51-B
JF3BFS 112,890- 710- 53-B
JR1CFG 111,000- 740- 50-B
JE2PKD 92,820- 595- 52-B
JA3EQC 88,935- 605- 49-B
JJ1NUB 85,680- 595- 48-B
JH1RNZ 79,254- 518- 51-B
JA1DFQ 75,036- 481- 52-B
JA1YHA 74,676- 508- 49-B
JHØBBE 73,590- 446- 55-B
JA3PGV 65,472- 496- 44-B
JR4BVD 46,053- 301- 51-B
JR7ICN 27,945- 207- 45-B
JA1JGP 26,595- 197- 45-B
JF3KNQ 19,314- 174- 37-B
JA3BBG 16,761- 151- 37-B
JH2ORJ 15,207- 137- 37-B
JA1NTK 14,364- 114- 42-B
JH9AJE 14,040- 117- 40-B
JA6EFT 13,338- 114- 39-B
JL1HZR 13,110- 115- 38-B
JA1FO 12,654- 114- 37-B
JL1CCX 12,096- 112- 36-B
JA1VZM 11,880- 132- 30-B
JR2VLS/1 9894- 97- 34-B
JJ1DBA 6885- 85- 27-B
JK1XKM 7830- 90- 29-B
JA2HPO 6525- 87- 25-B
JE2OOD 4992- 64- 26-B
JAØBLU 3816- 53- 24-B
JE3FUN 3591- 57- 21-B
JA2DHL 3300- 50- 22-B
JA6QDU 1440- 40- 12-B
JL1XEI 360- 15- 8-B
JF3FMD 252- 12- 7-B
JE3EZV 156- 13- 4-B
JAØBMS/1 40,176- 227- 62-A-QRP
JA1EF 29,970- 222- 45-A
JA9XBW 23,736- 184- 43-A
JA2QBA 16,956- 149- 38-A
JH4MUQ 3978- 51- 26-A
JD1ALU 1764- 42- 14-B-AB
UAØKBO 236,118- 667-118-B-AB
UAØWAY 152,562- 541- 94-B
UAØFCL 8004- 116- 23-B-80
UA9FDL 30,879- 219- 47-B-20
UV9DO 11,988- 111- 36-B
UAØSAU 137,904- 888- 52-B-15
UA9MR 31,863- 247- 43-B
UA9CRR 3078- 54- 19-B-10
UA9CMS 2700- 50- 18-B
UA9UFR 864- 32- 9-B
UD6DER 864- 18- 16-B-AB
UF6FER 429- 13- 11-B-10
UH8BO 2442- 37- 22-B-20
UJ8JCQ 2775- 37- 25-B-AB
UL7QF 23,493- 191- 41-B-15
UM8MAZ 1728- 32- 18-B-15
VS6JR 4617- 57- 27-B-AB
4Z4RS 357,744-1028-116-C-AB
4Z4RG 138,411- 507- 91-B
4Z4TY 90,720- 360- 84-B
4Z4SC 36,051- 197- 61-B
4X6DX 246,069-1439- 57-C-20

Europe

C31IU(K9MW,opr)
219,834-1357- 54-B-15
CT4MS 26,775- 175- 51-B-AB
CT1FL 26,676- 247- 36-C-80
CT1AOZ 59,796- 452- 44-C-40
CT7UA 116,064- 744- 52-C-20
CT1AIQ 6150- 82- 25-B-15
CT1AHU 1734- 34- 17-B-10
CT2DP(WØZX,opr)
275,607- 813-113-B-AB
DK3SN 986,082-2206-149-C-AB
DJ5TH 900,960-1877-160-C
DL6WD 553,059-1131-163-C
DK5AD 490,116-1034-158-C
DJ6OZ 325,611- 759-143-C
DL5BAN 248,487- 733-113-C
DK5DS 87,384- 331- 88-B
DL7XR 80,535- 295- 91-B
DL2EF 52,320- 218- 80-B
DF8XC 47,310- 215- 68-B
DL5LV 27,384- 163- 56-B
DK5KJ 1734- 34- 17-B
DL8PC 15,810- 155- 34-C-40
DJ9MH 3102- 47- 22-C
DJ9BA 65,331- 427- 51-C-20
DF9YY 157,716-1011- 52-C-15
DJ8RI 209,790-1295- 54-C-10
DF7UT 166,314-1046- 53-B
DF7RX 113,832- 744- 51-B
DK3QN 30,114- 238- 42-B
DJ4YH 14,478- 127- 38-B
DH4BAE/M 14,040- 120- 39-B
DJ3GE 9310- 59- 30-B
DL3ME 8316- 84- 33-B
DF2RG 3360- 56- 20-B
DH8AAB 594- 18- 11-B
DL8QS 139,602- 439-106-A-QRP
DK8FS 47,064- 212- 74-A
EA2QU 298,908- 722-138-C-AB
EA7LM 51,513- 223- 77-B
EA2XX 19,032- 104- 61-B
EA1YL 33,600- 280- 40-B-40

EA2CR 3300- 50- 22-B-20
EA3AVX 1785- 35- 17-B
EA3NA 148,665- 901- 55-B-15
EA5ANR 50,370- 365- 46-B
ED5EZ 35,376- 268- 44-B
EA7BWY 23,310- 210- 37-B
EA3SA 87,984- 611- 48-C-10
EA3AOE 75,000- 500- 50-C
EA7ALG 1152- 24- 16-B

EA6GP 19,272- 126- 51-B-AB

EI2BB 271,425-1645- 55-B-10
EI1OH 138,648- 872- 53-B

F6DZU 547,536-1037-176-B-AB
F9ER 100,062- 654- 51-B
F6GPG 27,156- 146- 62-B
F6CLM 26,040- 140- 62-B
F6ENT 17,304- 103- 56-B
F6CXJ 16,779- 119- 47-B
F8WE 11,484- 116- 33-B
F6DRP 8232- 98- 28-B
F6CCI 7776- 81- 32-B
F6BRK 561- 17- 11-B-20
F6BVB 37,779- 257- 49-B-10
FØFXX 20,538- 163- 42-A-QRP

G2QT 310,488- 761-136-B-AB
G2FNK 272,217- 803-113-C
G3YBH 22,200- 148- 50-C
G3NT 13,152- 137- 32-B
G4DKA 9660- 140- 32-C-80
G4JJE 324- 12- 9-B-40
G5DCU 1092- 28- 13-B-15
G4BWP 418,824-2493- 56-C-10
G4CHP 170,445-1033- 55-B
G3WTM 123,090- 746- 55-C
G4BEZ 100,620- 645- 52-B
G4KGA 79,542- 491- 54-B
G4KIU 7068- 76- 31-B
G3IMW 13,920- 116- 40-A-QRP

GI3KDR 217,248- 584-124-B-AB

GM3AYR 39,330- 190- 69-C-AB
GM5AXY 11,970- 114- 35-C-15
GM4FDM 158,523- 997- 53-B-10

GU3YIZ 101,577- 691- 49-B-10

GW4BLE 385,392-2294- 56-C-10
GW3NFF 128,700- 825- 52-C

HA9KPU 128,037- 469- 91-B-AB
HA1ZD 94,751- 336- 94-B
HA5KMB 10,101- 91- 37-B
HA4XH 171,192-1019- 56-B-20
HG8KQX 264,990-1606- 55-B-10
HA5LX 39,468- 286- 46-B
HA3HV 37,092- 281- 44-B
HG8KAX 22,878- 186- 41-B

HB9AAM 170,016- 506-112-C-AB
HB9DX 117,045- 765- 51-C-10

I6FLD 2,118,675-3445-205-C-AB
IT9YSW 48,375- 215- 75-B
I2KUW 5145- 49- 35-B
I4AVG 5580- 93- 20-C-80
I5NPH 92,862- 737- 42-C-40
I2VRN 83,688- 634- 44-C
I5VXG 173,250-1050- 55-C-20
I6ZJC 204,792-1219- 56-C-15
IØMGM 432,117-2527- 57-C-10
I1POR 832,808-1981- 56-C
I1JJZ 229,488-1366- 56-C
I2SVA 193,980-1220- 53-B
I2YKV 72,000- 500- 48-B
I3GRX 52,786- 391- 45-C
I5NSR 337,566- 886-127-A-QRP
I1LOM 27,864- 216- 43-A

LA7JO 360,084- 811-148-C-AB
LA2TO 65,412- 276- 79-B
LA6UL 64,452- 262- 82-C
LA9FY 50,745- 199- 85-B
LA2AD 27,105- 139- 65-B
LA3UG 10,965- 85- 43-B
LA9HW 14,274- 122- 39-B
LA1KQ 4176- 58- 24-B
LA2YT 240- 10- 8-B-10

LZ2ES 24,120- 201- 40-C-20
LZ1QR 864- 24- 12-B

OE1ETA 222,840- 619-120-B-AB
OE7SHI 29,412- 172- 57-B
OE5CWL 55,752- 404- 46-C-10

OH1LW 80,316- 291- 92-C-AB
OH3LA 34,026- 214- 53-B
OH7NW 4200- 40- 35-C
OH5TZ 2160- 36- 20-B
OH2TI(OH6GJ,opr)
3- 2- 1-B
OH2MM 284,373-1663- 57-C-20
OH5LF 257,526-1506- 57-C
OH3BX/2 4752- 48- 33-C
OH1CQ 1575- 35- 15-C
OH7VR 18,462- 181- 34-C-15
OH1CX 1938- 38- 17-B
OH2DN 60- 5- 4-B
OH2FS 22,116- 194- 38-C-10
OH3WU 18,564- 182- 34-B
OH5PA 4368- 52- 28-B
OH1TD 4221- 67- 21-B
OH3AT 378- 14- 9-B
OH6LK 23,754- 214- 37-A-QRP
OH6DO 594- 18- 11-A

K5KG/OHØ 515,061-1137-151-C-AB
OH2BAZ/OHØ
102,384- 711- 48-C-15

OK2BLG 451,197- 983-153-C-AB
OK1AR1 160,380- 660- 81-B
OK2PDE 76,692- 332- 77-B
OK2YN 29,382- 166- 59-B
OK3FON 7722- 66- 39-B
OK1XG 2970- 33- 30-B
OK1AAE 1938- 34- 19-B
OK3CFP 990- 22- 15-B
OK1KIR(OK1DAI,opr)
765- 17- 15-B
OK1FAR 3888- 72- 18-C-80
OK1ATE 67,236- 431- 52-B-20
OK2BBJ 306- 17- 6-C
OK2PEQ 18- 3- 2-B
OK1AGN 97,032- 622- 52-C-15
OK2ABU 87,552- 608- 48-C
OK2QX 81,090- 530- 51-C
OK2SLS 21,945- 209- 35-B
OK2BSA 9393- 101- 31-B
OK1DMJ 1053- 27- 13-B
OK1TA 300,384-1788- 56-C-10
OK2YAX 118,299- 839- 47-B
OK1ZL 93,942- 614- 51-C
OK3CFA 83,616- 536- 52-C
OK1MHI 19,116- 177- 36-B
OK3MB 10,125- 125- 27-B
OK1AJY 9836- 62- 26-B
OK1AOU 1287- 33- 13-B
OK1DKS 67,077- 257- 87-A-QRP
OK2BKR 63,036- 412- 51-A
OK3CGP 31,992- 248- 43-A
OK2POL 30,744- 168- 61-A
OK1KZ 16,416- 114- 48-A

ON4XG 21,480- 179- 40-B-15
ON6NL 32,430- 235- 46-A-QRP

OZ8T 82,719- 303- 91-B-AB
OZ1FRR 62,985- 247- 85-B
OZ2BM 23,712- 104- 76-B
OZ2OL 18,048- 128- 47-B

OZ1DYC 7560- 90- 28-B
OZ5EV 7560- 105- 24-C-40
OZ6QV 145,200- 880- 55-C-20
OZ6EI 210- 10- 7-C
OZ1CAH 87,363- 571- 51-B-15
OZ9OI 126- 7- 6-B
OZ6MW 16,626- 163- 34-B-10
OZ1AP 9696- 101- 32-B
OZ1BUR 6426- 102- 21-B
OZ5JR 4284- 68- 21-B
OZ6XR 2208- 46- 16-B
OZ7DX 1386- 22- 21-B
OZ6KS 273- 13- 7-B

PAØADC 144,816- 431-112-B-AB
PAØXPQ 113,751- 383- 99-B
PAØLOU 111,936- 424- 88-C
PAØKDM 32,922- 777- 62-B
PAØDUO 5400- 60- 30-B
PAØMVW 1776- 37- 16-B
PAØFEI 1080- 20- 18-B
PAØAWI 52,593- 373- 47-B-10
PAØLIE 18,819- 123- 51-B
PAØRRS 18,216- 138- 44-B
PI1ARS 11,424- 136- 28-B
PA3AOG 1092- 28- 13-B

SM6JVQ 271,440- 696-130-B-AB
SM5CAK 188,370- 690- 91-C
SK7NK(SM7AIO,opr)
91,224- 362- 84-C
SM5CBM 82,890- 307- 90-C
SK3MF 72,210- 290- 83-C
SMØDOQ 64,698- 263- 82-B
SM5IKQ 37,152- 172- 72-C
SM4BTF 36,120- 172- 70-B
SM4JEL 33,300- 150- 74-B
SM7HSP 33,060- 190- 58-C
SM7BOU 29,904- 178- 56-C
SK2IV 24,339- 133- 61-B
SM7AIO 18,792- 116- 54-B
SMØCHA 7680- 64- 40-B
SM5RE 5952- 64- 31-B
SM7TV 4350- 58- 25-B
SM5AAY 4050- 50- 27-C
SM6JY 3894- 59- 22-B
SMØBDS 3240- 45- 24-B
SM3DMP 113,400- 675- 56-C-20
SM6BGG 10,464- 109- 32-C
SM6INC 105,750- 750- 47-B-10
SMØAJU 101,292- 734- 46-C
SM3KWS 29,835- 255- 39-B
SM1BOE 10,878- 98- 37-B
SM6FGP 9792- 102- 32-B
SM5ALD 6612- 76- 29-B
SMØFM 6240- 65- 32-B
SM5BDV 4941- 61- 27-B
SM4JST 4602- 59- 26-B
SM3LGO 2700- 45- 20-B
SKØLM(SMØDRD,opr)
540- 18- 10-B
SMØLPO 1728- 36- 16-A-QRP

SP3DOI 1,576,800-2400-219-C-AB
SP8ARY 106,653- 487- 73-C
SP9FLY 91,800- 340- 90-B
SO5DW 44,943- 211- 71-B
SP9PZD 37,260- 207- 60-B
SP9AKD 28,320- 160- 59-B
SP2FAP 11,454- 83- 46-B
SP7PGK 10,032- 88- 38-B
SP9KMM(SP9GPW,opr)
22,248- 206- 36-B-20
SP7KTF(SP7LIH,opr)
10,404- 102- 34-B
SP6HTQ 9486- 102- 31-B
SP3IEZ 2679- 47- 19-B
SP1FOQ 2079- 33- 21-C
SP6GPJ 1800- 40- 15-B
SP3CFM 1350- 25- 18-B
SP8EMO 1014- 26- 13-B
SP9CLO 570- 19- 10-B
SP9IWO 351- 13- 9-B
SP9CTW 12,705- 121- 35-C-15
SP6PCL 8091- 87- 31-B
SP9BRP 4488- 68- 22-B
SP7AWA 936- 24- 13-B
SP3KEY(SP3DWQ,opr)
247,128-1471- 56-B-10
SP5GIQ 34,686- 282- 41-B
SP5DZI 11,118- 109- 34-C
SP9KAD 6240- 80- 26-B
SP6BPY 4090- 44- 31-A-QRP
SP6PAZ 975- 25- 13-A

SVØAU 181,398- 617- 98-B-AB
K1ED/SV 65,604- 284- 77-B

SVØAW/9(WB5WRY,opr)
72,618- 247- 98-C-AB

UA3TN 21,054- 121- 58-B-AB
UA4CH 5487- 59- 31-B
UW3TE 2958- 34- 29-B
UV3CS 1020- 20- 17-B
UA3EAL 60- 5- 4-B-80
UA6ADC 177,912-1059- 56-B-20
UA6WS 7350- 70- 35-B
UA1AET 8466- 83- 34-B
UW1AE 11,772- 109- 36-B-15
RA3YCR 68,649- 467- 49-B-10
RA3DKE 12,744- 118- 36-B
UA6XAX 9207- 99- 31-B
RA3LAL 9075- 121- 25-B
UW3HY 1680- 28- 20-B
RA3DQP 390- 13- 10-A-QRP

UA2EC 7626- 62- 31-B-10

UT5OV 55,458- 234- 79-B-AB
UB5VAZ 74,046- 602- 41-B-10
RB5MHY 9900- 110- 30-B
UB5UGD 21,720- 181- 40-B
UB5LAJ 5670- 90- 21-B
UB5UKO 4026- 61- 22-B
RB5IOV 459- 17- 9-A-QRP

UC2AFI 1050- 35-10-B-10

UP2BAS 4050- 50- 27-B-AB
UP2BBF 210- 10- 7-B-20
UP2OU 17,214- 151- 38-B-15
UP2PAQ 2862- 53- 18-B
UP2AV 1125- 25- 15-B
UP2DM 65,826- 477- 46-B-10
UP2BFR 52,245- 405- 43-B
UP2BDO 4590- 85- 18-B

RQ2GAE 8262- 102- 27-B-10
RQ2GAI 5700- 95- 20-B

UR2RKS 390- 13- 10-B-20
UR2DU 10,125- 125- 27-B-10
UR2RKB 11,880- 132- 30-A-QRP

Y45RN 85,086- 326- 87-B-AB
Y47ON 83,592- 324- 86-B
Y41ZH 63,096- 239- 88-B
Y22RK/P 28,386- 166- 57-C
Y32ZF 6510- 70- 31-B
Y31UC 1632- 32- 17-B
Y31XF 1512- 24- 21-B
Y21JH 1500- 25- 20-B
Y33TA 1989- 51- 13-C-40
Y27VH 1827- 29- 21-B-20
Y34XF 4071- 59- 23-B-15
Y27GL 3381- 49- 23-B
Y37ZE 1326- 26- 17-B
Y37WE 1092- 26- 14-B
Y35LM 117,900- 786- 50-C-10
Y31ZE 43,164- 327- 44-B
Y59UN 31,968- 222- 48-B
Y38YK 27,993- 217- 44-B
Y37UF 12,576- 131- 33-B
Y22WF 8268- 106- 26-B

Y24NN/A 4026- 61- 22-B
Y47XF 3760- 57- 22-B
Y35XA 2078- 57- 18-B
Y53WL 2760- 46- 20-B
Y64YH 1710- 30- 19-B
Y31YE 990- 22- 15-B
Y25BL 210- 10- 7-B

YO6AWR 468,270-1290-121-B-AB
YO3KSC 13,113- 141- 31-B-40
YO2BEH 5475- 73- 25-B-20
YO8BSE 936- 26- 12-B
YO3KWJ(YO3JW,opr)
196,185-1189- 55-B-10
YO9AFT 16,740- 180- 31-B
YO9HT 15,540- 148- 35-A-QRP

YU1NZW 48,336- 212- 76-B-AB
YU7SF/M 11,934- 102- 39-B
YU7ECD 207,816-1237- 56-C-20
YU3TU 295,512-1759- 56-C-15
YU3EY 431,604-2524- 57-C-10
YU1OBA 186,420-1195- 52-B
YU2RUR 19,950- 175- 38-B

North America

K6OJ/C6A
1,308,888-2058-121-B-AB
C6ADV 29,184- 152- 64-B

FMØFJE 222,600-1325- 56-C-10

FGØFOO/FS(N6RA,opr)
481,707-2817- 57-B-10

HC2BW 120,744- 387-104-C-AB

HI8LCP 63,222- 257- 82-B-AB
HI8JAG 31,008- 272- 38-C-160
HI8PGG 106,110- 655- 54-C-80
HI8MRF 23,985- 205- 39-C-40
HI8GB 292,545-1773- 55-C-15
HI8LC 43,200- 300- 48-B-10

HP1XOG 267,300-1620- 55-C-10

J87BM(WB1ABF,opr)
70,092- 354- 66-B-AB
J87BL(W1JP,opr)
27,693- 181- 51-B

KG4ET 444,690- 915-162-B-AB

AL7X 595,848-1342-148-C-AB

KP4AM 78,900- 526- 50-C-15

OX3ZM 719,628-1318-182-C-AB

W2BBK/PJ7 495- 15- 11-B-AB

TG9GI 3,969,252-4974-266-C-AB

VP2MP(K2YY,opr)
5,449,095-6285-289-C-AB

VP2VHD(W3FPO,opr)
231,516- 708-109-B-AB

N1GL/VP9
4,092,300-4547-300-B-AB
WA4ARV/VP9
650,484-1268-171-B
VP9IB 252,780-1532- 55-B-15

XE1LLS 441,351-2581- 57-C-10

HT5JAR 87,800- 586- 50-B-20

AU1UN(DL6LV,opr)
772,821-1363-189-C-AB

SP6M(VE3FCU,opr)
604,344-1352-149-B-AB

Oceania

DU1EFZ 22,176- 224- 33-B-15
DU6JM 63,798- 434- 49-B-10

FO8GW 199,800- 740- 90-B-AB

KC6QZ(KH2AD,opr)
63,360- 352- 60-C-AB

KH3AB 1,320,744-1948-226-C-AB

KH6NO 2,156,952-2776-259-C-AB
KH6BZF 1,948,089-2717-239-C
KH6ND 1,920,702-2303-278-C
WH6ALV 77,430- 445- 58-B
KH6IJ 5760- 64- 30-C
KA6MQY/KH6
1053- 27- 13-B
W7PSO/KH6
13,098- 118- 37-B-10
KH6BV 3180- 53- 20-B
KH6B 390- 13- 10-B
KH6CP 58,650- 230- 85-A-QRP

VK4VU 1,416,564-2166-218-B-AB
VK6IH 116,886- 322-121-C
VK4AJ 79,050- 527- 50-B
VK6NE 42,282- 243- 58-C
VK2AYD 16,848- 104- 54-B
VK8BE 3087- 49- 21-B-20
VK2NHV 52,773- 359- 49-B-10
VK5PS 48,618- 438- 37-B
VK6AJW 26,187- 203- 43-B

YB2SV 142,140- 460-103-B-AB
YB2NL 47,160- 262- 60-B

ZL2AH 1,193,985-2535-157-C-AB
ZL1AXB 152,640- 960- 53-B-20
ZL1AAS 64,107- 419- 51-C-10

South America

CE3TK 36,036- 308- 39-B-15

CEØAE 4224- 44- 32-B-AB

CP6EL 326,928-1946- 56-C-10

W6KBD/CX 1071- 21- 17-B-AB
CX7BY 247,296-1472- 56-B-10
KA6ISE/CX 80,028- 484- 54-B

HK3YH 74,304- 288- 86-B-AB

LU1TAB 115,440- 740- 52-B-10
LU2KAK 92,820- 595- 5-C
LU8ECD 14,472- 134- 36-B

OA8CP 112,254- 353-106-B-AB
OA4AWD 82,998- 522- 53-B-40
OA8V 287,712- 666-144-A-QRP

W1BIH/PJ2 308,112-1834- 56-C-10

PP2ZDD 825,903-1629-169-C-AB
PT7RNP 798,021-1673-159-C
PY1NEZ 320,463-1079- 99-C
PS7KM 195,780- 502-130-B
PY6AAZ 99,960- 680- 49-C
PY5VM 71,874- 363- 66-C
PY8ZLC 3060- 34- 30-C
PY5XFR 720- 20- 12-B-80
PT7WA 12,543- 113- 37-C-40
ZZ5EG 425,865-2581- 55-C-10

YV4BOU/2
131,835- 799- 55-B-20
YV2AS 10,509- 113- 31-B-15

ZP5PT 5850- 78- 25-C-80

9Y4VU 305,256-1817- 56-B-10

DX - PHONE

Multioperator Single Transmitter

Africa

CN8AN(+CN8CO)
819,501-1579-173-B

EL9A(+EL9C)
2,694,435-3415-263-C

ZS6TPB(ZS6s APS,APT,BPJ, BRV,BRX,BRY,BSI,WN,oprs)
132,849- 509- 87-C

Asia

JA2YKA(JG1GIF,JJ1BTA,JE2s RQT,TEM,JH2QXG,JR2GMC, JA4UDP,JH4VBQ,JA9NFO, oprs) 1,701,000-2700-210-C
JA1ZLO(JG1s ILF,IMM,JI1s ACI,QQI,JH2CKX,JH4PJI, oprs) 1,028,664-1884-182-C
JA8YXI(JA8s CEU,ERG,JCR, OYC,oprs) 30,276- 174- 58-C

UK7PAL(UL7s PAE,PBY,PCZ, oprs) 361,845- 435-129-B

UKØQAA(UAØs QBB,QCA, oprs) 1,124,388-2154-174-B

4X6AW(+WA1QGC)
16,317- 147- 37-B

Europe

CT2ARA,(CT2s AK,AO,AX, BV,CE,CJ,CM,CR,DA,DF, DI,DL,DR,oprs)
3,470,844-4684-247-C

DLØDW(DJ3JZ,DL1YD, DL3AO,DL6KB,oprs)
2,369,622-3691-214-C
DFØML(DL1FAB,DL5FL,oprs)
471,192-1354-116-C
DK7ZT(+DG7ZA)
233,508- 638-122-C

F3TV(F6s ARC,BEE,F9IE,oprs)
3,218,304-4624-232-C
F2AU(F6s CTT,DTE,oprs)
2,581,215-3965-217-C
F6KAW(F6s BDN,BPX,GDK, GWV,oprs)
1,583,289-2679-197-B

G4KPE(+N8ET)
1,495,728-2642-188-B

GM2IA(G3s HDT,KMR,YOG, GM2IA,GM3JNW,GM4HKH, GM8s BDX,IIO,YIK,YPI,oprs)
527,868-1419-124-B
GM4DMZ(GM3WOJ,GM4s COX, CXM,JGS,GM8DMZ,oprs)
329,616-1962- 56-C

GW4BRS(GW4s BVJ,DZE,JOG, LFV,GW6AQU,GW8KHQ,oprs)
982,977-2087-157-C
GW4IQA(+GW4JBQ)
75,999- 539- 47-C

HG6V(6 oprs)
2,121,804-3467-204-C
HG1W(6 oprs)
1,997,757-3217-207-B
HA5KKC/7(6 oprs)
1,590,336-3012-176-B
HG5A(8 oprs)
1,108,905-2065-179-C
HA6KNB(6 oprs)
869,715-1757-165-B
HAØKLE(6 oprs)
757,344-1568-161-C
HA1KZZ(6 oprs)
539,232-1312-137-C
HA4KYH(HA4s XX,YK,YL,YO, YQ,oprs) 535,296-1312-136-B
HA5KFN(6 oprs)
332,145- 915-121-B
HA2KRZ(6 oprs)
294,264- 804-122-B
HA8KAZ(3 oprs)
93,450- 350- 89-B
HA5KDB(2 oprs)
89,640- 332- 90-B
HA1KSA(6 oprs)
57,672- 267- 72-C
HA3KNA(HA3s NS,NU,oprs)
53,820- 276- 65-B
HA2KMR(3 oprs)
37,632- 196- 64-C
HA7KPL/2 3402- 54- 21-B

HB9AAA(HB9s AKQ,AMK,AOO, AWW,BEI,oprs)
1,833,162-2803-218-C
HB9AUS(+HE9s ASD,EEX, HWS,HB9NH)
1,239,249-2209-187-C
HB9BLQ(+HB9AGC)
395,595- 885-149-C

IRØWOX(IØs HRI,JBL,WOX, WX,ZXB,oprs)
3,245,586-4787-226-C
I3ON(I3s FIY,MAU,IN3DYG, oprs) 3,072,264-4472-229-C

LA5X(LA1EE,LA3s LJ,RT, LA6VM,LA7XK,LA9s OL,ZO, oprs) 385,362- 813-158-C
LA1H(LA1LO,LA2s RY,TAA, LA5NM,LA9AU,oprs)
264,252- 722-122-C

LZ1KDP(LZ1s GC,ZF,oprs)
1,118,910-1963-190-C
LZ2KKZ(2 oprs)
5046- 58- 29-C

OH8MA(+OH8s MV,PF)
904,728-2024-149-C
OH3AA(OH3s KS,TQ,WS,oprs)
151,728- 464-109-C
OH6AH(OH6s OH,EI,FP,oprs)
67,284- 267- 84-C

OK1KTW(OK1s AAE,DKA,MSN, oprs) 114,291- 459- 83-C
OK3VSZ(OK3s FON,ZAF,oprs)
108,927- 399- 91-C
OK2KYC(Multiop)
11,880- 110- 36-B
OK1KYS(OK1s DEY,FRF,oprs)
4464- 48- 31-C

ON6BR(ON5VA,ON6s JA,JN,OU, ON7s HW,PY,ON8OF,oprs)
609,930-1255-162-B

PAØGN(PA2AWU,PAØs ERA, GIN,oprs)
1,251,369-2207-189-B

SK4NI(SM4s APZ,DVF,MI, SM6s CJK,CVT,EDI,SM7DLZ, SMØGMZ,G4JVG,oprs)
1,647,345-2705-203-C
SM5GMG(+SMØGNU)
1,306,323-2517-173-C
SL2ZZU(SM2s CEW,EJE,EKM, EUO,GET,GXN,oprs)
952,020-1935-164-C
SM6CAW(+SM6DHU)
547,992-1052-172-C

SP7KTE(SP7s AW,IFM,IIT,oprs)
141,864- 514- 92-B
SP9PRO(3 oprs)
18,048- 128- 47-C

UK6LAZ(UA6LHK+2 oprs)
136,275-395-115-B
UK3DBV(UA3DFO+2 others)
89,112- 376- 79-B

UK5IBB(UB5s IJK,ILD,IMH, IOK,IPP,oprs)
1,232,472-2308-178-B
UK5MAF(RB5MUV,UB5s MNM, MNX,UY5LK,oprs)
288,774- 789-122-B
UK5JCI(3 oprs)
41,958- 333- 42-B
UK5IAI(3 oprs)
20,418- 166- 41-B

UK2WAR(3 oprs)
26,334- 209- 42-B
UK2AAF(3 oprs)
2295- 45- 17-B

UK2BAS(UP2BIG+1 op)
561,150-1450-129-B
UK2BBB(UP2s BIL,VJ,oprs)
467,364- 986-158-B
UK2BBK(2 oprs)
86,742- 366- 79-B
UK2BCR(2 oprs)
44,286- 242- 61-B

UK2GAZ(RQ2GGI+2 oprs)
281,688- 968- 97-B
UK2RDX(UR2RRJ+2 ops)
592,884-1532-129-B
UK2RAW(Multiop)
66,120- 551- 40-B

YO4KRF(2 oprs)
17,136- 112- 51-B

YU4FRS(Multiop)
2,503,515-3955-211-C

Y31ZA(Y31s OA,PA,oprs)
649,509-1379-157-C

North America

FMØFOL(W6s KG,QL,oprs)
2,769,228-3564-259-B
HP1XRK(+HP1s XAT,XAW,XUL, HP2XSG,K2UL,K7SFN)
5,790,609-6499-297-C

NP4A(+KP4s CC,ES,O,N4TO)
7,376,616-7384-333-C

K2GBH/KV4(+W4JVN,WA2KCL, WD4OCI)
3,372,291-4551-247-B

K9MK/VP2A(+K9LA,KN5N, N6YK'WB9TIY)
6,718,896-7248-309-C

VP2E(AA4GA,ADØJ,K8ND, WB6SHO,WB8VPA,oprs)
9,685,170-9873-330-C

VP5TDX(N8RK,WB8BTH,oprs)
4,923,780-5990-274-B

ZF2EX(K4LTA,KR4C,NC4U, ND4U,W4MDX,WA4CDH,oprs)
3,837,360-5420-236-C

Oceania

ZL3BK(+ZL3GI)
989,565-1783-185-C

South America

W4PRO/CEØ(+WA1SQB,W4GSM)
2,253,846-3647-206-C

DX - PHONE

Multioperator Multi-Transmitter

Africa

EA9IE(+EC9AM,EA9IH)
86,838- 353- 82-C

Asia

JA7YAA(JA7NRQ,JA8FTW, JE1SRK,JG1UJD,JH7s AEF, CUO,GFO,GPW,LIS,MYE, RVD,UIN,WHM,WTC,JH8BME, JP7s OMD,SEI,UVL,oprs)
1,861,860-2860-217-C
JF1ZRQ(JA1PXF,JF1CYU, JG1GGU,JH1CNT,JI1PYO, JR1RNC,oprs)
1,481,436-2494-198-B
JA3YKC(JA2VUP,JA3ODC, JE3s BLA,MAS,JF3s PMM, SFP,JH3VOT,JR3FRR, JA5TDH,oprs)
1,368,756-2316-197-C
JA9YAV(+JA9s KUG,SOI, IMB,VWC,VXM,JH9s CJV, CQX,oprs)
111,627- 471- 79-C
JA6YAI(JE6CIV,JR6s EZE, GAG,IZV,oprs)
92,736- 336- 92-B
JG1ZBT(2 oprs)
21,942- 159- 46-B

Europe

G4ANT(G3s CWI,JOE,LDI, MPN,NKQ,VZT,XLL,ZAY,G4s BAV,BTY,GVW,G5s BBX, CSU,oprs)

N2BVJ/LX(+DA1BM,DA2s BH, CK,LX1PD)260,010- 810-107-B

W/VE - CW

Single Operator

1

Connecticut

K1VTM(K1JX,opr)	1,832,436-2166-282-C-AB
N5AW/1	698,100- 895-260-B
K1BV	445,326- 922-161-C
WA1CCR	399,009- 787-169-C
W1KKF	360,864- 716-168-C
K1CO	347,277- 719-161-C
K1VDF	247,809- 731-113-C
W1XK	232,521- 433-179-B
AK1B	228,780- 620-123-B
K1WJ	200,415- 431-155-C
AB1U	161,280- 384-140-C
K1EBY	130,032- 344-126-C
KA1DS	125,001- 323-129-C
W1CNU	118,047- 361-109-B
KA1FIC	108,459- 309-117-B
N1JW	69,750- 310- 75-B
W1OIT	59,892- 217- 92-C
W1VH	57,354- 242- 79-C
W1AB	56,100- 170-110-C
K1DD	42,174- 198- 71-B
WB1CRI	15,552- 96- 54-B
W1HUE	13,104- 84- 52-B
WB1FVO	10,944- 96- 38-B
KA1BMB	4452- 53- 28-B
W1BBJ	2886- 37- 26-B
W1XX	108- 6- 6-B-160
W1ZM(K1ZM,opr)	49,842- 234- 71-C-80
W1NG	30,504- 164- 62-C
W1BWS	1650- 25- 22-C
W1EWD	1458- 27- 18-B
W1PV	12- 2- 2-C
K1WB	21,033- 171- 41-C-40
K1EFI	74,370- 335- 74-B-20
K1RM	306,000-1200- 85-C-15
K1EM	155,250- 750- 69-C-10
WA1FCN	91,392- 544- 56-B
WA1TRY	7854- 154- 17-B
K1CE	2280- 38- 20-C
KA1CZF/N	1224- 24- 17-A-QRP

Eastern Massachusetts

K1AR	1,717,455-1877-305-C-AB
K1DG	1,310,214-1571-278-C
W1IHN	989,898-1274-259-C
W1FJ	794,577-1099-241-C
W1DA	732,690-1163-210-C
W1WLW	433,008- 744-194-C
KA1CEI	152,334- 403-126-B
W1FM	131,733- 369-119-B
N1QY	130,476- 332-131-B
WB1DFV	105,396- 341-103-C
K1MEM	90,375- 241-125-C
AD1Z	74,580- 220-113-C
W1ZK	40,395- 247- 95-C
WA1KSF	59,904- 208- 96-C
N1ABX	35,154- 186- 63-B
KA1CLV	35,040- 146- 80-B
WA1YVT	21,546- 114- 63-C
W1OPJ	6231- 67- 31-B
W1PLJ	1824- 32- 19-C
W1BB	18- 3- 2-B-160
K1MC	3402- 42- 27-B-20
WB1CNM	71,001- 483- 49-C-15
KB1Q	70,227- 459- 51-B
W1BET	507- 13- 13-B
W1CM	1344- 28- 16-C-10
K1KSY	18,327- 149- 41-A-QRP

Maine

N1AC	1,029,882-1519-226-C-AB
WB1GLH	107,604- 366- 98-B
W1JD	30,351- 151- 67-C
W1GX	24,480- 136- 60-B
KB1U	17,490- 106- 55-C
K1PQS	12,672- 96- 44-B
WB1EIL	8514- 66- 43-B
K1UO	31,995- 237- 45-C-40
WA1PHY	36- 4- 3-C-20
K1MNR	17,028- 129- 44-A-QRP

New Hampshire

K1GQ	1,273,776-1561-272-C-AB
W2IQD	317,538- 767-138-C
W1END	184,950- 450-137-B
W1JSM	54,180- 215- 84-C
K1NH	24,000- 125- 64-C
W1UN	4785- 55- 29-C

Rhode Island

W1GL	822,447-1101-249-C-AB
W1RFG	20,130- 122- 55-B
K1VSJ	4350- 50- 29-C
WB7NRE	2016- 32- 21-C
K1JA	20,670- 130- 53-C-80

Vermont

K2LE/1	1,162,593-1389-279-C-AB
W1KQ	11,610- 129- 30-C-10

Western Massachusetts

K1BW	1,814,127-2009-301-C-AB
K1ST	797,280-1208-220-C
W2TA/1	755,055- 987-255-C
W1GG	620,568-1014-204-C
WB1HIH	288,684- 594-162-C
KA1T	133,464- 332-134-B
WA3OFR	64,512- 224- 96-B
K1VHS	5550- 50- 37-C-80
K1RQ	161,028- 852- 63-C-15

2

Eastern New York

W2PV(N2NT,opr)	2,007,936-2016-332-C-AB
W2YV	1,246,200-1550-268-C
W2IB	1,215,024-1489-272-C
KF2O	367,227- 603-203-C
WA2LJM	96,552- 298-108-C
W2AWF	83,916- 259-108-C
W2DW	63,558- 198-107-C
N2CAP	39,474- 153- 86-B
K2MN	6498- 57- 38-B
N2BJB	1425- 25- 19-B
K2EK	122,904- 569- 72-C-40
W2CRS	13,803- 107- 43-B
W2AO	177,021- 663- 89-C-20
W2KHQ	21,267- 139- 51-B
KB2CR	144- 8- 6-C-15
AG2X	60,207- 427- 47-C-10
WB2THN	33,228- 213- 52-C
W2PTF	7080- 59- 40-A-QRP

New York City - L.I.

K2PE	851,643-1131-251-C-AB
N2GC	545,664- 784-232-B
K2MFY	439,587- 729-201-B
N2UN	362,880- 630-192-C
W2GKZ	145,248- 356-136-C
W2LPA	136,539- 389-117-B
WA2EYW	125,370- 398-105-B
W2MT	97,968- 314-104-B
K2SX	96,696- 237-136-C
N2KA	87,648- 332- 88-C
WA2ISH	83,448- 244-114-C
W2AFM	62,073- 209- 99-B
WB2QEU	32,160- 134- 80-B
KA2CIW	21,645- 111- 65-B
K2QD	20,160- 120- 56-C
W2III	8160- 68- 40-B
K2CNF	6612- 58- 38-B
KA2HTH	6600- 55- 40-B
W2GFF	5478- 83- 22-B
KG2A	5400- 45- 40-C
W2SGK	3441- 37- 31-C
W2ER	24,840- 138- 60-C-80
WA2SQY	4698- 54- 29-B-40
N2DT	125,244- 588- 71-C-20
K2OB	56,925- 275- 69-C
W2CZZ	27- 3- 3-B-15
W2NBI	12- 2- 2-C
W2AYJ	82,008- 402- 68-C-10
WB2AMU	38,775- 235- 55-B
KA2AEV	37,350- 249- 50-B
KA2DFO	10,692- 108- 33-B
K2CMV	6216- 74- 28-B
WB2ENW	22,110- 134- 55-A-QRP

Northern New Jersey

N2LT	1,669,221-1899-293-C-AB
W2RQ	1,448,172-1908-253-C
AE2A	1,333,284-1622-274-C
K2DM	1,128,930-1555-242-C
N7TT/2	1,024,560-1423-240-C
W2VJN	976,374-1134-287-C
K2NJ	840,315-1057-265-C
W2GD	710,700-1030-230-C
N2IC	657,639-1059-207-C
K2PH	334,368- 648-172-B
KD2G	209,979- 693-101-C
W2NJ	187,920- 432-145-B
W1GD	154,440- 330-156-C
W2ZZ	153,510- 430-119-B
W2HUG	84,870- 246-115-B
W2HN	59,592- 191-104-C
K2BLA	57,684- 253- 76-B
N2IN	6003- 69- 29-B
WA2PQU	4275- 57- 25-C
WB2OHV	2760- 40- 23-B
WA2IFS	7992- 72- 37-C-40
KJ2N	5046- 58- 29-B
W2WD	76,893- 361- 71-C-15
W2UL	147- 70- 7-C
K2TW	94,920- 452- 70-C-10
AF2L	36,000- 250- 48-C
N2AA	444,960- 720-206-A-QRP
KA2EYH	7680- 80- 32-A
K2RF	1311- 23- 19-A

Southern New Jersey

W2YC	726,408-1062-228-C-AB
N2CQ	450,870- 791-190-B
K2BU	386,460- 678-190-C
N2MR	378,480- 664-190-C
N3RG/2	289,083- 557-173-C
AB2E	280-575- 725-129-C
WB2YOF	273,546- 546-167-C
W2REH	260,928- 576-151-C
WB2BYU	233,895- 503-155-B
K2QIL	225,288- 504-149-C
K2FL	207,480- 455-152-C
K2TO	161,130- 410-131-C
W2EA	155,295- 357-145-B
WA2DPU	142,485- 413-115-C
W2PAU	119,574- 273-146-C
K2JF	106,029- 297-119-B
K2HPV	103,896- 333-104-B
K3JGJ	32,760- 156- 70-B
W2BLV	27,090- 129- 70-B
WA2NPD	23,700- 158- 50-C
KA2BEW	21,576- 124- 58-B
K2OSV	21,060- 130- 54-C
W2GTN	15,582- 106- 49-B
N2AWC	1914- 29- 22-B
WA2NBM	12,000- 100- 40-B-20
AF2G	1440- 24- 20-C
N2IT	62,640- 348- 60-B-10
W2FGY	48- 4- 4-C

Western New York

W2TZ	644,170-1090-197-B-AB
W2FTY	259,518- 518-167-B
K2SPO	136,890- 351-130-C
W2ABM	102,648- 329-104-C
WA2EYA	88,992- 288-103-C
W2FUI	81,810- 303- 90-B
W2PHT	59,700- 199-100-B
WA2ORX	42,228- 207- 68-C
KA2HIQ	30,096- 209- 48-B
KA2CGV	18,810- 114- 55-B
AK2O	11,856- 76- 52-B
WA2AAZ(WB2AUW,opr)	8664- 76- 38-B
KA2CDJ	3376- 39- 28-B
N2FI	816- 17- 15-B
N2ALK	2625- 35- 25-B-40
WA2RLQ	9849- 67- 49-C-20
N2PP	169,632- 744- 76-B-15
N2CU	133,560- 636- 70-C
W2HPF	93,372- 502- 62-C
W2SEC	42,126- 238- 59-C
K2UAN	1728- 32- 18-B
WA2ABN	25,245- 187- 45-B-10
KB2SG	11,700- 100- 39-B
WA2ICY	81,702- 267-102-A-QRP

3

Delaware

K3HBP	213,852- 502-142-C-AB
W3GL	192,168- 408-157-C
K3JL	14,136- 124- 38-B-10

Eastern Pennsylvania

N3BB	1,550,640-1846-280-C-AB
K3PA	1,210,818-1778-227-C
W3AP	1,003,314-1354-247-C
K3FN	742,995-1045-237-C
W3GU	429,300- 675-212-C
K3CY	369,402- 638-193-C
W3ARK	349,641- 733-159-B
N3AW	341,061- 763-149-C
N3HW	332,910- 810-137-C
K4JLD/3	283,140- 605-156-C
W3EVW	264,696- 538-164-C
W3KV	253,038- 466-181-C
W3GK	240,039- 537-149-C
K3IE	172,458- 402-143-C
WA3SZV	151,578- 401-126-C
K3ZUF	150,510- 290-173-C
AA3B	150,192- 336-149-C
W3KFQ	135,420- 305-148-C
N3BBG	92,391- 299-103-B
W3GRS	77,004- 186-138-C
N3VV	61,380- 220- 93-C
W3EAN	56,643- 239- 79-C
WA3IMY	54,273- 229- 79-C
K3TX	51,678- 198- 87-B
KA3BKY	43,521- 163- 89-B
K3NL	42,039- 173- 81-C
WB3JYY	24,282- 142- 57-B
W3FPO	22,320- 120- 62-C
W3MA	14,022- 82- 57-C
W3HYJ	13,860- 110- 42-C
WB3JZE	13,674- 86- 53-B
W3EHZ	12,636- 81- 52-B
W3HMR	7134- 58- 41-C
W3CEI	5208- 56- 31-B
K3EUH	5040- 60- 28-B-20
WB3CAC	1173- 23- 17-B
WB3KIL	672- 16- 14-B
WA3JXW	11,988- 108- 37-B-15
KA3BTG	2673- 33- 27-C
N3KZ(WA2SFB,opr)	116,388- 636- 61-C-10
WB3DCT	75,348- 364- 69-C
W3PC	13,800- 100- 46-C
WA3NHO	48- 8- 2-C

Maryland - D.C.

K3SA	701,568-1008-232-C-AB
W3UJ	580,788- 884-219-C
K3HPG	472,680- 780-202-C
K3TC	421,590- 611-230-C
N3AM	351,075- 755-155-C
W3AZ	288,192- 608-158-C
WA3NQJ	256,530- 503-170-B
W3ZZ	94,695- 295-107-C
W3ICM	48,384- 168- 96-C
K3NCO	28,638- 129- 74-B
W3HVM	25,935- 133- 65-C
K3DQ	17,934- 122- 49-B
W3YOZ	14,100- 94- 50-C
W3EE	13,338- 78- 57-B
W3FQE	7875- 75- 35-C
W3TUX	4455- 55- 27-B
AG3S	270- 10- 9-B
K3TW	163,155- 745- 73-C-10
K3KMO	1836- 36- 17-B
KA9X	300- 10- 10-B
W3EWL	259,017- 517-167-A-QRP
K3WS	131,271- 329-133-A

Western Pennsylvania

K3LR	1,556,415-1701-305-C-AB
K3MD	775,290-1202-215-C
W3HDH	306,900- 620-165-C
AI3E	250,344- 488-171-C
AG3H	89,784- 258-116-B
WA3MDY	47,304- 219- 72-B
KA3FMH	28,182- 154- 61-B
W3DKL	15,912- 104- 51-C
W3IW	10,578- 82- 43-C
WA3FAL	9990- 90- 37-C
K3UA	3744- 52- 24-C-15
KA3BQE	1674- 31- 18-A-QRP

4

Alabama

N4KG	593,664- 773-256-C-AB
KR4F	185,955- 385-161-C
WD4PZN	66,231- 223- 99-B
K4BWU	1950- 26- 25-C
K4ZGB	56,880- 316- 60-C-15
K4MG	23,214- 146- 53-C-10

Georgia

K4BAI	809,172-1092-247-C-AB
N4HI	538,740- 820-219-B
N4VZ	457,215- 815-187-C
N4TZ	133,152- 304-146-C
K4GFH	75,240- 264- 95-C
K4BAM	58,710- 206- 95-B
W4GBU	11,655- 111- 35-C
N4PN	918- 18- 17-B-160
W8ZF/4	40,572- 196- 69-C-80
W4DXI	31,140- 173- 60-C-15

Kentucky

WB4PRU	528,612- 899-196-C-AB
N1GL/4	447,432- 724-206-C
WA4QMQ	112,572- 318-118-C
K4AVX	14,766- 107- 46-B
K4FU	37,701- 213- 59-C-40
KA4JMZ	19,890- 130- 51-B-15
KA4MFE	25,578- 203- 41-B-10

North Carolina

N4AA	830,655-1465-189-C-AB
AA4NC	496,203- 857-193-C
WB5YMS/4	217,305- 439-165-B
AA4S	125,367- 319-131-C
N4MO	109,305- 347-105-C
AA4NN	66,264- 251- 88-C
W6NWS/4	35,292- 173- 68-B
N4BLV	17,467- 113- 53-C
W4DGJ	11,280- 80- 47-C
WA4ZXA	3870- 43- 30-C
W4ZZ	351- 13- 9-B
K4UWH	153,576- 648- 79-C-10
K4JO	6699- 77- 29-A-QRP

Northern Florida

NE4F	137,472- 358-128-C-AB
W2AW/4	131,052- 326-134-B
W4WKQ	103,683- 323-107-C
N4BAA	33,048- 153- 72-C
W4VQ	36,456- 217- 56-C-40
WA4SVO	32,175- 195- 55-C
W4WHK	52,182- 223- 78-B-15
N4WW	239,850-1025- 78-C-10
W4IIR	5742- 58- 33-B
KA4KID	1404- 26- 18-B

South Carolina

K4WJT	303,537- 559-181-C-AB
AE4Y	291,276- 522-186-C
K0EJ/4	140,850- 313-150-B
WA4TNI	4488- 44- 34-B
AA4V	13,113- 93- 47-C-80

Southern Florida

W4BV	245,952- 448-183-C-AB
WD4AHZ	190,260- 420-151-B
W4YN	69,300- 210-110-C
K4JRF	67,689- 207-109-C
W4KO	67,362- 218-103-C
N4DMI	10,863- 71- 51-C
N4AZS	7410- 65- 38-B
K4KUZ	1944- 27- 24-C
N4IN	2139- 31- 23-B-160
WB4OSN	765- 17- 15-B
N4AW	34,692- 196- 59-C-40
W2SDB/4	360- 12- 10-B-15
WB4TDH	154,770- 670- 77-C-10
W1YG	130,356- 612- 71-B
WA4OML	43,740- 270- 54-C
N4BP	22,275- 165- 45-A-QRP

Tennessee

K4XU	829,470-1286-215-C-AB
AB4H	616,896- 952-216-C
K4AMC	533,007-1039-171-C
N4IR	238,941- 573-139-C
AA4KT	120,888- 292-138-B
WB4EBX	77,361- 241-107-B
KA4RJC	73,440- 240-102-B
W4OGG	33,930- 130- 87-B
N4OI	32,760- 168- 65-C
WD4SIG	29,070- 170- 57-B
AA4AK	3999- 43- 31-C-80
W4JD	109,503- 529- 69-C-15
N4ZZ	246,636-1054- 78-C-10
W4IV	41,790- 199- 70-A-QRP

Virginia

N4RV(N3TR,opr)	1,139,985-1551-245-C-AB
N4DW	921,000-1228-250-C
N4UA	877,656-1261-232-C
N4EA	720,360- 920-261-C
W3YY	424,530- 795-178-C
W4YE	323,565- 583-185-C
N4ND	251,079- 659-127-C
W4RW	197,127- 441-149-C
N4MM	139,302- 327-142-C
NI4R	121,095- 351-115-C
K4GKD	112,800- 400- 94-C
WD4GCE	90,630- 285-106-B
WB4ZPF	36,729- 159- 77-B
W4GF	29,250- 150- 65-C
W4KMS	27,378- 117- 78-C
KG4F	25,230- 145- 58-B
K4OD	17,574- 101- 58-C
KG4W	15,840- 110- 48-C-80
W4UQ	6270- 55- 38-C
W4MYA	46,827- 363- 43-C-20
W4KFC	44,560- 220- 66-C
K7SV/4	247,860- 918- 90-C-15
AA4M	176,640- 736- 80-C
K4OAQ	151,305- 655- 77-C
W4RX	243,486-1002- 81-C-10
K4CTY	57,288- 341- 56-C

5

Arkansas

WA5SOG	172,620- 411-140-C-AB
K9VGB	64,512- 224- 96-B
W5RUH	45,360- 180- 84-B
K5UR	34,953- 191- 61-C-80
W5EIJ	3441- 37- 31-C-10

Louisiana

W5ZR	497,904-1012-164-C-AB
WA5IGD	259,992- 552-157-C
K5EOA	228,195- 461-165-C
K5KLA	103,824- 309-112-C
W5OB	79,920- 240-111-C
W5HEZ	71,583- 223-107-C
WB5ZRD	17,100- 114- 50-C
KA3BER/5	10,920- 91- 40-B
W5WMU	132,066- 667- 66-C-40
K5KU	243,600-1015- 80-C-15

Mississippi

WA5OYU	88,200- 280-105-C-AB

New Mexico

AA5B	217,764- 526-138-B-AB
W5YZ	10,440- 120- 29-C-80
W5TVX	14,310- 159- 30-B-15

Northern Texas

K5NW	843,822-1086-259-C-AB
N5AU	833,907-1193-233-C
W5FO	805,920-1168-230-C
K5MR	692,475-1319-175-C
AF5K	525,816- 804-218-C
KA5Q	348,102- 699-166-C
KM5X	295,680- 704-140-C
KA5W	285,570- 570-167-C
K5LP	262,656- 608-144-C
K5FUV	253,575- 575-147-C
W5LSF	231,192- 494-156-C
K5AQ	217,566- 474-153-C
KE5C	208,917- 501-139-B
K5HM	105,987- 343-103-C
W5RKT	94,176- 327- 96-C
W5QF	54,648- 198- 92-B
K2SCU/5	47,808- 192- 83-C
KA5DYB	17,712- 123- 48-B
W5UPV	14,742- 117- 42-C
W5ONL	11,799- 69- 57-C
N5FW	4551- 41- 37-B
W5UN	164,010- 710- 77-C-40
N5UD	10,878- 98- 37-C
K9MK/5	9126- 78- 39-B
K5LC	6966- 86- 27-C-20
K5QY	4248- 59- 24-C
N5CR	208,086- 878- 79-C-15
N5EG	276- 23- 4-C
W5MYA	144,342- 729- 66-C-10
K8TD/5	18- 3- 2-B

Oklahoma

KM5H	367,728- 752-163-C-AB
N5GE	245,388- 572-143-C
W5AS	2376- 44- 18-C
KK5I	5115- 55- 31-B-40
K5WE	336- 14- 8-C-20

Southern Texas

KN5H	649,005- 883-245-C-AB
N5BA	366,078- 629-194-C
W5DV	336,600- 600-187-C
K5DB	279,000- 620-150-C
K3ZMI/5	150,144- 368-136-B
W5ASP	110,592- 384- 96-B
K5DX	91,881- 249-123-C
WB5UWF	83,517- 287- 97-C
W5PF	58,788- 142-138-B
W5KCR	58,695- 215- 91-C
N5HB	50,301- 207- 81-B
W5ODD	26,796- 116- 77-C
W5YB	12,900- 100- 43-B
W5NR	6840- 76- 30-B
WB5BSB	3780- 45- 28-C
N5JJ	27,531- 161- 57-C-80
K5BZU	3969- 49- 27-C-40
K5IY(KA5CHW,opr)	345,396-1076-107-C-20
K5SF	162,240- 676- 80-C
W5NN(WB5WHR,opr)	147,168- 672- 73-C
W5UW(WD5ABR,opr)	140,685- 565- 83-C
K5WA	91,317- 499- 61-C-15
W5GO	61,938- 333- 62-C
K5RF	27,675- 205- 45-C-10

6

East Bay

K6HIH	390,720- 814-160-C-AB
K6ATV	168,732- 516-108-C
AD6D	129,654- 343-126-C
KS6H	94,962- 266-119-B
W6EYC	19,152- 114- 56-C
K6CSL	7326- 74- 33-B
K6VL	33,885- 251- 45-C-15
KS6Q	30- 10- 1-B-10

Los Angeles

N6AA	438,600- 850-172-C-AB
N2YQ	374,178- 826-151-C
N6AR	157,080- 374-140-C
WB6ZHT	111,696- 358-104-C
W6PYV	66,150- 245- 90-C
KA6FZN	39,216- 172- 76-C
W6MFC	30,150- 150- 67-C
K5DY/6	16,104- 122- 44-B
KK6P	13,560- 113- 40-B
N6DWW	714- 34- 7-C
K6SE	576- 32- 6-B-160
WA6TLA	1554- 37- 14-C-80
N6IC	405- 27- 5-C
W6AM(N6TJ,opr)	125,775- 645- 65-C-40
N6DHV	89,670- 490- 61-C-10
W6YQ	24,360- 203- 40-C
W6GGV(WB6PKA,opr)	61,596- 348- 59-A-QRP

Orange

WD6EWG	69,402- 269- 86-B-AB
K6GLF	9585- 71- 45-B
AA6DC	8424- 117- 24-C
N6DFY	81,588- 523- 52-C-10
WA6NGO	37,515- 205- 61-C

Sacramento Valley

W6NKR	243,528- 556-146-C-AB
N6JV	218,088- 466-156-C
K6DR	139,620- 358-130-C
WA6TKT	94,536- 303-104-C
W6SX	52,200- 300- 58-C
K6KWN	43,560- 242- 60-C
KB0W	13,317- 193- 23-B
WA6BRV	2850- 50- 19-B
W6YMH	20,178- 177- 38-C-10
WA6POC	60,750- 270- 75-A-QRP

San Diego

K6NA	812,238-1162-233-C-AB
WA6EJL	106,353- 351-101-C
W6JVA	33,930- 174- 65-B
K6TQ	33,075- 147- 75-C
KT6V	31,806- 171- 62-C
WA6UFY	29,568- 176- 56-C
AA6EE	23,100- 154- 50-C
W6OVO	3888- 54- 24-C
W6ZT	18,816- 128- 49-C-15
WA6VNR	17,658- 218- 27-B-10
W6ABT	33,741- 163- 69-A-QRP

San Francisco

W6WB	175,122- 414-141-C-AB
N6OJ	67,335- 335- 67-C
AF6F	29,904- 178- 56-B
W6RQ	9699- 61- 53-B
K6FH	2691- 39- 23-B

San Joaquin Valley

N6GG	520,065- 889-195-C-AB
N6EA	325,260- 556-195-C
W6BYH	135,036- 341-132-C
W6MYP	15,369- 109- 47-C-20

Santa Barbara

W6OUL	195,294- 538-121-C-AB
W6SWM	84,357- 309- 91-C
N6HK	31,098- 142- 93-C
WB6TGD	3120- 65- 16-B
N6VR	2184- 56- 13-C-80

Santa Clara Valley

N6MG	566,676- 954-198-C-AB

N6AN 404,307- 807-167-C
K6ZBV 247,650- 635-130-C
W6SZN 209,547- 597-117-B
W6DU 155,232- 462-112-C
K6PU 130,661- 366-119-B
KC6D 117,312- 416- 94-B
N6RZ 106,125- 283-125-B
WA6GFY(K6CN,opr) 68,355- 217-105-C
N6UW 60,300- 268- 75-C
W6ISQ 49,446- 201- 82-C
AA6T 26,334- 154- 57-B
W6ERS 16,128- 128- 42-B
WA6OCV 4050- 500- 27-B
W6QDE 2484- 36- 23-C
KA6ING 1860- 31- 20-B
KA6FRY 858- 22- 13-C
AG6U 32,436- 204- 53-C-20
W6ATO 24,600- 164- 50-C
N6QW 80,889- 457- 59-C-15
N6NF 82,404- 252-109-A-QRP

7

Arizona

N7MW 258,720- 539-160-C-AB
N7BJX 131,985- 419-105-C
W2GGL/7 92,916- 267-116-C
W7ZMD 41,208- 202- 68-B
WA7NXL 3627- 39- 31-B
N7CW 4800- 64- 25-C-80
K6LL/7 278,880-1120- 83-C-15
W7IR 199,698- 802- 83-C-10
K7GM 179,478- 767- 78-C
W7AYY 25,560- 213- 40-C

Idaho

K7NHV 1,163,091-1693-229-C-AB
W6JXO/7 2820- 47- 20-B-20
K7FC 7332- 94- 26-A-QRP

Montana

W7JYW 287,859- 793-121-C-AB
KB7Q 79,278- 362- 73-B

Nevada

WA7CWM 173,438- 622- 93-C-AB
W7JKA 35,997- 169- 71-C
W9GIL/7 23,667- 161- 49-B
AK7G 129,792- 676- 64-C-15

Oregon

W7NI 995,304-1468-226-C-AB
W7CB 439,734- 883-166-C
W7YAQ 356,706- 798-149-B
W7CPK 343,872- 796-144-C
AD7T 48,848- 168- 87-B
W7TWL 44,427- 251- 59-B
W7LT 15,987- 73 73-B
W7LNE 8910- 90- 33-B
K7DBV 2166- 38- 19-B-20
W7EJ 150,336- 696- 72-C-10
W7XN 70,623- 413- 57-B

Utah

N7DF 1,078,020-1695-212-C-AB
W7KQZ 24,948- 198- 42-B-10

Washington

W6RR 994,728-1528-217-C-AB
K7LAY 248,292- 627-132-C
K7UO 126,540- 444- 95-C
KG5W/7 98,175- 425- 77-C
W7III 75,027- 281- 89-C
K7NW 67,032- 266- 84-C
W7BUN 36,900- 300- 41-C
AD7U 32,391- 177- 61-B
K7NF 22,950- 150- 51-C
W7IEU 9450- 75- 42-B
W7FRH 4455- 55- 27-B
N7FA 2580- 43- 20-C-80
K7WQD 396- 17- 11-C
K7UR 123,948- 626- 66-C-40
K7ZA 169,278- 634- 89-C-20
AG7M 168,948- 741- 76-C
K7OEW 105,534- 533- 66-C
W7KKR 3300- 50- 22-C
K7RI(W7WA,opr) 249,210-1170- 71-C-15
N7RO 3540- 59- 20-B
K7IIZ 1728- 48- 12-B
W7LUR 1188- 33- 12-B
N7AYF 61,254- 498- 41-C-10
KH7G 34,320- 286- 40-B
W7RYK 10,620- 118- 30-B
W7EKM 6540- 109- 20-C
KB7NV 1014- 26- 13-A-QRP

Wyoming

N7NG 969,900-1325-244-C-AB
W7TO 216- 12- 6-B-80

8

Michigan

WA8YVR 1,114,218-1554-239-C-AB
K8GL 942,240-1208-260-C
KB8EC 583,950-1145-170-C
K8LJG 198,915- 149-445-C
WA8RTP 105,096- 302-116-C
WB8WZT 31,236- 137- 76-B
K8PUI 27,141- 109- 83-C
WA8WMC 26,622- 153- 58-B
KA8IPL 26,316- 172- 51-B
N8BKO 26,226- 186- 47-B
K8MVZ 26,130- 134- 65-B
W8WVU 23,595- 121- 65-B
K8QWG 18,018- 143- 42-B
K8CV 9933- 77- 43-B
N8MK 5115- 55- 31-C
K8KM 1872- 39- 16-C
N8BIK 153- 17- 3-B
W8UVZ 2583- 41- 21-C-80
W8TA 339,810-1205- 94-C-20
W8TJQ 81,003- 403- 67-B-15
W8TWA 128,640- 670- 64-C-10
KA8IIN/N 510- 17- 10-B
W8VSK 65,736- 166-132-A-QRP
K8BX 8550- 57- 50-A
K8IF/8 4080- 40- 34-A
KA8DFJ 420- 14- 10-A

Ohio

K8NZ 665,334- 999-222-C-AB
K8MR 586,095- 953-205-C
K8US 463,404-1058-146-C
W8ELE 287,760- 545-176-C
N8BJQ 283,800- 550-172-C
W8GOC 207,036- 426-162-B
N8BC 156,087- 369-141-C
WA8TNO 139,356- 316-147-C
N8LM 139,122- 393-118-C
W8UPH 118,701- 363-109-C
W8ZCQ 113,760- 316-120-C
WD8POG 110,433- 281-131-B
K8JK 107,463- 317-113-C
W8YGR 83,331- 197-141-B
WD8MOV 79,170- 203-130-C
N8TN 77,658- 301- 86-C
W8NPF 76,962- 254-101-C
WD8KKF 62,748- 252- 83-C
W8DWP 56,055- 185-101-B
WD8ALG/M 55,146- 202- 91-B
WB8JEY 49,104- 186- 88-C
W8CAR 44,688- 196- 76-C
WD8ECA 43,659- 189- 77-B
K8GN 21,600- 120- 60-B
K8HV 5160- 43- 40-C
W8USM 4278- 46- 31-B
WB8RRR 4200- 56- 25-B
KC8E 1500- 25- 20-C
K8WW 12,000- 80- 50-C-80
W8LNO 4410- 42- 35-C
K8MN 50,886- 257- 66-C-40
KJ8I 12,051- 103- 39-C
WB8JBM(WB8LSN,opr) 129,990- 619- 70-C-20
K8KR 12,600- 105- 40-C
N8XE 6786- 78- 29-B
WB8JBM(WB8DQP,opr) 230,022- 983- 78-C-15
WD8AUB 168,012- 718- 78-B
WA8FCH 3042- 39- 26-B
W8WPC 225,504- 928- 81-C-10
WA8DXB 132,408- 613- 72-C
KD8O 42,840- 280- 51-B
KA8JZR 27,798- 226- 41-B
W8MH 6804- 84- 27-B
WB8NBA 168- 8- 7-B
AA8S 36,936- 152- 81-A-QRP
W8EAO 2886- 37- 26-A

West Virginia

K8OQL 189,567- 413-153-C-AB
KB8FJ 13,545- 105- 43-C
W8LRL 2664- 37- 24-B-160

9

Illinois

AI9J 1,062,234-1422-249-C-AB
K9BGL 764,736-1138-224-C
AF9C 414,864- 804-172-C
N9TI 357,678- 641-186-C
K9BG 339,570- 686-165-C
WD9DBC 233,100- 555-140-C
W9RW 228,957- 457-167-C
W9DWQ 211,500- 470-150-C
N9BWE 167,628- 458-122-B
WD9IIC 158,850- 706- 75-C
K9UQN 155,520- 432-120-C
K9JU 143,250- 382-125-C
W9NUD 124,872- 344-121-C
N9AEJ 117,018- 394- 99-B
W9AG 104,535- 303-115-C
WA9EYY 88,176- 334- 88-C
K9KA 87,969- 413- 71-C
W9HPG 83,160- 315- 88-C
WD9GGY 75,816- 243-104-B
AG9E 43,434- 254- 57-C
K9MDO 40,764- 158- 86-C
KA9ACS 34,056- 172- 66-C
W9TNZ 20,085- 103- 65-B
W9REC 19,899- 99- 67-B
KB9PY 16,059- 101- 53-B
AA9F 13,884- 89- 52-B
K9JIQ 312- 13- 8-B
K9KU 10,530- 78- 45-C-80
K9RF 91,287- 441- 69-C-40
WD9IIX 50,874- 278- 61-C
WA0AXH/9 5589- 69- 27-B-20
K9QVB 241,230- 946- 85-C-15
W9OFV 189,420- 770- 82-C
KA9IMZ 12- 2- 2-B
KA9INB 3- 1- 1-B
W9OA 175,689- 723- 81-C-10
W9VA 128,439- 603- 71-C
WD9EXD/9 21,912- 166- 44-B
N9UN 11,832- 116- 34-C
W9PNE 93,906- 282-111-A-QRP
W9JUV 26,535- 145- 61-A

Indiana

K9TUS 506,760- 824-205-C-AB
N9AR 63,438- 218- 97-C
WA9BAJ 62,037- 183-113-B
K9KB 24,186- 139- 58-C
W9LT 3600- 50- 24-C
K7NHK/9 324- 12- 9-B
W9FN 11,349- 97- 39-C-20
W9MOK(W4JKC,opr) 45,900- 300- 51-C-15

Wisconsin

W9OP 588,816-1128-174-C-AB
KE9A 354,930- 635-186-C
K9BN 324,000- 600-180-C
W9GXR 193,158- 511-126-C
W9NA 131,580- 430-102-C
K9GDF 33,078- 149- 74-C
W9HE 25,125- 125- 67-C
WB9HRO 17,784- 114- 52-B
W9RRT 13,653- 111- 41-B
W9YCV 3762- 38- 33-C
K9PQG 77,400- 344- 75-C-20
N9KS 5360- 120- 26-C-15
W9WAQ 69,480- 386- 60-B-10
KB9S 37,290- 226- 55-C
AG9G 2040- 40- 17-B

Ø

Colorado

KØRF(WØUA,opr) 1,762,713-1091-281-C-AB
KØZFL 188,784- 342-184-B
WDØABI 103,740- 380- 91-B
WBØCMM 750- 25- 10-B-160
KØZX 231,756- 868- 89-C-20
ACØS 87,606- 471- 62-C-15
NØBCN 49,765- 319- 52-B
KØUK 48,633- 559- 29-C
KAØCLS 14,157- 143- 33-B
WØZV 265,683-1067- 83-C-10
WØYK 219,564- 963- 76-C
AGØL 17,745- 169- 35-B
WØKEA 7236- 67- 36-A-QRP

Iowa

WØEJ 470,238- 866-181-C-AB
N4RR/Ø 320,292- 651-164-C
KFØH 251,256- 551-152-C
AKØM 121,605- 335-121-B
W9TW/Ø 114,756- 524- 73-B
NØBB 98,496- 304-108-B
WA2CNF/Ø 28,416- 148- 64-B
KFØZ 26,727- 151- 59-B
WØUZ 21,750- 125- 58-B
WØRU 12,900- 100- 43-C
WBØPYD 29,766- 242- 41-C-40
KCØQ 42,000- 250- 56-C-10

Kansas

WØIUB 273,504- 592-154-C-AB
WBØISW 76,140- 270- 94-C
W6FN 42,897- 181- 79-C
K9BLY/Ø 19,836- 87- 76-C
WØWPL 19,440- 120- 54-B
ABØX 4140- 46- 30-C-80

Minnesota

WØUC 426,862- 802-177-B-AB
WØYCR 318,903- 629-169-C
KØIHG 167,100- 557-100-B
KØTPF 156,195- 445-117-C
WØBF 93,021- 307-101-C
WØLP 54,432- 224- 81-C
WBØBJP 16,104- 88- 61-B
WØRXL 6510- 62- 35-C
KØKX 38,247- 209- 61-C-20
WØHW 72,159- 359- 67-C-15
NØBUI 24,030- 178- 45-C

Missouri

KBØRC 649,530-1031-210-C-AB
AGØU 465,918-1159-134-C
NØTT 464,163- 961-161-C
AGØA 153,893- 369-139-C
WØGAX 102,678- 314-109-C
KAØHOB 57,000- 200- 95-B
WØLEZ 14,280- 85- 56-B
KAØP 12,900- 86- 50-B
KØTLM 3645- 45- 27-B
NØDX 7872- 64- 41-C-80
KØCS 1296- 24- 18-C-40
KØRWL 7347- 79- 31-B-20
K9HF/Ø 16,383- 127- 43-B-15
WØPWH 957- 29- 11-C
WBØUXI 5940- 66- 30-C-10
WØVWW 2736- 38- 24-B

Nebraska

KØDI 97,128- 456- 71-C-AB
WB5QPH 7245- 69- 35-B

North Dakota

KØQQ 77,988- 268- 97-B-AB
WØLHS 32,292- 156- 69-B
KFØA 28,899- 169- 57-C
WDØBRL 17,640- 120- 49-B

South Dakota

WØRSP 53,040- 208- 85-A-QRP

VE

Maritimes - Newfoundland

VE1AIH 436,995- 747-195-C-AB
VO1KO 168,966- 447-126-B
VE1ANU 159,588- 286-186-C
VE1FW 119,328- 352-113-B
VE1BNN 78,960- 235-112-C
VO1CA 52,836- 238- 74-C
VE1AXI 14,784- 112- 44-B-80
VE1UG 19,380- 190- 34-C-40

Quebec

VE2AYU 537,810- 910-197-C-AB
VE2WA 289,980- 540-179-B
VE2DZE 11,400- 76- 50-C-80
VE2JR 26,634- 193- 46-C-10

Ontario

VE3IY 1,296,000-1500-288-C-AB
VE3GCE 289,962- 543-178-C
VE3DAP 229,500- 500-153-B
VE3J1P 29,403- 121- 81-B
VE3GWM 27,528- 148- 62-C
VE3MCL 24,570- 130- 63-C
VE3INQ 6- 2- 1-B-160
VE3CUI 576- 16- 12-C-80
VE3OZV 122,322- 551- 74-C-15
VE3MFT 84,042- 483- 58-C
VE3JTQ 42,612- 268- 53-B
VE3BMV 13,344- 139- 32-C-10
VE2AEJ/3 12,168- 78- 52-B
VE3KKB 112,125- 325-115-A-QRP

Manitoba

VE4ADV 141,588- 437-108-B-AB

Saskatchewan

VE5RA 535,590-1082-165-C-AB
VE5TT 29,046- 206- 47-B

Alberta

VE6MP 208,254- 569-122-B-AB

British Columbia

VE7BTV 381,744- 964-132-C-AB
VE7IN 104,400- 725- 48-C-15

W/VE - CW

Multioperator Single Transmitter

1

N1TZ(+KA1ERF,K1s FIR,IU,KNQ,SF,N1ACU,W1BR,WA1UZH) 2,229,120-2160-344-C-WM
K1XA(+AA2Z,W1OD) 1,884,333-1969-319-C-CT
W1OO(+K1SA,KB1U) 1,431,840-1570-304-C-ME
K1GW(+N1BBV,W1PH) 1,231,200-1520-270-C-NH
K1IK(+KA1BBY,N1RI,W1s IBQ,NHJ) 1,177,344-1533-256-C-VT
K1XM(+K1PR,KA1GHR) 405,372- 814-166-C-EM
K1GSK(+WB1FPF) 266,016- 652-136-C-EM
K1FWF(+N1CW) 13,860- 77 60-C-EM
W1BK(+N1CW) 24- 4- 2-C-EM

2

N2RM(+N2MM) 1,637,289-1669-327-C-SNJ
K2OY(+WA2s OVE,STM) 1,500,930-1962-255-C-ENY
K2BK(+W2IFK) 1,019,136-1327-256-C-NNJ
KD2I(+WB2TSY) 673,425-1025-219-C-NNJ
W2UI(+N3KR) 472,068- 837-188-C-SNJ
KC2L(+K2HA,W2XL,WB1GGR) 390,096- 688-189-C-ENY
WA2LQO(K2s DOO,UAT,N6PF,W2s DKM,ZZE,WB2FMP,oprs) 375,705- 759-165-C-NLI
WØVU/2(+ADØF) 45,756- 164- 93-C-WNY
KB2NU(+KB2SE) 33,660- 170- 66-C-WNY

3

W3BGN(+K2BMI,KC2X) 2,611,863-2193-397-C-EPA
K3UC(+K3s OO,VDU) 1,123,188-1474-254-C-EPA
K3QMR(+W3s HV,YQ,WA3PXA,WB3KKX) 1,020,228-1441-236-C-WPA
N3ED(Multiop) 809,628-1007-268-C-EPA
K3RN(+K3BSY) 782,040-1064-245-C-WPA
N3GB(+Net) 552,608- 873-211-C-MDC
N3RL(+Net) 517,752- 799-216-C-MDC
K3AO(+Net) 505,344- 752-224-C-MDC
W3FG(+K3YDX,K5BTS,KB5LA,KA6FDF) 440,340- 716-205-C-MDC
W3GNQ(+Net) 426,024- 732-194-C-MDC
W3KT(+Net) 253,638- 462-183-C-EPA
N3ARK(+WB3FIY) 81,534- 254-107-C-EPA
W3YFV(+N3RW) 68,085- 255- 89-C-EPA

4

K4NYV(+K4CIA,KE4I,N4TN,WB4ZKG) 1,148,112-1407-272-C-NC
K2BA/4(+KA3BRS,W4FOA) 695,931-1013-229-C-VA
W4AQL(DF4SV,K2PO,WB3DRE,WA4ABY,oprs) 383,496- 841-152-C-GA
KC4UQ(+WA5HAO) 274,104- 564-162-C-VA
N4AU(+K4s IZN,OVG,WA4MTG) 161,595- 399-135-C-AL

5

K5RC(+K5s GA,GN,LZO,ZD,N5s CDO,DU,W5VAH) 3,142,191-2599-403-C-STX
W5VX(+K5s BDS,TSQ) 1,622,907-1859-291-C-STX
K5EE(+AK5X,KJ5W,N5WS) 1,046,928-1283-272-C-NTX
W5AC(WB5s OON,PYI,VZL,WD5s BIK,EGK,oprs) 572,118-1207-155-C-STX
WD5COV(+WA5IPS) 357,696- 576-207-C-NM
N5CDO(+N5JJ) 31,080- 140- 74-C-STX

6

N6TU(+N7KA,W6NV,WB6SHD) 1,614,678-1651-326-C-EB
N6BT(+K6STI) 1,037,553-1367-253-C-SCV
N6GJ(WA6HCI,WB6PYI,oprs) 861,738-1271-226-C-SCV
K6DC(+W6BJH) 678,345-1103-205-C-SCV
K6SG(+KV6H) 549,276-1006-182-C-SV
W6TPH(+Net) 543,582- 897-202-C-SV
K6ANP(+K6LRN,KD6GC,N6DCJ) 342,954- 657-174-C-SF
W6BIP(+W2TDQ) 321,984- 624-172-C-SF
W6OKK(Multiop) 246,906- 638-129-C-SCV
W6GO(+Net) 189,570- 355-178-C-SV
K6FO(+Net) 94,374- 294-107-B-SV
N6OM(+Net) 72,288- 251- 96-C-SCV
AJ6V(+Net) 63,684- 244- 87-C-SCV
AA6G(+2 Meter Net) 29,400- 196- 50-C-SCV
N6ST(+Net) 15,582- 106- 49-C-SCV
N6RC 9450- 70- 45-C-SCV
KK6X 8487- 69- 41-C-SF

7

K7LXC(+K7s HBN,WA,WA7GCI) 611,961-1267-161-C-WA
WA7JTC(+KB7EO,WA7ZTN,oprs) 34,515- 195- 59-C-WA

8

AD8P(+N8ABL,W8FN,WB4AIN,WB8WMB) 1,710,1857-307-C-OH
K8SS(+K8CC,WA8RRR) 1,061,280-1474-240-C-MI
K8SIA(+K8JM,N8BNF,W8s FWC,MNL) 772,740-1215-212-C-MI
K8OD(+AC8W,K8JLB,KJ8A,WA8s BSF,MEC) 755,292-1114-226-C-MI
K8AQM(+WA8ARS,WB8ZFB) 678,426-1114-203-C-MI
WB8KKI(+WD8LLO) 592,764-1051-188-C-OH
K8MJZ(+AC8Y,AI8D,K8LF,WB8MTD,WD8DSV) 572,976-1384-138-C-MI
W8QLK(+WB8s BMX,SCN,WD8PVA) 122,661- 413- 99-C-WV

9

WA9EOD(+WB9VJB) 263,224- 607-144-B-IL
W9YB(N9BWI,WB9s OJY STD,oprs) 193,401- 551-117-C-IN
WB9JBF(+AI9T,KA9HZO,WB9s AQI,OEC,UAI,YMF,WD9GUR) 165,612- 373-148-C-WI

Ø

WAØQMU(+AE5W,KØMAT,WBØWRU) 529,740-1090-162-C-KS
KGØA(+NØCGA) 524,880- 972-180-C-CO

VE

VE6OU(+VE6UD) 1,462,500-1950-250-C-AT
VE1DXA(VE1s AVX,FH,oprs) 651,453-1039-209-C-MAR
VE3UOT(VE1BCZ,VE3HTT,oprs) 567,600- 860-220-C-ON

W/VE - CW

Multioperator Multi-Transmitter

K2UA(+N2ME,WA2HGM,KA3BKR,N3s AD,RD,RS,W3XU) 6,686,361-4653-479-C-SNJ
W3FA(+K3s EST,RV,ZZ,K4PQL,KA1GD,N8II,W3ABC,WA3s KCY,ZAS,WB4SGV) 5,919,264-4216-469-C-MDC
W3LPL(+AE3Y,K3s NA,RA,W3s IUU,WZL,WA3UXU,WD4AXM) 5,890,500-4125-476-C-MDC
K3WW(+K2ZSY,K3WJV,KA3BLP,KB3GJ,N2ATX,WA3VLB) 5,786,600-4240-455-C-EPA
W3MM(+K2WK,N2BA,K3s GM,NZ,N3LR,W3BI,W8FJ) 5,422,914-4053-446-C-EPA
K1ZZ(+AK4L,K1s CC,TO,W1s GNC,WEF,WA1YEC) 5,406,438-4162-433-C-CT
N9MM(+K9s FN,UWA,KB9AF,KC9C,N9s NB,NS,W9s LF,OBF,SFR,ZRX,WB9s LTY,POH) 5,199,450-4078-425-C-IND
W9TM(+K9s GL,HMB,KM,NO,PPY,PW,RS,WB9TIY,WD9DCL) 4,976,784-4066-408-C-IL
K1OX(+K1s EA,HI,LL,RX,UA,VR,W1RR) 4,943,736-4039-408-C-NH
K8LX(+K8s GM,MD,NA,N8s UM,EA,W8KPL,WA8s TBQ,ZOT,WN8PEE,WD9HFW) 4,909,920-4240-386-C-MI
K2VV(+K2s QF,XA,N2s AIF,JJ,W2NC) 3,983,544-3628-366-C-WNY
AI6V(+K6KLY,KB6F,N6TV,W6s EEN,QEN,XX,YKM,WA6s NTG,VEF,WB6DHN) 3,797,010-3430-369-C-SV
N6RO(+KF6I,N6KB,W6OAT,WA6s DIL,KXN,WA7LQO,K9LBQ,N9NC) 3,487,575-3175-363-C-EB
K2TR(+K2WR,WA2SPL,WB2SJG) 3,401,700-3335-340-C-ENY
ABØI(+WA5DGX,KØsGUG,JVX,RWL,VBU,KAØAQZ,KBØs AB,GU,NØSS,WØJU,WAØTKJ,WBØs LFY,UZJ,VHN) 3,336,840-3588-310-C-MO
W3GM(+K3s NO,RL,W3FV) 3,295,017-2739-401-C-EPA
W3RJ(+K3VW) 2,652,912-2136-414-C-EPA
N6ND(+K6XT,N6s RM,ZI,W6UQF,WB5CSO) 2,623,116-2767-316-C-SDGO
K6RR(+AA4KF,AA6RX,K3VA,N6TR,WA3LRO,WA6s JAH,OTU) 2,611,098-2737-318-C-ORG
WØAIH/9(+KØs FVF,TQ,NØBG,WØs UO,ZZ,WAØRBW,WBØs BQA,CJV) 2,268,420-2455-308-C-WI
N5RM(+K5IU,KM5s K,R,N5s AIL,BQQ) 2,119,650-2174-325-C-NTX
W1YN(+AG1C,AK1A) 2,093,220-2406-290-C-EM
K3IU(+K3s KMO,KU,N3CL) 2,046,606-1966-347-C-MDC
K6RU(+K6XO,KA6CUG,N6YV,W1ARR) 1,942,968-2218-292-C-SCV
W5XZ(+K3JT,W5DC) 1,692,462-1814-311-C-LA
KB1T(+W1HCS,WB1HJF,WB8BTH) 1,534,590-2006-255-C-NH
K6ZM(+AK6Y,K6CLV,N6OP,WA6JCZ,WB6DSV,WD6ERA) 1,145,781-1399-273-C-EB
K3II(+AJ3G) 982,254-1274-257-C-EPA
N1AU(+AI1E,AJ1I) 928,203-1363-227-C-EM
W3NX(+AD3V,N8NA) 837,930-1054-265-C-DE
KA1R(+Net) 811,026-1306-207-C-EM
K3FD(+WB3EAG) 231,660- 468-165-C-EPA
N8CHJ(+KA8LVD,WD8s IJP,IJR) 22,776- 104- 73-B-OH

DX - CW

Single Operator

Africa

EA8TY 287,430- 715-134-C-AB
EA8RL 85,824- 596- 48-C-80
EA8EY 1450- 30- 16-A-QRP

EA9EU 371,151- 759-163-B-AB
EA9GK 105,258- 662- 53-B-20
EA9JG 103,518- 639- 54-B
EA9GI 56,736- 394- 48-B-10

EL2AV 830,826-1371-202-C-AB

ZS6APS 35,136- 183- 64-B-AB
ZS5VP 566- 23- 14-B-40

5T5CJ 1,330,035-1855-239-C-AB

9X5AB(ON8RA,opr) 187,680- 544-115-B-AB

Asia

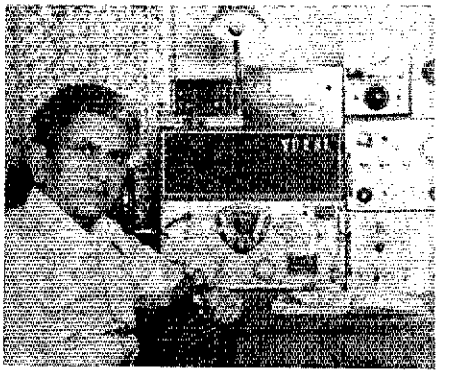
A51PN 13,395- 95- 47-C-AB

A7XE 5082- 77- 22-C-40

HZ1HZ 545,424-1033-176-C-AB

HM1PW 6399- 79- 27-B-20

JA1BWA 1,076,103-1653-217-C-AB
JE1CKA 927,888-1487-208-C
JA9CWJ 578,340-1071-180-C
JA1JKG 541,002-1171-154-C
JF1SEK 524,772-1017-172-B
JA9SQO 339,372- 857-132-B
JK1FLU 337,260- 730-154-B
JJ1SOE 302,151- 667-151-B
JA2NPS 262,773- 679-129-B
JA6PWN 254,466- 633-134-B
JH1MTR 240,555- 553-145-B
JA7JWF 223,440- 490-152-B
JA1NLX 223,146- 539-138-B
JA3EGC 217,551- 571-127-B
JA6BIF 215,358- 502-143-C
JR3IOT 207,417- 581-119-C
JR3WXA 180,348- 532-113-B
JA2IU 174,420- 510-114-B
JA1JQY 167,571- 433-129-B
JH8JYV 157,125- 419-125-B
JR3XEX 142,374- 389-122-C
JH7AJY 104,940- 330-106-B
JH2JEV 101,376- 352- 96-C
JK1VXH 96,084- 314-102-B
JA1VZM 92,160- 320- 96-B
JA3HTT 82,365- 289- 95-B
JR1JUR 79,002- 266- 99-B
JA1KF 73,038- 259- 94-C
JH4DRB 63,525- 276- 77-B
JA2DHL 52,020- 255- 68-B
JA4ESR 49,086- 202- 81-C
JA3BRB 43,452- 204- 71-B
JA1IZ 37,944- 204- 62-C
JA4ENN 36,924- 181- 68-B
JA3BAG 31,863- 167- 63-B
JA8SPZ 26,190- 194- 45-B
JR2TWA 26,100- 150- 58-B



Dale, VU2SL, runs 100 watts to a two-element monoband (20-meter) Yagi at 30 meters.

The operators at AI6V preparing to give it a go on cw. Forty-eight hours and 3.7 million points later, they had the number 12 multi-multi cw score in the world.

CT2DP (WØZX), a welcome multiplier in 813 logs on phone.

JA7EC	21,609- 147- 49-B
JA9FT	21,372- 137- 52-C
JA1IIX	19,584- 136- 48-B
JA1THL	19,188- 123- 52-B
JH1LSS	17,820- 135- 44-C
JA1BZM	17,316- 111- 52-B
JA6LYV	16,650- 111- 50-B
JA3ARM	16,113- 131- 41-C
JR7LNP	15,795- 117- 45-B
JA1KXT	14,365- 99- 45-B
JA3ULI	8400- 80- 35-B
JA1HQS	7872- 82- 32-B
JH1AVU	7854- 77- 34-B
JF1LKM	7254- 62- 39-B
JH2XTV	4896- 51- 32-B
JL1QGB	3627- 39- 31-B
JA1AJA	3213- 51- 21-B
JA9BV	2268- 36- 21-C
JA7AOU	855- 19- 15-C
JA1BK	480- 20- 8-C-160
JA6LCJ	120- 8- 5-C
JA1SJV	14,070- 134- 35-B-80
JA1ELY	8613- 99- 29-C
JH1CBI	7980- 95- 28-C
JA3BCT	627- 19- 11-B
JA1KSO	92,826- 573- 54-B-40
JE1TSD	10,290- 98- 35-B
JJ1DBA	5976- 83- 24-C
JK1RJU	3060- 60- 17-B
JF3CCN	2580- 43- 20-B
JH7BDS	2451- 43- 19-C
JL1VHB	2064- 43- 16-B
JA1BOK	1140- 38- 10-B
JH1CCN	960- 32- 10-B
JHØBBE	756- 28- 9-B
JA4AQR	342- 19- 6-B
JAØJHA	162,288- 966- 56-B-20
JH1PBR	133,560- 795- 56-C
JA8SW	36,156- 262- 46-C
JF1MYI	16,740- 155- 36-B
JG1QGQ	9240- 88- 35-B
JA1KKA	2394- 38- 21-C
JA1AVI	2040- 40- 17-B
JA4FMA	780- 20- 13-B
JH1BBU	182,325-1105- 55-C-15
JH3LPT	158,565- 961- 55-B
JA2VUP	153,120- 928- 55-C
JE1JKL	130,845- 793- 55-C
JH3CXL	124,740- 770- 54-C
JF1PUW	112,035- 679- 55-C
JAØVBJ	97,350- 590- 55-C
JG1TSF	96,990- 610- 53-B
JK1AFA/3	80,931- 509- 53-B
JA3MXE	75,750- 505- 50-C
JE1AYU	64,150- 510- 55-B
JE3UNA	48,240- 335- 48-B
JA1CSB	36,720- 272- 45-C
JK1NAE	31,050- 225- 46-B
JAØNL	30,627- 249- 41-B
JA2AJA	28,890- 214- 45-C
JA8CJY	17,400- 145- 40-B
JJ1LBJ	15,207- 137- 37-B
JA4BFL	14,478- 127- 38-B
JA2KPV	9630- 107- 30-B
JA1HYU	3726- 46- 27-B
JE3UWU	2340- 39- 20-B
JAØGZ	1938- 34- 19-B
JA1KEG	1350- 25- 18-B
JG1GWE	1020- 34- 10-B
JR4KMN	432- 16- 9-B
JAØNCE	84- 7- 4-B
JH1EDD	172,425-1045- 55-B-10
JAØJCJ	144,705- 877- 55-B
JH7FMJ	144,045- 873- 55-B
JH1EDB	134,145- 813- 55-B
JA2YKA(JJ1BTA,opr)	126,723- 797- 53-B
JA7GAX	120,999- 761- 53-B
JJ1NUB	118,137- 743- 53-B
JA1CG	109,026- 673- 54-B
JF2GNY	108,120- 680- 53-B
JR6RRD/3	106,590- 646- 55-B
JA1YXP(JH4OWG,opr)	97,920- 640- 51-B
JA2EMP	96,831- 609- 53-B
JE1SPY	93,240- 555- 56-B
JA1AFF	92,178- 569- 54-B
JR1CFG	90,699- 617- 49-B
JA1PCY	84,303- 551- 51-B
JA1QXY	84,111- 529- 53-B
JA1EMX	80,808- 518- 52-B
JA1YHA(JJ1AEB,opr)	78,468- 503- 52-B
JA1DFQ	69,615- 455- 51-B
JH3FYR	66,000- 440- 50-B
JA1SGX	65,808- 457- 48-B
JA2HO	61,899- 439- 47-B
JA2EOX	45,360- 336- 45-B
JR4BVD	44,133- 313- 47-B
JA2TTO	41,952- 304- 46-B
JH7BRG	40,425- 275- 49-B
JF1SDH	38,364- 278- 46-B
JA3YQO(JF3PLF,opr)	35,301- 287- 41-B
JA1OP	32,292- 276- 39-B
JF2XAR	27,606- 214- 43-B
JH7CJM	26,760- 223- 40-B
JF2BDK	25,704- 204- 42-B
JG1GGF	24,948- 198- 42-B
JJ1OSP	19,680- 160- 41-B
JR2NTC	15,225- 145- 35-B
JA9KRO	14,250- 125- 38-B
JA1NTK	10,395- 99- 35-B
JH1EVD	9180- 102- 30-B
JA8CAQ	7980- 76- 35-B
JE2DOD	6162- 79- 26-B
JA9WNS	4485- 65- 23-B
JA1BGW	4320- 60- 24-B
JA8GTO	840- 20- 14-B
JA1OCL	297- 11- 9-B
JA1AAT	288- 12- 8-B
JA1MCU	287,100- 660-145-A-QRP
JR6KRI	50,400- 200- 84-A
JA1EF	44,655- 229- 65-A
JA1KFX	38,850- 185- 70-A
JA1BN	27,027- 231- 39-A
JA2DN	13,365- 135- 33-A
JH3WKE	11,844- 94- 42-A
JA4JKD	9396- 87- 36-A
JA1EIA	5670- 63- 30-A
JAØBMS/1	5184- 54- 32-A
JA9XBW	450- 15- 10-A
OD5LX	35,250- 250- 47-C-20
UD6CN	24,255- 165- 49-B-AB
UD6DKW	16,605- 123- 45-B
UD6DLJ	10,176- 106- 31-B-20
UF6CX	7875- 105- 25-B-20
UH8BO	15,435- 105- 49-B-AB
UH8EAD	76,626- 473- 54-B-20
UI8LC	9900- 100- 33-B-20
UI8AIJ	5670- 70- 27-B
UL7CAD	1176- 28- 14-B-40
UL7CBP	56,850- 379- 50-B-20
UL7GBR	45,900- 306- 50-B
UL7PBI	33,699- 239- 47-B
UL7BAA	23,874- 173- 46-B
UL7GBM	18,240- 152- 40-B
UL7CBM	11,340- 108- 35-B
UL7QF	44,064- 306- 48-B-15
UL7PBY	10,500- 100- 35-B
UM8MBA	51,282- 222- 77-B-AB
UM8MAZ	900- 20- 15-B
UM8MAX	59,976- 408- 49-B-20
UM8MCY	3906- 62- 21-B-10
UA9WS	75,603- 319- 79-B-AB
UAØKBV	21,735- 161- 45-B
UAØCDA	18,669- 127- 49-B
UAØKCL	2304- 32- 24-B
UAØZCQ	8556- 124- 23-B-80
UA9OBG	4950- 50- 33-B-40
UAØSAU	164,304- 978- 56-B-20
UA9CKC	99,630- 615- 54-B
UA9YBR	63,648- 408- 52-B
UAØSGL	57,450- 383- 50-B
UAØBBT	56,214- 347- 54-B
UAØBCV	34,950- 233- 50-B
UAØBYL	19,278- 153- 42-B
UA9AIQ	16,236- 132- 41-B
UA9QAQ	16,206- 146- 37-B
UAØZBP	15,015- 143- 35-B
UA9LBM	7968- 83- 32-B
UAØBCS	5589- 69- 27-B
UA9AFO	1488- 31- 16-B
UAØZCR	104,499- 683- 51-B-15
UA9MR	73,224- 452- 54-B
UAØLS	28,896- 224- 43-B
UA9UTF	10,695- 115- 31-B-10
UA9QBT	7134- 82- 29-B
UAØSH	1968- 41- 16-B
VS6JR(WA4UAZ,opr)	245,784- 616-133-B-AB
VU2SL	20,664- 164- 42-B-20
VU2UR	576- 16- 12-B
4Z4RS	31,005- 159- 65-C-AB
4Z4TA	30,444- 172- 59-B
9M2KG	25,758- 165- 53-B-AB
Europe	
C31IU(K9MW,opr)	72,765- 441- 55-B-15
CT2QN	322,677- 629-171-C-AB
CT2DP	28,674- 162- 59-B
CT2CY	64,887- 503- 43-B-20
DJØIV	867,432-1538-188-B-AB
DKØHR(DK9FE,opr)	411,312- 936-164-B
DL6WD	346,896- 657-176-C
DJ6OZ	250,488- 588-142-C
DL7ON	243,873- 553-147-C
DJ1XT	184,464- 549-112-C
DJ4UF	125,568- 384-109-B
DLØEP(DJ3XK,opr)	117,360- 326-120-C
DJ4OE	90,630- 318- 95-B
DK7ZT	79,170- 290- 91-C
DF3QN	51,543- 207- 83-C
DL1OM	48,306- 194- 83-B
DL2EF	33,216- 173- 64-B
DF2MF	10,413- 89- 39-B
DL1KB	14,454- 146- 33-C-80
DF3OL	1887- 37- 17-B
DJ9MH	79,200- 528- 50-C-40
DF3TJ	53,730- 398- 45-C
DJ5JH	2469- 41- 20-C
DK3NR	6270- 94- 22-B-20
DK8AX	2880- 48- 20-B
DK3SN	159,225- 965- 55-C-15
DL1TH	39,606- 287- 46-B
DL8IG	12,654- 111- 38-B
DK4HD	12,051- 103- 39-B
DL1NE	11,340- 105- 36-B
DL4LF	7533- 81- 31-B
DJØBC	72,324- 492- 49-C-10
DLØVW(DF3OL,opr)	58,896- 409- 48-C
DK5JA	18,774- 149- 42-B
DJ1YH	7623- 77- 33-B
DK5OS	1536- 32- 16-B
DL8CM	57,603- 211- 91-A-QRP
DK3BN	12,825- 95- 45-A
EA2IA	2,302,977-2987-257-C-AB
EA3ARO	164,730- 578- 95-B
EA5YU	105,300- 325-108-B
EA1JO	69,153- 259- 89-C
EA3GF	11,703- 83- 47-B
EA2CR	10,374- 91- 38-B
EA2OP	55,566- 441- 42-C-80
EA4BV	5070- 65- 26-B
EA7ALG	68,943- 469- 49-B-40
EC1GY	7695- 95- 27-B
EA5AMU	5328- 74- 24-C
EC2GR	20,295- 165- 41-B-15
EI9J	585,123-1043-187-B-AB
EI3CP	98,421- 619- 53-B-10
EI1DH	93,912- 602- 52-B
F6GCP	142,290- 465-102-B-AB
F6EQV	107,952- 346-104-B
F9BB	93,240- 280-111-B
F8TM	65,880- 244- 90-B
F9QE	63,270- 222- 95-B
F3AT	36,225- 175- 69-B
F6GIN	4680- 52- 30-B
F6CCI	4371- 47- 31-B
F8VJ	336- 16- 7-A-160
F6EPO	24,192- 224- 36-B-40
F8TQ	45,402- 329- 46-B-20
F6ACV	5394- 62- 29-A-QRP
G4CNY	1,140,666-1807-211-B-AB
G2QT	486,528- 896-181-B
G3TXF	319,809- 679-157-B
G3ESF	220,110- 506-145-B
G3HRY	83,100- 277-100-B
G3KSH	81,726- 257-106-B
G2FNK	59,262- 238- 83-B
G3APN	51,480- 195- 88-B
G2AJB	32,064- 167- 64-B
G3COJ	26,715- 137- 65-B
G3SXW	1755- 39- 15-B-80
G3XTT	29,982- 263- 38-B-40
G4JJE	2793- 49- 19-B
G3PVA	106,053- 667- 53-B-20
G5CMX(N8ET,opr)	162,030- 982- 55-B-15
G3KKP	93,312- 576- 54-B
G2RO	80,496- 516- 52-B
G4GIR	210,045-1273- 55-B-10
G3WPF	176,064-1048- 56-B
G4BUE	411,360- 857-160-A-QRP
GM3LYY	492,525- 995-165-B-AB
GM3RAO	115,380- 429- 90-B
GW3NYY	104,445- 633- 55-B-20
GW3NIN	25,671- 199- 43-B-15
HA8UB	310,800- 700-148-C-AB
HA9KPU	188,892- 583-108-B
HA7MC	93,912- 364- 86-B
HA3GA	87,882- 302- 97-B
HA5KBM	57,600- 384- 50-B
HA5BA	43,050- 205- 70-B
HA5KMB	31,584- 188- 56-B
HA5LX	29,946- 217- 46-B
HA8UH	27,054- 167- 54-B
HA5JK	3528- 49- 24-B
HA5OV	15,840- 165- 32-B-40
HA6NG	11,658- 134- 29-B
HA4YG	3600- 60- 20-C
HA4XT	146,685- 889- 55-B-20
HA7LP	32,016- 232- 46-C
HA4XR	28,080- 208- 45-B
HA3HE	13,950- 150- 31-B
HA8DU	9207- 99- 31-B
HA5FE	4899- 71- 23-B
HA6OA	89,199- 561- 53-B-15
HA3GJ	56,304- 369- 51-C
HA1ZH	41,040- 285- 48-B-10
HA3NU	15,120- 144- 35-B
HB9AGN	291,450- 670-145-B-AB
HB9LF	144,864- 503- 96-C
HB9KC	69,120- 288- 80-B
HB9ZJ	35,325- 157- 75-B
HB9BOW	32,175- 165- 65-B
HB9DX	55,125- 375- 49-C-10
I7PXV	181,173- 461-131-B-AB
I2UBI	19,305- 195- 33-C-80
I2VXJ	56,118- 398- 47-C-40
I7LMR	93,444- 599- 52-B-20
I1QJC	27,120- 226- 40-C
I1EUA	10,125- 125- 27-B
I4DVT	133,980- 812- 55-C-15
I2XBO	104,145- 655- 53-C-10
I2RVW	58,032- 403- 48-B
I2SVA	56,850- 379- 50-B
I1XPQ	43,500- 290- 50-B
IØSKK	3864- 56- 23-A-QRP
ISØFPH	65,121- 443- 49-B-20
ISØMVE	14,760- 123- 40-C-10
LA6ZW	212,814- 563-126-C-AB
LA6ZV	48,024- 184- 87-B
LA2KD	36,738- 157- 78-B
LA6XO	20,223- 107- 63-C
LA3BO	13,452- 76- 59-B
LA4YW	12,255- 95- 43-C
LA6VM	864- 24- 12-C-40
LA9FY	462- 14- 11-B-15
LA5SH	39,600- 300- 44-B-10
LZ2AG	1302- 31- 14-B-40
LZ1KX	4860- 81- 20-B-20
LZ2LY	312- 13- 8-B-15
OE6KZ	238,095- 555-143-B-AB
OE3RE	54,201- 203- 89-B
OE1JJB	4800- 50- 32-B
OE1DSA/3	94,446- 583- 54-C-10
OE5KE	86,814- 546- 53-C
OE1OPW/3	12,741- 137- 31-B
OH6OH	200,250- 534-125-B-AB
OH8LB	123,165- 357-115-B
OH2FS	125,580- 455- 92-C
OH5UO	118,116- 386-102-B
OH6MM	104,520- 335-104-C
OH3LA	52,448- 262- 68-B
OH5PT	39,330- 138- 95-C
OH7NW	26,790- 95- 94-C
OH5TZ	2244- 34- 22-B
OH6GO	5400- 72- 25-C-40
OH6OC	2510- 40- 21-B
OH5TQ	202,122-1182- 57-C-20
OH1PS	147,744- 864- 57-C
OH1CQ	97,104- 578- 56-C
OH1QB	24,288- 184- 44-C
OH3AA(OH3KS,opr)	22,995- 219- 35-C
OH8AV(OH8PF,opr)	256,032-1524- 56-C-15
OH7VR	95,094- 587- 54-C
OH6EI	53,550- 350- 51-B
OH2BMH	12,831- 91- 47-B
OH6EF	10,494- 106- 33-B
OH2SX	8448- 88- 32-C
OH1CX	7917- 91- 29-B
OH2BUU	4125- 55- 25-B
OH1KO	43,200- 300- 48-B-10
OH6RC	36,984- 268- 46-B
OH6GD	23,160- 193- 40-B
OH3AT(OH3MP,opr)	15,552- 144- 36-B
OH5OZ	9657- 87- 37-B
OH6ZH/1	4874- 67- 24-B
OH9TD	3240- 45- 24-B
OH6QU	14,994- 147- 34-A-QRP
OH1BK	10,440- 120- 29-A
OH7JR	1530- 30- 17-A
OH3BI	18- 3- 2-A
OH3XT/OHØ	43,470- 345- 42-C-10
OHØPA	60,264- 248- 81-A-QRP
OK3ZMV	818,292-1406-194-B-AB
OK3CEM	739,260-1369-180-B
OK2BLG	570,402-1006-189-C
OK2YN	308,034- 654-157-B
OK3CEE	231,954- 577-134-B
OK2ABU	216,276- 538-134-C
OK2BWH	204,732- 564-121-B
OK1AWC	188,442- 551-114-B
OK1DKR	170,046- 402-141-B
OK2QX	106,140- 305-116-C
OK3BA	79,674- 271- 98-B
OK1ALW	72,618- 494- 49-C
OK1XG	70,902- 234-101-B
OK3FON	67,266- 222-101-B
OK1MKU	53,928- 214- 84-B
OK1AOR	40,110- 191- 70-C
OK1AOU	32,190- 185- 58-B
OK2BQZ	29,160- 243- 40-B
OK1DVK	29,097- 183- 53-B
OK2PBG	25,092- 164- 51-B
OK3KTP(OK3COV,opr)	25,020- 139- 60-B
OK2KYC	20,349- 133- 51-B
OK2LN	19,881- 141- 47-C
OK1US	12,816- 89- 48-B
OK1AIA	10,290- 70- 49-B
OK1MSB	4950- 50- 33-B
OK1DOC	3393- 39- 29-B
OK3CGI	3213- 51- 21-B
OK1KZ	27- 3- 3-B
OK3CPL	594- 22- 9-A-160
OK2BUH	2565- 57- 15-B-80
OK2HI	648- 18- 12-B
OK3CEL	420- 14- 10-B
OK1MMW	85,650- 571- 50-B-40
OK2PGG	23,310- 210- 37-B
OK1AGN	13,500- 150- 30-C
OK2BCI	13,356- 159- 28-C
OK3TOA	5244- 76- 23-B
OK2BUJ	51,597- 351- 49-B-20
OK1JPH	41,760- 290- 48-B
OK1AOZ	22,533- 203- 37-B
OK3CAU	17,520- 146- 40-B
OK1AXB	14,985- 135- 37-B
OK2BNX	14,949- 151- 33-B
OK2BGR	11,220- 110- 34-C
OK1JJB	10,500- 125- 28-B
OK2SPS	7392- 88- 28-B
OK1AVG	5478- 83- 22-B
OK1MZO	4830- 70- 23-B
OK1AJY	4428- 82- 18-B
OK2SGW	3762- 57- 22-B
OK3UG	3300- 50- 22-B
OK1JDJ	2112- 44- 16-B
OK3KTR	1584- 33- 16-B
OK2BQP	1428- 34- 14-B
OK1MIZ	756- 21- 12-B
OK2SLL	648- 18- 12-B
OK1JHR	96,036- 604- 53-B-15
OK1AOV	46,818- 306- 51-B
OK1FAR	41,328- 328- 42-C
OK1DLA	28,644- 217- 44-B
OK1ZP	26,910- 795- 46-B
OK2TBC	22,317- 173- 43-B
OK1DMJ	20,418- 166- 41-B
OK3CYU	17,316- 148- 39-B
OK3TCF	4347- 63- 23-B
OK2BBJ	1632- 32- 17-C
OK1DFW	180,180-1092- 55-B-10
OK1DWA	150,336- 928- 54-C
OK3KFO(OK3CMZ,opr)	110,712- 659- 56-B
OK1AVD	65,550- 437- 50-B
OK3IF	26,865- 199- 45-B
OK2KRT	23,625- 175- 45-C
OK1DGN	21,033- 171- 41-B
OK1FRA	21,027- 163- 43-B
OK2KNN	19,350- 150- 43-B
OK2BRZ	7644- 91- 28-B
OK2BJR	6660- 74- 30-B
OK1AXK	4875- 65- 25-B
OK3YDP	2280- 38- 20-B
OK3CGP	22,317- 173- 43-A-QRP
OK2BBI	14,469- 91- 53-A
OK2BMA	12,810- 122- 35-A
OK1DKW	1170- 26- 15-A
ON8RD	520,275- 991-175-B-AB
ON4XG	360,480- 751-160-B
ON7BV	11,016- 108- 34-B-15
ON6FT	133,719- 841- 53-B-10
ON5TZ	8415- 85- 33-B
ON6NL	29,256- 212- 46-A-QRP
OZ1LO	2,010,663-2781-241-C-AB
OZ1FGS	292,221- 711-137-B
OZ5WQ	236,430- 555-142-B
OZ7BW	195,750- 450-145-B
OZ1W	164,052- 434-126-B
OZ1BRV	97,485- 335- 97-B
OZ4HW	59,670- 255- 78-B
OZ1BII	18,189- 129- 47-B
OZ2NU	5487- 59- 31-B
OZ1AXG	144- 8- 6-B
OZ1EXZ	31,374- 249- 42-B-20
OZ1NF	13,266- 134- 33-B
OZ8XW	6750- 75- 30-C
OZ1EE	5712- 68- 28-C
OZ8XO	144- 8- 6-B
OZ6XR	57,876- 371- 52-B-15
OZ9OI	8091- 87- 31-B
OZ7JZ	88,452- 567- 52-C-10
OZ5KU	63,063- 429- 49-B
OZ6KS	22,080- 184- 40-B
OZ1DYU	11,844- 94- 42-B
OZ1AZZ	8190- 78- 35-B
OZ1BUR	4140- 60- 23-B
OZ8E	13,596- 103- 44-A-QRP
PAØLOU	1,004,571-1587-211-B-AB
PAØVDV	737,715-1315-187-B
PAØGT	234,654- 518-151-B
PAØEP	228,636- 522-146-B
PAØXPQ	129,276- 342-126-B
PA3ASC	128,688- 383-112-B
PAØCF	23,868- 117- 68-B
PAØPHK	9870- 70- 47-B
PAØDIN	7980- 70- 38-B
PA3AUK	5310- 59- 30-B
PAØEHF	2448- 48- 17-B-40
PA3AEX	198- 11- 6-B
PAØUV	41,601- 283- 49-B-15
PAØRRS	828- 23- 12-B-10
SM6DHU	871,530-1390-209-C-AB
SM6CVT	622,746-1193-174-C
SM6BZE	330,300- 734-150-B
SM6JVQ	326,556- 772-141-B
SKØLM(SMØDRD,opr)	259,380- 660-131-B
SMØOJZ	223,512- 536-139-C
SMØDJZ	223,512- 536-139-C
SMØBOS	189,750- 506-125-C
SM6HCJ	141,480- 393-120-B
SK3MF(SM3COL,opr)	133,488- 432-103-C
SM5AKT	116,907- 293-133-B
SM5DAC	94,956- 386- 82-C
SK2IV	91,164- 284- 61-B
SM5RE	86,355- 303- 95-B
SM1BOE	76,174- 258-101-B
SM5BRW	77,280- 280- 92-C
SMØCGO	71,280- 264- 90-B
SMØBTS	46,350- 206- 75-C
SM5IMO	27,135- 135- 67-B
SM5XX	24,750- 150- 55-B
SM5AFE	10,296- 78- 44-B
SMØEEJ	1275- 25- 17-B
SM4CAN	5472- 76- 24-C-80
SMØAJU	43,428- 308- 47-C-40
SM3DMP	100,485- 609- 55-C-20
SM5LPC	23,247- 189- 41-C
SM5CBM	11,979- 121- 33-C
SMØCXM	10,494- 106- 33-C
SM6JY	8019- 81- 33-B
SM7BXV	11,700- 100- 39-C-15
SM7GGK	6786- 78- 29-B
SM7KNW	5547- 43- 43-B
SMØKV/Ø	4050- 50- 27-B
SM7TV	528- 16- 11-B
SM3DXC	113,256- 726- 52-C-10
SM6INC	90,324- 579- 52-B
SM6CNX	81,855- 535- 51-B
SM7BKH	52,500- 350- 50-C
SM3DXV	37,281- 289- 43-B
SMØCRM	23,355- 173- 45-B
SM7HPV	6720- 80- 28-B
SK2KW(SM2DMU,opr)	303,960- 680-149-A-QRP
SM5CCT	73,386- 302- 81-A
SM6AOQ	71,508- 236-101-A
SMØFSM	45,864- 196- 78-A
SM6LRR	8112- 104- 26-A
SM3BP	4455- 55- 27-A
SM4AJV	4284- 51- 28-A
SM7CZC	1800- 30- 20-A
SM6EUZ	792- 22- 12-A
SMØHPL	27- 3- 3-A
SP3DOI	1,461,438-2013-242-C-AB
SP2FAP	381,612- 826-154-B
SP9AKD	97,566- 322-101-B
SP2FUA	96,390- 306-105-B
SP3HC	67,536- 268- 84-B
SP9CVY	66,528- 264- 84-B

SP9HWN 62,775- 225- 93-B
SP9BBH 40,128- 209- 64-B
SP5KVW(SP5JOE,opr)
25,116- 161- 52-B
SP9DTH 16,740- 124- 45-B
SP9BRP 12,960- 144- 30-B
SP9PZF 7884- 73- 36-B
SP6FER 7140- 70- 34-B
SP6DMJ 6120- 60- 34-B
SP3IOE 855- 19- 15-B
SP8MJ 594- 18- 11-C-80
SP5IXI 144- 8- 6-B
SP5CJQ/5 17,535- 167- 35-B-40
SP4EEZ 11,790- 131- 30-B
SP5JTR 5106- 74- 23-B
SP3LWP 4278- 62- 23-B
SP9EMI 2244- 44- 17-C
SP2JGK 432- 16- 9-B
SP9JRA 198- 33- 6-B
SP2FOV 21,177- 181- 39-B-20
SP9EEE 14,326- 154- 31-B
SP5MBA 6300- 84- 25-B
SP8EMO 5303- 77- 23-B
SP2EFU 4140- 60- 23-B
SP9DH 2052- 38- 18-B
SP1KBU 1995- 105- 19-B
SP4INT 49,914- 354- 47-B-15
SP9CTW 39,015- 289- 45-B
SP5BR 37,647- 267- 47-B
SP3HYK 20,541- 167- 41-B
SP7AWA 7290- 81- 30-B
SP2AIV 4050- 50- 27-B
SP3KEY 203,112-1209- 56-B-10
SP9CAV 63,336- 423- 52-B
SP5AD 54,468- 356- 51-B
SP5GIQ 17,226- 174- 33-B
SP6AND 2070- 46- 15-A-QRP

SVØAT 217,350- 630-115-B-AB
SVØAU 146,349- 483-101-B
K1ED/SV 98,982- 361- 94-B

SVØAW/9(WB5WRY,opr)
6138- 62- 33-B-AB

TF3YH 317,520-1890- 56-C-15

UW6CA 517,080-1240-139-B-AB
UW3HY 207,504- 524-132-B
UA4HFK 188,370- 483-130-B
UA3PAV 184,080- 472-130-B
UW3UO 170,280- 473-120-B
UK3ABO 144,900- 460-105-B
UA4CH 109,461- 341-107-B
UA3XP 79,650- 295- 90-B
UA3AAH 60,258- 242- 83-B
UA1NAY 22,464- 144- 52-B
UA3BR 21,114- 138- 51-B
UA3RAQ 12,360- 103- 40-B
UA6AKT 6438- 74- 29-B
UA3EAL 1092- 26- 14-B-80
UQ2GEC 12- 2- 2-B-40
UA3GD 52,050- 347- 50-B-20
UW6CV 27,636- 196- 47-B
UA3TR 25,326- 201- 42-B
UA3EAH 24,600- 200- 41-B
UA6LIC 16,848- 144- 39-B
UA3ABN 14,256- 132- 36-B
UA1OBQ 14,094- 162- 29-B
UA4LM 11,997- 129- 31-B
UA4NEJ 11,780- 112- 35-B
UA4LBN 11,625- 125- 31-B
UA3RCT 7980- 95- 28-B
UA1DF 5673- 61- 31-B
UA1AJ 4896- 68- 24-B
UA3VAS 1350- 25- 18-B
UA1QAV 36,378- 258- 47-B-15
UV3DN 28,224- 224- 42-B
UA1OAI 28,215- 209- 45-B
UA3RDH 21,735- 161- 45-B
UA3DCX 13,320- 120- 37-B
RA3YCR 78,000- 500- 52-B-10
UA6AYX 64,125- 475- 45-B
UA1ZCG 48,465- 359- 45-B
UA3EZ 39,336- 298- 44-B
UA1OCT 22,833- 177- 43-B
UA3AIF 20,511- 159- 43-B
UA4CM 4371- 47- 31-B
UA1XM 3312- 48- 23-B
UA6LOF 7308- 87- 28-A-QRP

UA2FBO 3381- 49- 23-B-AB
UA2EC 50,337- 329- 51-B-15

UB5LAW 719,043-1339-179-B-AB
UY5UI 34,410- 185- 62-B
UB5UKO 32,913- 159- 69-B
UB5ZBF 2160- 36- 20-B
UT5EH 6708- 86- 26-B-40
UB5UGO 2160- 40- 18-B
UB5LAJ 27,090- 210- 43-B-20
UB5GBC 18,981- 171- 37-B
UB5VK 18,480- 176- 35-B
UB5JIO 14,976- 156- 32-B
UT5PI 14,976- 128- 39-B
UB5CEM 10,881- 117- 31-B
UB5HCW 5765- 105- 31-B
UB5RS 8502- 109- 26-B
UB5LAE 71,292- 457- 52-B-15
UK5QBE(UB5QBG,opr)
14,790- 145- 34-B
UY5TE 4158- 63- 22-B
UB5QFB 14,910- 142- 35-B-10
UB5UCF 6708- 86- 26-B

UC2SE 35,811- 173- 69-B-AB
UC2WAZ 28,560- 170- 56-B
UC2AFI 6138- 66- 31-B
UC2AAD 11,484- 116- 33-B-40
UC2WBJ 22,248- 206- 36-B-10
UC2AHA 144- 8- 6-A-QRP

UO5ODA 1968- 41- 16-B-40
UO5OBD 12,702- 146- 29-B-20
UO5OWC 30,756- 233- 44-B-15
UO5OEK 11,880- 132- 30-B-10

UP2BBF 48,840- 220- 74-B-AB
UP2BAS 44,793- 237- 63-B
UP2OU 690- 23- 10-B-80
UP2BEX 3717- 59- 21-B-40
UP2AW 864- 24- 12-B
UP2BAO 82,680- 530- 52-B-20
UP2BEI 39,621- 281- 47-B
UP2PBM 1302- 31- 14-B
UP2BEL 80,976- 482- 56-B-15
UP2PAQ 66,192- 394- 56-B
UP2OQ 57,810- 410- 47-B-10

UQ2GQ 57,290- 210- 84-B-AB
UQ2GFM 12,648- 124- 34-B-40
UQ2GKM 5040- 70- 24-B-20
UQ2PQ 47,628- 324- 49-B-15
UQ2PM 5394- 62- 29-B
UQ2PP 2871- 33- 29-B
UQ2GAA 351- 13- 9-A-QRP

UR2RKS 53,583- 337- 53-B-AB
UR2RSA 756- 18- 14-B
UR2RDQ 15,096- 136- 37-B-40
UR2RKV 1620- 30- 18-B
UR2RCU 199,920-1190- 56-B-20
UR2AW 1176- 28- 14-B-10

YO6KEI 73,980- 274- 90-B-AB
YO9AFT 61,200- 300- 68-B
YO2BEO 16,224- 104- 52-B
YO3AC 13,800- 115- 40-C
YO4BEX 3780- 70- 18-B
YO3BYF 1674- 31- 18-B
YO3KSC 55,440- 420- 44-B-40
YO2CGZ 5451- 79- 23-B

YO6ADW 148- 8- 7-B
YO2BEH 20,196- 187- 36-B-20
YO9YE 18,240- 160- 38-B
YO9AGI 9900- 110- 30-B
YO3RN 5925- 79- 25-B
YO6EZ 4851- 77- 21-B
YO5BRZ 2451- 43- 19-B
YO6UD 1998- 37- 18-B
YO7AWQ 1044- 29- 12-B
YO8BSE 1008- 42- 8-B
YU3CAB 214,200- 840- 85-B-AB
YU3DKR 183,438- 474-129-B
YU4VBR 183,120- 436-140-B
YU1NZW 162,432- 423-128-B
YU7NGO 136,269- 441-103-B
YU2SDX 31,557- 157- 67-B
YU7ORQ 8241- 67- 41-C
YU3TOJ 7650- 75- 34-B
YU3EY 24,378- 239- 34-C-80
YU4FRS(YU4VQT'opr)
101,712- 652- 52-C-40
YU3TBG 66,297- 451- 49-C
YU7PFT 106,947- 699- 51-B-20
YU4YA 106,260- 644- 55-C
YZ7OCZ 36,378- 258- 47-C
YU3TOK 35,520- 296- 40-B
YU7ECD(YU7QDA,opr)
21,360- 178- 40-B
YU2WJ 8352- 96- 29-B
YU2RRI 8100- 90- 30-B
YU3NP 4914- 63- 26-B
YU4AW 150,864- 898- 56-C-15
YU2OG 62,161- 584- 51-C
YU1NYU 71,760- 460- 52-C
YU1NYY 18,630- 138- 45-B
YU2BQR 137,424- 818- 56-C-10
YU4GD 131,712- 784- 56-C
YU7OCV 100,440- 620- 54-B
YU4FST 62,928- 456- 46-C
YU3TZP 42,840- 408- 35-B
YU3BC 270,135- 621-145-A-QRP
YU3TMJ 264- 11- 8-A
YU1NPF 75- 5- 5-A

Y51XE 115,854- 438-111-B-AB
Y31OA 111,435- 391- 95-C
Y38SI 93,492- 318- 98-B
Y31XF 66,792- 253- 88-B
Y41ZH 46,560- 194- 80-B
Y31SK 43,608- 184- 79-B
Y22EO 42,840- 210- 68-C
Y24GE 42,480- 171- 80-B
Y39YD 40,608- 188- 72-B
Y42ZB 38,430- 183- 70-B
Y23LM 26,520- 136- 65-B
Y38WG 24,768- 129- 64-B
Y32UG 20,886- 118- 59-B
Y23CM 14,688- 97- 51-B
Y42YB 14,040- 104- 45-B
Y47VN 11,817- 101- 39-B
Y22HF 8925- 85- 35-B
Y24SG 7455- 71- 35-B
Y22YJ 6240- 65- 32-B
Y48TJ 4263- 49- 29-B
Y23RJ 2880- 40- 24-B
Y24EA 2160- 36- 20-B
Y57WJ 1326- 34- 14-B-80
Y48WO 97,812- 627- 52-C-40
Y23UI 32,745- 295- 37-B
Y33VA 16,485- 157- 35-C
Y26FL 4320- 72- 21-B
Y67ZG 27,090- 210- 43-B-20
Y27VH 24,123- 187- 43-B
Y24MF 23,493- 191- 41-B
Y47UG 1512- 44- 12-B
Y26IH 1116- 31- 12-B
Y31ZE 660- 20- 11-B
Y45SA 48,501- 317- 51-B-15
Y55XG 40,500- 270- 50-B
Y37ZE 17,640- 140- 42-B
Y39QA 17,400- 145- 40-B
Y47XN 12,420- 115- 36-B
Y27GL 13,908- 122- 38-B
Y51YJ 4725- 63- 25-B
Y33YA 4628- 58- 27-C
Y37WE 2046- 31- 22-B
Y24ZH 468- 13- 12-B
Y22TO 85,800- 572- 50-C-10
Y22WF 48,645- 345- 47-B
Y31PA 25,326- 201- 42-C
Y59UN 19,440- 144- 45-B
Y34SE 18,840- 157- 40-B
Y41YN 5742- 87- 22-B
Y21JH 5220- 58- 30-B
Y37YL 4941- 61- 27-B
Y62XG 3402- 42- 27-B
Y41YL 2646- 42- 21-C
Y33TA 1080- 24- 15-C
Y21XC 15,876- 108- 49-A-QRP
Y22ZL 8742- 94- 31-A
Y22PM 5628- 67- 28-A
Y23UA 1620- 36- 15-A

ZB2EO 183,960- 511-120-B-AB

North America

HH2VP 2,564,298-2878-297-B-AB

HI8LC 39,600- 300- 44-B-80

HP1XPA(WA4ARV,opr)
21,720- 181- 40-C-20

AL7X 646,908-1147-188-C-AB

NP2AE 524,736- 911-192-B-AB

KP4EHP 68,697- 449- 51-B-80
KP4EQF 125,226- 773- 54-C-40

K4FW/VP2K
220,314- 503-146-B-AB

VP2VI(WØDX,opr)
2,473,688-3042-271-B-AB

ZF2EQ 184,884- 434-142-C-AB

K8ZH/6Y5 922,272-1478-208-B-AB

8P6EZ(W7RED,opr)
79,869- 337- 79-B-AB
8P6NX(WØSA,opr)
24,804- 212- 39-B-80

Oceania

N7ET/DU6 74,160- 309- 80-B

KG6DX 144,828- 894- 54-C-10

KH6ND 2,003,637-2311-289-C-AB
KH6NO 1,562,340-2003-260-C
KH6CKJ 617,760-1040-198-B
AH6K 99- 11- 3-C-80
K8CW/KH6 45,000- 300- 50-B-40
KH6JWK 20,160- 168- 40-B-15
WH6AMR 12,648- 124- 34-C-10
KH6B 5292- 63- 28-B
KH6B 5292- 63- 28-B
KH6CP 16,758- 147- 38-A-QRP
KH6H 7104- 64- 37-A

KX6BU 457,920- 848-180-C-AB

VK3AEW 144,942- 406-119-B-AB
VK2GW 118,944- 354-112-B
VK2AYD 107,730- 342-105-B
VK4UR 103,776- 368- 94-B
VK6FS 31,266- 193- 54-B
VK3XB 561- 17- 11-B-80
VK4XA 75,843- 477- 53-B-10

VK4SF 14,406- 98- 49-A-QRP

South America

NØNO/CEØA
309,285- 711-145-C-AB

HC1MD 50,304- 262- 64-C-AB
HC2BW 1224- 24- 17-C

HK3YH 77,532- 497- 52-B-80

LU1EWL 42,267- 193- 73-B-AB
LU2KAK(SM5GXW,opr)
39,186- 311- 42-C-10

OA8CP 291,024- 564-172-B-AB
OA4FW 9024- 94- 32-B-80
OA8V 459- 17- 9-A-QRP

W1BIH/PJ2
2,498,688-2892-288-C-AB

PY1BHB 44,178- 199- 74-B-AB
PY1BOA 30,096- 228- 44-B-20
PY8ZLC 103,680- 640- 54-C-15
PY1VT 83,148- 533- 52-B
PY25HI 25,623- 219- 39-B-10

YV1NX 771,888-1237-208-C-AB
YV5IKU 13,566- 119- 38-B
YV4BOU 12,672- 132- 32-B-40
YV5HUJ 20,943- 179- 39-C-20

9Y4VU 1,651,545-2247-245-C-AB

DX - CW

Multioperator Single Transmitter

Africa

CN8CO(+CN8AN)
352,944- 817-144-B

TL8WH(+TL8s JM,CN)
382,956- 658-194-C

Asia

JA7YAA(JG1UJD,JH7s AEF, CUO,GFO,GPW,LIS,HWR, RVD,UJN,WTC,WHM,JR7s OMD,SEI,UVL,JH8BME,oprs)
2,729,124-3506-258-C

JA7YAF(JA7s FWR,RHJ,UES, JH7s SJH,WKQ,JR7GGO, oprs)
1,008,000-1600-210-C
JA3YKC(JA3ODC,JE3MAS, JF3PMM,JH4PAM,JR3FRR, oprs) 758,646-1338-189-C
JA6YFS(JE3MYB,JE6CNW, JH4JLS,oprs)
518,076-1053-164-C

JT1KAA(Multiop)
45,261- 321- 47-B

UKØQAA(UAØs QAS,QBB,oprs)
1,439,067-2363-203-B
UKØZAB(UAØs ZBF,ZBT,ZBW, oprs) 1,184,259-1739-227-B
UK9FER(UA9s FAL,FAR,FOA, FDW,oprs) 885,984-1678-176-B
UK9AAA(UA9s AFV,AGQ,oprs)
554,688-1284-144-B
UK9OAZ(UA9s OBL,OCA,OCI, oprs) 373,875- 997-125-B
UKØFAD(4 oprs)
301,500- 750-134-B
UK9CBD(UA9s CBM,CT,UW9OW, oprs) 284,262- 803-118-B
UKØKAF(UAØs KBW,KCL,oprs)
125,874- 567- 74-B
UKØKAG(UAØs KBC,KCG,oprs)
72,708- 332- 73-B
UK9SBI(UA9s SCG,SFK, UV9SN,oprs)
60,060- 260- 77-B

UK7BAL(3 oprs)
313,266- 958-109-B
UK7PAA(3 oprs)
6549- 59- 37-B

UK8MAA(3 oprs)
261,030- 791-110-B

Europe

DLØAA(DF6TR,DJ5PA,DK2ZO, DL1YD,DL3BK,DL6s KB,TV, oprs) 2,607,120-3408-255-C
DKØTU(DF5GX,DK1PD,DK5s GB,HH,DK6s BO,QI,DL7s WC, ZN,oprs)
2,018,601-2769-243-B

F3TV(F5IN,F6s ARC,BEE, oprs) 2,372,265-3101-255-C

G4DAA(G3s FXB,MXJ,oprs)
2,172,702-3043-238-B
G3WTM(+G3RAU,G4IQM)
753,858-1351-186-B
G3UFY(+G3s SJX,WRR)
690,039-1217-189-B

GU3HFN(GU3MBS,GU4CHY, N6RA,oprs)
2,348,064-3156-248-B

GW4BRS(GW4s BVJ,DZE,oprs)
898,614-1849-162-B

HG6V(6 oprs)
1,922,031-2573-249-C
HG1W(6 oprs)
1,556,841-2483-209-B
HG5A(8 oprs)
1,351,080-2085-216-C
HAØKLE(6 oprs)
1,340,955-2079-215-C
HA6KNB(8 oprs)
1,241,628-1934-214-B
HA5KKC/7 (6 oprs)
1,080,792-1766-204-B
HA5KKG(6 oprs)
960-150-1730-185-B
HA1KZZ(6 oprs)
784,392-1421-184-C
HA3KNA(HA3s NS,NU+2 oprs)
612,504-1128-181-B
HA5KFN(6 oprs)
562,776-1048-179-B
HA2KRZ(3 oprs)
496,485-1003-165-B
HA2KSD(7 oprs)
494,748-1018-162-B
HA5KJD(HA5s KM,OB,oprs)
490,320-1135-144-B
HA1KJA 445,725- 849-175-C
HA1KZU(6 oprs)
372,300- 850-146-B
HA7KLC(4 oprs)
344,565- 741-155-B

HA8KAZ(5 oprs)
341,037- 743-153-B
HA5KJC(5 oprs)
322,272- 746-144-B
HA1KZD(HA1s ZD,ZG,ZU,oprs)
275,859- 601-153-B
HA8KAX(Multiop)
228,825- 675-113-B
HA4KYH(HA4s YO,YQ,XG, XX,oprs) 225,120- 560-134-B
HA5KHG(5 oprs)
184,041- 507-121-B
HA9KSF(3 oprs)
154,560- 444-115-B
HA1KSL(3 oprs)
131,670- 385-114-C
HA9KSD(Multiop)
116,064- 372-104-B
HA8KWG(6 oprs)
114,948- 372-103-B
HA6KNX(HA6s NO,NW,OD,oprs)
91,800- 360- 85-B
HA2KMR(4 oprs)
76,995- 295- 87-C
HA5KFZ 64,449- 231- 93-B
HA3KGS(Multiop)
47,520- 220- 72-B
HA3KDB(3 oprs)
36,750- 175- 70-B

LA4O(LA9HW,LAØBS,oprs)
654,720-1264-160-B

LZ1KDP(LZ1s GC,ZF,oprs)
917,748-1443-212-C
LZ2KKZ(3 Oprs)
86,211- 309- 93-C
LZ1KAU(3 oprs)
59,640- 280- 71-B

OH9AB(OH9s PH,SS,UW,oprs)
240,264- 564-142-B
OH2TI(OH1QC,OH6s DO,GV)
76,440- 364- 70-B

OK1KSO(OK1s AEZ,AMF,JCW, JJB,JKT,JWA,TS,WT,oprs)
1,232,220-1867-220-C
OK1KPA(OK1s AFC,MHI, MUK,ZL,oprs)
766,350-1310-195-C
OK1KRQ(OK1s AYQ,DLF, IVJ,oprs)
474,204- 919-172-B
OK3KTY(OK3CMF+2 Loggers)
281,400- 700-134-C
OK3KEE(Multiop)
244,608- 637-128-B
OK2UAS(OKs LG,WHT,oprs)
178,778- 427-138-C
OK3KYR(Multiop)
154,089- 439-117-B
OK1KYS(OK1s DEY,FRF,oprs)
69,387- 229-101-C
OK2KWU(OK2s BHB,JK,oprs)
20,535- 185- 37-B
OK1OXP(Multiop)
19,668- 149- 44-B
OK1KTW 7482- 86- 29-C

ON6BR(ON5VA,ON6s DX,JA, JN,OU,ON7s HW,PY,QU,XN, oprs) 541,089-1019-177-B

OZ5EDR(OZ3QN,OZ8s AE, OQ,WD,oprs)
428,160- 892-160-C

PAØGN(+PAØs ERA,GIN)
1,275,165-1977-215-B

SL2ZZU(SM2s CEW,EKM,EUO, GET,GXN,oprs)
1,877,382-2938-213-C
SM5GMG(+SMØGNU)
1,696,545-2655-213-C
SK1AQ(SM1ALH+others)
901,503-1557-193-C

SP6PZV(SP6s ANY,ATG,LMY, LTF,oprs) 610,740-1131-180-C
SP9KMM(SP9s DKW,DMY, DUV,EYY,GPW,oprs)
238,680- 612-130-C

UK6LEZ(6 oprs)
748,797-1267-197-B
UK3QAE(UA3s QGN,QJA,QKX, QLL,QLW,oprs)
597,528-1158-172-B
UK1ZAO(UA1s ZCZ,ZBQ,ZV, oprs) 768,888-1448-177-B
UK3SAB(4 oprs)
580,560-1180-164-B
UK4AAM(UA4s ABS,ADG,oprs)
194,328- 594-109-B
UK4LAZ(UA4LAJ+1 op)
126,654- 418-101-B
UK3DBV(UA3DFO+ Logger)
19,980- 148- 45-B

UK5IAZ(9 oprs)
1,798,242-2801-214-B
UK5MAF(RB5MUV,UB5s MDC, MNX,MOA,UY5LK,oprs)
723,492-1276-189-B
UK5MAA(UB5s EC,MDA,MGY, MQF,oprs) 647,280-1160-186-B
UK5WAA(UB5s WAL,WCF, WCJ,oprs)
542,850-1034-175-B
UK5UDX(UB5CXM+ 1 op)
459,036- 933-164-B
UK5IBM(UB5s INO,ITU, EZ5IBZ,oprs)
248,769- 633-131-B
UK5QAV(6 oprs)
100,170- 371- 90-B
UK5DAA(UB5s OAV,VK, UT5DL,oprs)
96,186- 391- 81-B
UK5QAD(3 oprs)
82,620- 324- 85-B

UK2AAF(3 oprs)
6474- 83- 26-B

UK2BAS(UP2s BIG,PAJ,oprs)
1,931,310-2799-230-B
UK2PRC(UP2s BBM,BIC,oprs)
289,476- 946-102-B
UK2BCC(2 oprs)
12,312- 108- 38-B
UK2GKW(UQ2GKM+2 ops)
1,116,696-2023-184-B
UK2GJL(UQ2GDT+1 op)
277,125- 739-125-B
UK2GAI(UB5RCG,UQ2PP, oprs) 47,304- 216- 73-B

UK2RBT(3 oprs)
282,654- 766-123-B

UK2OAA(2 oprs)
162,336- 608- 89-B

YO4KRF(YO4s ATW,XF,oprs)
114,840- 348-110-B

4NØRA(YU1s OFT,OND,OOW, OPI,oprs)
1,105,200-1842-200-C

YU2CBV(YU2RRA+2 oprs)
612,408-1292-156-C

Y39ZO(Y39s XO,UO,oprs)
1,143,882-1842-207-C
Y35ZK(Multiop)
61,254- 246- 83-B

North America

FMØFOL(W6s KG,QL,oprs)
1,839,960-2280-269-B

KL7HFV(+N6IV)
1,064,028-1484-239-C

Oceania

KH6IFY(WH6s AML,AMM, AMS,oprs) 1200- 25- 16-B

DX - CW

Multioperator Multi-Transmitter

Asia

JF1ZRQ(JG1GGU,JH1CNT, JI1PYO,JR1RNC,oprs)
1,465,893-2211-221-B
JH2ZKT(JA2s FKV,GIT,GWF, oprs) 437,373- 873-167-B
JA1ZIK(JA3VXH,JA4FGD, JA9DGP,JH6OPP,oprs)
417,474- 860-162-B

Europe

OH1AF(OH1s EH,HS,KA,oprs)
875,502-1569-186-C

North America

NL7M(+AL7BM,KL7IVX)
2,967,750-3957-250-C

Check Logs

AA4M,ACØE,AH6K,AK2H,CX7BU, CX8DT,DK3DI,DL5TI,EA3RCI, EA5AMW,EA8ZS,G3XWZ,HA1KVK, HA2KSD,HA3KGY,HA7PF, HA8KUL,HA8KVG,HA7MY, HL9RD,JA7ECT,JI3DBQ,K1DW, K1KI,K3NCO,K3SWZ,K3TGM,K4AJV, K4CHN,K5OEC,K6FM,K8HV, K9QXY,KA1EUL,KA2HZN, KA2KGD,KA3EVR,KAØCTJ,KB7KN, KC8A,KD6JY,KG4WM,KK2E, KL7LI,LA4TG,LA6LX,LA7XB, LA7ZN,LA8CJ,LB1GB,LZ1FI, LZ1GC,LZ1HY,LZ1MS,LZ1RN, LZ1ZF,LZ2CC,N1API,N1BDB, N1NN,N9BWI,OA4SS,OH1EH, OH1SZ,OH4MM,OH6UM, OK1ASQ,OK1AVG,OK1DIB, OK1KPY,OK2BCJ,OK2BOB, OK2SOS,OK3CQH/P,OK3KJF, OK3TDO,OX3CS,OX3RA,OY1A, OZ6PD,OZ7KV,OZ7KV,OZ9JX, PA3AFF,PA3AFL/A,PA3ALG, PA3ASC,PAØCF,PAØWAD, P(1)RC,RA3DPD,RB5GCJ, SK6AW,SM3DXV,SM3BDB, SM5ARG,SM5ARR,SM5BDL, SM5BFJ,SM5LI,SM6AYM, SM6LRR,SM7FSV,SM7IWN, SP1GGX,SP2FUA,SP2GGZ, SP2LLO,SP3XR,SP4BYQ, SP5EAQ,SP5ECZ,SP5ENA, SP5GIQ,SP5LGT,SP5LM, SP6CZ,SP6DYD,SP6JIR,SP6JZB, SP7CJS,SP8BAB,SP8FNA,SP9EML, SP9HZF,SP9PZF,UA1NBF, UA1TBG,UA1ZBP,UA2FEA, UA3ACD,UA3ADO,UA3AGL, UA3AHF,UA3AIO,UA3DAM, UA3DFV,UA3DJS,UA3DLG, UA3ESN,UA3PAV,UA3TAG, UA3TAM,UA3TBX,UA3TEW, UA3XBB,UA4ACA,UA4ACP, UA4AGH,UA4HAN,UA4HBR, UA4HFG,UA4HLX UA4PAB,UA4YAT,UA4YAZ, UA6APP,UA6AQJ,UA6EAE, UA6HFO,UA6JAV,UA6JWW, UA9OBJ,UA9OEQ,UA9UGU, UA9UOF,UA9WFB,UA9XS, UA9XSQ,UA9YFA,UA9YFD, UA9FHK,UAØBBT,UAØKBO, UAØKBZ,UAØLAF,UAØLDI, UAØQQC,UAØQDI,UAØQWI, UAØZCY,UB5AAT,UB5ABJ, UB5EQJ,UB5EU,UB5FAP, UB5FDF,UB5GEI,UB5JFX, UB5LEE,UB5RAF,UB5RCF, UB5UCH,UB5UCH,UB5VAG, UB5WOD,UB5ZAT,UB5ZBQ, UC2ACL,UC2CFA,UC2WBJ, UD6DHC,UF6CX,UH8EAA, UK1AFA,UK1ZAB,UK2BBK, UK2RAQ,UK3RAD,UK3DAH, UK3WAF,UK4AAD,UK4HBB, UK4QNZ,UK5DAA,UK5FAB, UK5FAD,UK5MAG,UK6MCP, UK5QAA,UK5ZAC,UK6ACR, UK6LAZ,UK6PAG,UK9CCE, UK9HAC,UL9SAV,UK9UAQ, UK9XAN,UKØSAW,UL7NAA, UP2BHI,UP2BV,UP2OU,UR2RKG, UR2ZN,UT5LN,UV3FD,UV3MM, UV9WF,UW3PU,UW3ZU,UW6CF, UWØMF,VE1RH,VE3DGX, VE3DIZ,VE3IKN,VO2CW, VK2DID,VK6AJ,W1PWK,W1SIY, W1YCW,W2HAZ,W3AUR, W3GRK,W3NQC,W4NOS,W6DWI, W6HPB,W7YF,W8RV,WØCHJ, WA2WRE,WA4BTG,WA9GFR, WB2YQO,WB4BBH,WB4RUA, WB5QPH,WB6HGH,WB8YQX, WB9OKN,WB9ZED,WD8RNQ, WD9HTN,WDØBZR,Y21DH, Y21HI/A,Y21YH,Y22JO,Y22TD, Y22UB,Y23VB/A,Y24XJ,Y24WL, Y26XM,Y27OL,Y27GL,Y33TA, Y34YF,Y43XL,Y53XM,YU2QU, YU3TVQ,YU7FFT,YV1ANT, YV1OB,YV3AZC,ZL2GZ,ZS6AJS, 4S7MX

Disqualifications:

CW
AB1A, W3GG, AJ7S, K7OX, K9DX, OK1FCW, SM6ADW, YU2BOP, 4Z4RG.

Public Service

Conducted By Robert J. Halprin,* K1XA

The Art of Net Controlling

One of the most essential parts of a traffic or emergency net is the character and skill of the net control station (NCS). The NCS has command of all net activity and shapes the efficiency (or inefficiency) of net operation. There are many qualities an NCS must have to meet the objectives. Some are predetermined and are contained in ARRL publications such as *Operating An Amateur Radio Station* and *The ARRL Operating Manual*. Others are gained through added knowledge and experience at different net levels and modes. I will endeavor to define the art of highly effective net controlling and to encourage recognized techniques.

A good portion of my own experience has been with cw nets at all levels of the National Traffic System (NTS). I have, at times, controlled phone nets during emergency operation. In either case (cw or phone operation), all of the following general rules of net controlling apply:

1) Call the net promptly at the appointed time. If possible, notify your alternate or Net Manager in advance if you cannot meet your appointed schedule.

2) Keep a written record of the situation and traffic list of each station in a systematic form. If the traffic is heavy, you will become confused unless you use an organized recording system.

3) Know where each net participant is located and what traffic he/she can handle. Don't find yourself constantly having to ask stations what traffic they can take.

4) Excuse from the net promptly (or within an agreed-on time limit) each net operator who is free of traffic.

5) Make your directions clear and concise, using as few words as possible. On cw, use Q signals whenever applicable. On phone, use language direction, not Q signals.

6) Keep your sending under control. Too hasty sending is usually sloppy sending. Don't send any faster than the speed of the operators in the net. They will just ask for repeats. On phone, speak with clarity and deliberate enunciation.

Rules 2 and 3 are exceptionally important and deserve further mention. Keeping a written record in systematic form is of great importance and cannot be overemphasized.

A typical net control log form is shown here. This format has proven to be very adequate to record all activities during my function as NCS for the Pacific Area Net (PAN). PAN operates on a strict National Traffic System timetable, with a large volume of traffic and rate (ratio of traffic handled to length of net session in minutes; i.e. traffic ÷ time). The net control log allows me to record all net activity quickly and accurately, and in a systematic manner.

Most of the information is self-explanatory. In the appropriate column, note the area or region or TCC function represented by each station to send and/or receive traffic. As stations are sent off frequency to clear traffic, the frequency location (distance from the net frequency) is recorded in the "up" or "down" column. As traffic is routed, I check (✓) it, and when the station(s) returns indicating the messages were cleared, I draw a line through the listing. Some NCS operators prefer the use of colored pencils to show more distinction between routed and fully cleared traffic. This is adequate, but you must use two or more different pencils or pens; with the check and line-out method you use only one. [In a method popularized by K2KIR, hex nuts or buttons are used — see page 41 of *The ARRL Operating Manual* for complete details. — Ed.] When practical, the smaller traffic listings should be routed first. In unusual circumstances, traffic should be handled in order of Emergency, Priority, Welfare and Routine precedence, the definitions of which are contained in form CD-3, available from Headquarters for an s.a.s.e. At the close of the net session, the NCS report to the Net Manager is readily available from the information recorded in the NCS log.

When directing a net on cw, use of the QN signals is extremely important. (A list of Q signals and cw abbreviations comprises form CD-218, also available for an s.a.s.e.) Much time is wasted by long-winded instructions by the NCS. An example of this is shown below. Note how the same direction is greatly shortened in example B.

A) N6TR GO UP 5 AND SEND 3 LOS ANGELES TO WA6YBT AFTER W6IPL.

B) N6TR QNQ UP 5 WA6YBT LA 3.

Minimum use of full call signs also speeds net operation. Full identification is required only every 10 minutes. The call-letter suffix or other short designation is all that is necessary to identify your station to the NCS at other times. I use JV since my call-letter suffix is just an A.

There are many net control stations in our field organization who display excellent examples of skillful net controlling. Younger or newer (or ever older) operators can easily spot the better nets, within the context of the points I've mentioned. "Getting your feet wet" will be a little easier by your knowledge of the art. An efficient net with snap and precision is a beauty to behold. Great pride can be taken by the NCS in leading the net to a successful and recognized end. — *Jerry L. VerDuft, AD0A*

Typical Net Control Log Form

QNN _____

QND _____

QNF _____

PAN NET CONTROL SHEET

3675 kHz

All dates and times are Zulu

Date _____

UP								TRAFFIC							DOWN		
20	15	10	5	Funct	CALL	in	out	CAN	EAN	RN6	RN7	TWN	Other	QTC	5	10	15
				Stn G													
				Stn H													
				RN6R													
				RN7R													
				TWNR													
				Stn I													
				Stn J													
				RN6T													
				RN7T													
				TWNT													

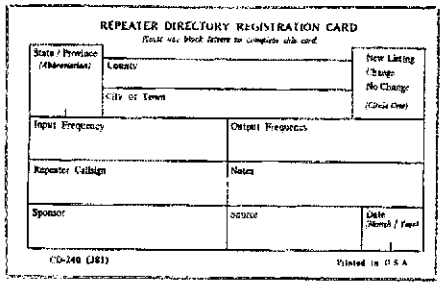
*Assistant Communications Manager, ARRL

THE FEELING THERMOMETER

It's not too late to return the "Public Service" column survey ("The Feeling Thermometer"), which can be found on page 79 of July 1981 *QST*. The response has been good, yet many of you have not had the opportunity to return the survey, owing to vacations and such. So why not take a moment and complete and mail the questionnaire (to the attention of the conductor)? Just reach for your July issue, and you've got it made. We'd like to hear from as many of you as possible, with the goal being to make improvements in the column that *you* have recommended. Incidentally, it is not necessary to carve up your July issue. Any reasonable facsimile of the survey — a photocopy, a piece of scrap paper, even a cocktail napkin — is more than acceptable. Your conductor is not at all particular about the format in which your answers are rendered. The important thing is to get your opinions concerning the "Public Service" column on record.

REPEATER DIRECTORY DEADLINE LOOMS

The deadline for registering your repeater for the next edition of the ARRL *Repeater Directory* is November 1, 1981. Repeaters must register annually to be included. Please register your repeater on form CD-240 (see page 70, September 1981 *QST*). Additional copies of CD-240 are available for an s.a.s.e. Send all registration information to the ARRL Communications Dept., 225 Main St., Newington, CT 06111.


REPEATER DIRECTORY REGISTRATION CARD

(Print or type block letters to complete this card)

State / Province (Abbreviation) | County | New Listing / Change / No Change (Circle One)

City or Town

Input Frequency | Output Frequency

Repeater Callsign | Notes

Sponsor | Address | Date (Month / Year)

CD-240 (3/81) | Printed in U.S.A.

Register your repeater for the next edition of the ARRL *Repeater Directory* on form CD-240.

PUBLIC SERVICE DIARY

☐ Worcester, Massachusetts — April 24-25. During the 23rd New England Square-Round Dance Convention, The Central Massachusetts ARA provided support communications between 13 locations in and around the Worcester Auditorium. Nearly 50 amateurs participated, and over 100 formal messages were handled during the two-day affair, which had an attendance of 9000 plus. (WIDOY, EC South Worcester Co.)

☐ Mount Ranier, Washington — May 6. WA7IFV encountered a woman who had lost control of her car and had an accident resulting in personal injury. WA7IFG put through a call for help over the K7OSM repeater. KA7FIG responded and called for the State Police and Fire Department units. (W7CDM)

☐ Enid, Oklahoma — May 9. Two youths were thrown into the water after sailing a boat down a Flood Control Stream (at near-flood level) and losing control. One of the boys was rescued immediately. During the search for the other youth, the Enid ARC was called in to help with communication liaison between the site and police headquarters. (WA5FSN, SCM Oklahoma)

☐ Paramus, New Jersey — May 16. While mobile on Rte. 17, WA2DWB came upon an accident involving a car and a gasoline tank truck. Using W2AKR/R he contacted K2MHP who, in turn, notified police of the situation. Fire and rescue units soon arrived, and fought the rapidly spreading flames. (WA2DWB)

☐ Meriden, Connecticut — June 21. While tuning across the 20-meter band, N1API heard a MAYDAY call from HP2XMJ, located on an island off Panama. HP2XMJ advised that her husband was in a state of shock after being beaten and shot. She wanted her doctor in Panama to arrange for a medical evacuation. With the help of the telephone company, N1API was able to immediately contact the doctor (who turned out to be HP2XPV) by long distance, and he came up on frequency. Owing to propagation, however, HP2XMJ and HP2XPV could not copy each other. N1API served as relay until a helicopter arrived and airlifted the injured man to the hospital. (N1BLL)

☐ Fremont, Nebraska — June 25. Late at night, WØUA became stranded with a dead car battery and a defective voltage regulator. He contacted WAØHBS using a hand-held transceiver. The local sheriff was notified of the situation, and help was sent immediately. (WDØBVH)

☐ North Augusta, South Carolina — July 7. A search was initiated for a plane on fire and which had allegedly crashed in the area. Members of the North Augusta-Belvedere Radio Club were requested to assist with both the hunt and communications. No plane or crash site were found and the authorities speculated that the plane had dove in an attempt to extinguish the flames and recovered at near treetop level. (WB4NBK)

☐ Kansas City, Missouri — July 17. Two catwalks at the Hyatt Regency Hotel collapsed, killing over 100 persons. Within an hour after the tragedy, an emergency net was in session. Many amateurs were posted at several area hospitals. During the next few hours and into the next morning, these stations handled over 125 messages that accounted for 157 of those at the hotel. (KØRWL, SCM Missouri)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Wilsonville, Alabama — May 20. A chemical plant near Childersburg exploded, and deadly fumes were sent toward Wilsonville. After evacuation was warranted, the Shelby County ARES members supplied communications to the relief site at nearby Columbiana until the "all clear" was sounded. (N4DMA, EC Shelby Co.)

☐ Boise, Idaho — May 29. While listening on 20 meters, KI7K came upon a distress call from the fishing boat "Junita." The skipper's hand had been caught in some machinery, and required immediate medical attention. KI7K called a local hospital for first-aid advice, and relayed the information to the "Junita." Following the self-treatment, the skipper sailed the vessel to Midway Island, the nearest medical center. (W7JMH, SCM Idaho)

☐ Churubusco, Indiana — June 8. When a tornado struck the local area and knocked out power and telephone service, the Whitley County ARES Net was activated on WB9VLE/R. Communications were provided for the police and Red Cross. Hams with mobile facilities assisted with missing persons' hunts until all involved were located. (N9EV, EC Whitley Co.)

☐ Riverside County, California — June 15. During a breakout of fire storms, the Volunteers-In-Prevention (VIP) group found itself supplying crucial communications for California Department of Forestry officials. Additional radio channels were required because of the overload that was caused by multiple operations. (A16I, EC Riverside Co.)

☐ Cardington, Ohio — June 23. Four people were killed, several were injured and most of the town's business district was destroyed by a tornado. K8DDG, located at Red Cross Divisional Hq., was put into operation soon after the storm ended. The COARES Net was activated to assist the NWS with reports. Five ARES members were sent to the scene to set up a direct radio link with the Red Cross to Cardington. Thirteen more members arrived the next day to help out, and stayed until normal communications were reestablished. (W8BKO, DEC Central Ohio)

☐ Bellaire, Ohio — June 30. After a storm knocked out power lines leading to the Fire Department, WD8CBC and WD8JIK unloaded their generator, which was used for Field Day earlier in the day, and provided communications until normal means were restored. (K8AN, SEC Ohio)

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For July, 31 SEC reports were received denoting a total ARES membership of 19,049. Sections reporting were: Al, Ariz, Colo, Ill, Ind, Kans, Ky, La, Me, Mich, NH, NLI, NTex, Ohio, Org, RI, SV, SDgo, SJV, SCV, SC, SFla, Tenn, Utah, Va, Wash, WMass, WNY, WPa, WVa, Wis.

REPEATER LOG

According to reports received between July 21 and August 21, the following repeaters were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Fire	Public Safety Events	Drills/Alerts	Power Failures	Total
W1PW						1				1
WR1AHQ							1			1
N1CB							1			1
KA1C						1				1
W1XJ					1	1	3			5
K1FFK						1				1
K1ZZN				3		1				4
KC2CY	3			4		1	1			9
WB2IID							1			1
WA2HWW							1			1
AB2S	1						1			2
KB2IQ	1						1			2
WB2NQV	1		2	1			1			5
WB2ZII							1			1
W3URL							1			1
WB3III							1			1
WR3ABM	1									1
K3OIH							1			1
K3SPI							1			1
W3NBN							1			1
K3JSZ				2			4			6
W3CWC	7	5	1	8	2		5		2	31
WA3ZXG	2			1			8	11		22
W3UER	2		1	4						5
N3AIA		1		2	1		1			5
W4RQC								1		1
WB4DAQ								1		1
W4HFH							1			1
K4HY								1		1
WR4AZD							1			1
WB4FUS								1		1
WB4LET	1			3						4
KA4BGA				3						3
W4LBL	4		3	31	1					39
WB5VFF				1						1
W5RVT			1	1					1	3
WB5RDD				1				1	3	5
W6ASH							1			1
K6KSU								1		1
WB6PUB								1		1
WB6PVS				2			4	3		9
WR6AEN		1	3	19	3					26
K6IS		1		10	4					15
W6IYY			2	5			5	2		14
WA6EUZ				11	1		1			13
WA6WTT		2		6				1		9
WA7KGT				2						2
W7WGW		1	2	1					1	5
K7CC				8	1			4		13
W8NXD			1				5	2		8
WR8AES							4	3		7
WA8ULB	2			1					1	4
KB9WC								1		1
N9AHP	3					1		1		5
WRØAEZ								1		1
WRØAEV								1		1
WBØSBH	3							1		4
WRØAFT	4							2		6
WØVQR	1		1							2
TOTAL	34	11	17	130	13	2	47	57	8	319

NATIONAL TRAFFIC SYSTEM

The Boy Scout Jamboree, K2BSA/4, provided unusually high traffic totals for the month of July. The 16th annual traffickers' picnic at W2MTA's palatial estate was a huge success — KA2KWY won the gold medal in volleyball after W2MTA withdrew from the competition with a pulled muscle. The Ninth Region has implemented an excellent interface between cycles two and four. 2RN/c2 has completed its fourth consecutive "perfectly reported" month. WB5YDD and KA4MZY are new managers of RN5/c2 and 9RN/c2, respectively. The Central and Pacific area staffs have scheduled their meetings for the same weekend — October 3 and 4. CAS is meeting in Houston, PAS in Denver. WB4SGV, longtime net control on EAN/c4, is QSYing to Oman (A4). RN7/c4 certificates were earned by N7AFZ KA7AOB WA7BZY N7CSP W7FJZ VE7CJ VE6CHK VE7CSI VE7FAZ AD7G W7HKE W7HNA WA7IHS KL7JEB KB7JW K7JV WA7LGN W7LNE AC7P W7TC W7TGU WB7TQF K7WPC K7ZIG AJ7X W7ZB. EAN/c2 certificates were earned by W2MLC KB2HM WB2IDS N2YL WA2FJJ WA2MFV W2MTA.

July Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	1051	33.9	.726	89.2	
CAN	31	899	29.0	.335	100.0	
PAN	46	472	9.8	.320	70.4	

Region Nets						
1RN	54	189	3.5	.265	65.4	100.0
2RN	62	243	3.9	.223	92.5	100.0
3RN						45.2
4RN	62	498	8.0	.309	79.0	96.8
RN5	31	351	11.3	.317	92.3	100.0
RN6	91	529	5.8	.228	77.0	77.4
RN7	59	369	6.3	.451	100.0	67.7
8RN	61	306	5.0	.308	79.2	100.0
9RN	62	410	6.6	.327	100.0	100.0
TEN	30	210	7.0	.191	56.6	100.0
ECN						93.5
TWN	60	184	3.1	.278	55.2	66.1
TCC						
TCC Eastern	108[1]	635				
TCC Central	76[1]	411				
TCC Pacific	82[1]	347				
Cycle Four						
Area Nets						
EAN	31	1580	50.9	1.114	93.0	
CAN	31	762	24.6	.510	100.0	
PAN	31	1265	40.8	1.058	98.3	
Region Nets						
1RN	53	606	11.4	.510	87.7	93.5
2RN	92	611	6.6	.443	97.2	93.5
3RN	62	370	5.9	.552	96.2	80.6
4RN	57	799	14.0	.544	83.4	100.0
RN5	62	610	9.8	.400	88.7	100.0
RN6	62	745	12.0	.381	98.0	96.8
RN7	62	679	10.9	.828	99.1	100.0
8RN	60	440	7.3	.390	95.0	100.0
9RN	62	472	7.6	.348	98.0	100.0
TEN	62	300	4.8	.295	76.7	100.0
ECN						90.3
TWN	62	507	8.2	.364	89.4	98.4
TCC						
TCC Eastern	86[1]	576				
TCC Central	80[1]	336				
TCC Pacific	114[1]	833				
Sections[2]	6579	25,918	3.9			
Summary	8050	44,513	5.5			
Record	8336	45,072	15.2			

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (227): APSN ATN (AB), ABN ASN (AK), AENB AEND AENK AENM AENZ (AL), APN ARN OZK (AR), ATEN HARC (AZ), NCN NCTN SCN (CA), HNN (CO), DEPN DTN (DE), FAST FMSN FMTN FPON FPTN MEN PEN QFN QFNS SPARC SWFTN TPTN (FL), CGVHFN CVEN GCN GSN GSSBN GTFCN (GA), I75MN ICN ITEN TLCN (IA), BSN IMN MTN (ID/MT), ICN ITN QIN (IN), KPN KSBN QKS (KS), 4ARES 5ARES 6ARES 11ARES BARES CARN KEN KNTN KPON KRN KSN KTN KYN MKPN PAEWTN SEKEN TSTMN (KY), LAN LEN LRN LSN LTN (LA), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN NENN RIEM MTN WMBCETMN WMFN WMN (MA/RI), MEPN MTN WRIN (MB), MEPN (MD), AEN MPSN MSN NMPN PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), NEMOE (MO), CMN CN CNCTN CNN JFK M2MEM NCSSBN PCTN RARS THEN (NC), MNARES NCHN NE4ϕ NE75 NQCN NSN PARC2MN WNN (NE), GSFMN GSPN NHN (NH), JSARS NJN NJPN NJSN NJVN NWNJVN ONTTN SJVN SOCTN UCETN (NJ), BC NMRRN SWN Y2MN (NM), NSN (NV), CDN CNYTN EPN HVN NLIPN NLIVHF NLS NYS OCTEN STAR WDN (NY), ALERT BN BRTN COARES FRCN HCARES LCNWARES NOARC O6MN OSN OSSBN TATN (OH), OLZ OTWN STN (OK), KTN OLN OPN OSN QLN (ON), BSN LCARES ORARES OSN PDXARES PTTN (OR), EPA EPTN HARCTN NWPA2MTN PFN PTTN WPA WPA2MTN WPAPTN (PA), BR2MN LC2MN S2MN SCSSBN (SC), TNCW TNPN TNVHF (TN), DFW TEX TJN TSN TTN (TX), BUN UCN (UT), VLN VN VNTN VSBN VSN (VA), VTN (VT), IETN PSTS WSN (WA), WINC WINO WINS (WE/IN), BEN BWN NWTN WIN WNN WSBN WSSN (WI), WVARES WVFN WVMDN WVN WVNN (WV), WCN (WY).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

W2CS has succeeded W4SQQ as Eastern Area/c4 TCC Director. Welcome Gary, and hail and farewell Gil. Central Area/c2 certificates awarded to K4VM W5CTZ N5AMK WA5EQQ K5BNH and WDϕCID. Central Area/c4 certificates to W4ZJY W5RB W5SBE W5TFB N5BB N5BT N5RB N5TC K5GM K5TL W9CXY W9DND W9NXG WB9UYU WϕAM WϕHI KϕEVH and KϕEZ.

	1	2	3	4	5
Cycle Two					
TCC Eastern	124		87.0	1257	635
TCC Central	93		82.0	709	411
TCC Pacific	124		66.1	658	347
Summary	341		78.4	2624	1393
Cycle Four					
TCC Eastern	124		69.4	1154	576
TCC Central	93		86.0	659	336
TCC Pacific	124		91.9	1647	833
Summary	341		82.4	3460	1745

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (July) *Cycle Two* — Eastern Area (N2YL, Director) — K1s CE XA, N1BHH, W1s QYY XX, N2YL, K2PL, W2s CQB RQ XD ZOJ, WB2IQJ, K3JSZ, WB3GZU, K4DHX, WA4CCK, WB4PNY, AF8V, W8PMJ, WB8YDZ, VE3s ATU CWA GOL. Central Area (W9JUJ, Director) — WD4HIF, K4VM, W5s CTZ KLV, KA5BSN, N5AMK, WA5s EQQ INJ, WB5s NKC OXE YDD, K5s BNH KJN, W9s HOT JIJ JUJ, WDϕCID. Pacific Area (WϕHXB, Director) — W5JOV, KA5DDW, WB6EIG, KM6I, KT6A, W7s DZX GHT VSE, WA7GYQ, WϕS EJD HXB RE, WDϕAIT, KϕDJ, KDϕM, NϕBDE. *Cycle Four* — Eastern Area (W2CS, Director) — N1BHH, W1s EFW KX NJM QYY, K1s BA EIR GN SSH XA, WB1CPF, W2s CS FR GKZ MTA RQ XD, K2NY, WA2s ICB SPL, W3s FAF PQ, WB3GZU, W4s JK UQ, K4s BKX KNP ZK, KB4N, WB4PNY, N4s KB NK, W8PMJ, WB8WTS, K8KMQ, KC8C, VE3s ATU CWA GOL. Central Area (W5GHP, Director) — W4ZJY, W5s RB SBE TFB, N5s BB BT RB TC, K5s GM TL, W9s CXY DND NXG, WB9UYU. AEϕR, WϕS AM HI, KϕEZ. Pacific Area (KϕDJ, Director) — N5NG, W5KH, N6s GW PZ, W6s EOT OA VZT, WB6PVH, KN6C, KT6A, K7s HLR KSA, KB7JW, W7s DZX EP GHT LYA VSE, WA7GYQ, KϕS BN DJ, KCϕD, WϕS HXB LB OGH, WDϕAIT, VE7ZK.

Independent Nets (July 1981)

	1	2	3	4
Amateur Radio Telegraph Society	31	403	247	
Clearing House	31	245	361	
Early Bird	30	835	367	
Hit and Bounce	31	157	300	
IMRA	27	411	1077	
Midwest RTTY	24	32	130	
Mission Trail	31	403	1360	
New England Teleprinter	11	105	44	
North American Sideband	25	74	219	
Southwest Traffic	31	75	1170	
20-Meter ISSB	27	1027	602	
75-Meter ISSB	31	483	964	
7290 Traffic	49	579	3057	

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll July 1981

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 SCM). 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, max. 5. This listing is available to Novices and Technicians who achieve a total of 40 or more points.

932
KA9CPA
176
N1BHH
171
KA3T
165
WD8LRT
159
W2AHV
153
W7LRB
150
KAϕAID
148
WD4COL
W2GLH
KA1ON
WD4HIF
140
KZ4K
139
WA4PFK
138
WB3GZU
130
W7VSE
128
W9JUJ
123
KB2HM

121
W2XD
AD7G
120
KA8CPS
119
W7LNE
AG2R
KAϕE
118
W9YCV
117
W9DM
NJ4L
116
WA5RVT
115
WB4FVV
114
WP4AOH
113
NP4F
KA3CDQ
111
KA1FE
110
WA1TBY
108
KB2KW
WA4JDH
KY4K

107
W2MTA
NG4J
106
WB1HIH
WA4STO
AK1W
KA1BBI
104
WB2EAG
KA4ASZ
WA2SPL
WA4PIZ
WA2KOJ
103
WA5RKU
AF8V
N8BJD
102
KA2GSL
WD4AWN
KA4LNA
WD4ALY
101
WB8JGW
KC9CJ
WA3WIY
KB5NX
100
N5AMK
KB2WI
WDϕAIT
99
W5DTR

W4NWM
98
W1EOF
WB7DZX
AA4FG
K4JST
97
WB1GXZ
AG9G
KA4GFU
WB5MMI
N2APB
W4ANK
96
K5CXP
K3RZR
WA4CCK
WA4UTC
95
N9BYK
WϕOYH
WD5JYI
94
KC1G
WB4TZR
WD8IBY
K3JL
93
W5JOV
W2YJR
N6GW
KT6A
WB8MTA

VE3GT
W1TN
K7GXZ
WD4CNQ
92
K3JSZ
91
W7GHT
VE3GOL
KN6C
K4IWW
N1NH
90
W4CKS
N6AWH
N4EDH
W4WXH
WA4SRD
89
N1ARI
W4GPL
W3VA
WϕFT
K5ZC
88
KK8L
K9BVE
N5RB
87
WB4FDT
W4OGG
86
N9AUG
WϕKJZ
KB4OZ
N2BNB
VE3DPO
K5TL
W6NTN
85
VE2PJ
W2ACQ
K8OZ
WB8YDZ
W6ASH
W7FJZ
84
N2CER
WB3CAI
W5CTZ
KϕDJ

83
W5VMP
KA2BHR
82
WA7LGN
W5KLV
81
KF4U
WA4EYU
WD8RHU
AF2L
80
WB9YPY
WA7IHS
79
KD4DC
WB4AID
K1BSO
WB5YDD
KA2CTU
78
WB7OEX
KF8J
WA4EIC
KA7JEX
77
WB2MCO
WB4WYG
KA4MZY
76
N5TC
N2CFF
K4ZN
75
K2VX
WB3FKP
KBϕMB
74
N2BDW
KK2R
WB6QBZ
73
KB5EK
VE3HTL
WA2SEL
WϕHXB
71
KA9HPQ
KB7JW
KC5SF
WB2IDS

W6CPB
70
WB9YPZ
WA7GYQ
KA5AVQ
K1NAN
N2BXB
WA6LVO
69
WA8HGH
WA4GAL
W9IEM
68
AA4EI
VE3KK
KCϕZ
KA9IKR
KB3DT
AC3N
KG9B
67
WD8PEI
WB4RUJ
N3AZT
AA3B
AFϕO
WϕOTF
W4ZJY
WB1ABQ
W6RNL
66
W8VPW
W5SBE
WA2ZJP
WB7TQF
WD9DHF
KA2BKF
65
WA8JNQ
K4EV
WBϕHOX
WA8GMT
VE2EDO
64
N4PL
WA4QXT
WD4BSC
WA3WQP
WAϕEMX
63
W4BSP

W1TM
WA7DPK
KC5FX
W9JIJ
WD5AAH
W1RWG
KA8HOK
62
W1BJ
KB6OT
61
NP4D
N4UF
W4HON
WA8DHB
VE3HOI
VE3BVG
WϕOUD
K4VWK
KA2CLQ
KS6T
WD4JJK
W8GGX
60
KA4BBA
WA8PIM
VE3LDU
WA4LJI
KA3DTE
KB2GT
WA6WZO
K5DY
W8EK
WϕOGH
57
KA5IWF/T
52
KA5KRI/T
KA8DEZ/N
51
N8ADA/T
50
KA2HNQ/T
WD9ERN/T
42
KA4SAA/N
KA4AUR/N
KA4IKH/N
40
KA8GVZ/T

Brass Pounders League July 1981

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

	1	2	3	4	5	6
W3CUL	930	930	1351	61	2984	
WϕWYX	31	1227	431	796	2485	
KA9GPA	43	1043	171	873	2130	
NϕBQP	29	830	176	494	1529	
W9JUJ	2	738	746	27	1513	
WAϕHJZ	31	766	31	520	1348	
WB4PNY	202	209	507	2	1010	
WA4JDH	4	483	421	7	915	
KA3DTE	359	46	410	3	818	
WD4HIF	6	360	366	52	784	
WB6EIG	12	365	360	5	742	
W7DZX	2	340	347	4	693	
WP4AOH	126	325	266	58	675	
WB3GZU	27	112	219	37	675	
W7VSE	9	356	262	41	668	
N1BHH	0	313	269	70	652	
W3ATQ	2	312	305	8	627	
K9BVE	18	275	293	16	602	
W3VR	214	108	270	90	601	
KA8CPS	194	147	189	63	593	
KT6A	1	285	289	4	579	
WA4STO	5	267	299	0	571	
KS6T	36	246	274	8	564	
KA4ERP	232	58	228	35	553	
NG4J	27	289	200	22	539	
W5KLV	0	263	268	7	538	
AF8V	4	254	247	26	531	
WB2EAG	0	267	251	8	528	
NP4F	104	159	163	96	522	
WD4COL	122	119	224	52	517	
WAϕTFC	5	272	238	0	515	
WD8LRT	162	145	143	64	514	
KY4K	9	281	201	17	508	
KBϕMB	11	259	201	33	504	

BPL for 100 or more originations plus deliveries:

WD4SIG	289
WP4BDS	130
WA4NIF	121
KAϕAID	121
W1YI	119
W7LRB	115
K7NTS	115

Multioperator station:

WA6WZO	152

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

W1AW Schedule

October 25, 1981-April 24, 1982 **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
	RTTY 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.
	RTTY Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
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.
	RTTY Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
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.
	RTTY Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice and cw bulletin frequencies: 1.835, 3.58, 7.08, 14.08, 21.08, 28.08, 50.08, 147.555 MHz.
RTTY bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.835, 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 February 1980 *QST*, pages 9 and 82" 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 page 82.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

Cw bulletins are sent at 18 wpm; Teletype bulletins are sent at 60 wpm with 170-Hz shift, then repeated on 110-baud ASCII.

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 your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, RTTY at 15 minutes past the hour, and cw on the half hour.

W1AW will be closed on November 26, December 25, January 1, February 15 and April 9.

Station staff: Chief Operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Chris Schenck, W1EH; Charles Chadwick, K8AXL.

SCM ELECTION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, San Diego, South Dakota, Louisiana, North Carolina, Virginia, Pacific and Maritime/Newfoundland sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. 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)
Communications 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 Communications Manager for this Section for the next two-year term of office. (Signature . . . Call . . . City . . . ZIP . . .).

An SCM candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, December 4, 1981.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on December 31, 1981, returns counted February 16, 1982, and SCMs elected as a result of the above procedures will take office April 1, 1982.

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, 1982.

If no petitions are received for a section by the specified closing date, such section will be resolicited in April *QST*, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.

John F. Lindholm, W1XX
Communications Manager

REPEAT SCM NOMINATING SOLICITATIONS

Since no petitions were received for the Sacramento Valley section as a result of notices in the April and May *QST*, nominating petitions for this section are herewith resolicited. See the above notice for details on how to nominate. QST

*Communications Manager, ARRL

November Sweepstakes All-Time Records (through 1980 SS)

High-Power Phone

Division	*Call*	*Score*	*Year*
Canadian	VE5DX	289,050	78
Atlantic	K3UA	233,692	79
Central	K9CT	238,800	78
Dakota	KØZZ	274,800	78
Delta	W5WMU	249,232	80
Great Lakes	K8LX	223,200	78
Hudson	K2TR	276,150	78
Midwestern	K5JZN/Ø	222,592	79
New England	K1VTM	259,950	79
Northwestern	K7SS	286,950	77
Pacific	WA7NIN	318,792	79
Roanoke	K4VX	229,350	78
Rocky Mountain	KØRF	288,304	79
Southeastern	KP4Q	351,796	79
Southwestern	N7DD	309,320	80
West Gulf	K5JA	257,400	78

High-Power CW

Canadian	VE7CC	173,550	78
Atlantic	K3LR	178,192	79
Central	W9RW	155,550	78
Dakota	KØZZ	171,828	78
Delta	K5GO	171,600	78
Great Lakes	K4GSU	169,458	76
Hudson	W2GD	180,264	78
Midwestern	NØGA	156,300	78
New England	K1GQ	177,304	78
Northwestern	K7RI	167,608	78
Pacific	WA7NIN	181,892	79
Roanoke	K4VX	168,900	78
Rocky Mountain	WØUA	185,900	77
Southeastern	KP4RF	193,732	77
Southwestern	W6AM	182,646	77
West Gulf	AA5LES	182,780	76

Low-Power Phone

Canadian	VE4OY	145,950	78
Atlantic	W2KI	151,950	78
Central	W9OBF	134,612	77
Dakota	KØFRP	153,476	79
Delta	N5DX	197,100	78
Great Lakes	W8TR	117,718	76
Hudson	K2UF	108,750	78
Midwestern	WØRR	166,848	80
New England	K1LL	172,568	80
Northwestern	K7SS	211,988	80
Pacific	WB6SHD	169,950	78
Roanoke	N4MM	175,500	77
Rocky Mountain	AA5B	207,612	80
Southeastern	KB4I	151,548	80
Southwestern	N7US	170,664	79
West Gulf	K5RHZ	148,000	76

Low-Power CW

Canadian	VE4VV	156,198	79
Atlantic	W2TZ	131,760	80
Central	WB9GFC	128,772	74
Dakota	NØNO	136,080	78
Delta	K4XU	141,300	78
Great Lakes	W8CQN	137,492	74
Hudson	N2IC	139,416	79
Midwestern	KØLUZ	130,378	79
New England	W1ZT	139,392	80
Northwestern	K7SS	133,792	80
Pacific	AD7K	135,780	80
Roanoke	N4DW	137,850	78
Rocky Mountain	N7DF	150,234	79
Southeastern	N4BP	149,850	77
Southwestern	AA7A	147,704	78
West Gulf	K5LZO	153,180	77

Information compiled by Tom Taormina, K5RC.

OSCAR Operating Schedule

	OSCAR 7			OSCAR 8			
Date (UTC)	*Orbit No.*	*Time (UTC) Hr Mn*	*EQX W. Long. (Degrees)*	*Orbit No.*	*Mode*	*Time UTC Hr Mn*	*EQX W. Long. (Degrees)*
1 Oct.	31,462	0112	100.0	18,211	A	0000	65.4
2 Oct.	31,474	0011	84.8	18,225	A + J	0005	66.6
3 Oct.	31,487	0106	98.4	18,239	J	0009	67.8
4 Oct.	31,499	0005	83.3	18,253	J	0014	69.0
5 Oct.	31,512	0059	96.9	18,267	A	0018	70.2
6 Oct.	31,525	0153	110.4	18,281	A + J	0023	71.4
7 Oct.	31,537	0053	95.3	18,295	X	0028	72.7
8 Oct.	31,550	0147	108.9	18,309	A	0032	73.9
9 Oct.	31,562	0046	93.7	18,323	A + J	0037	75.1
10 Oct.	31,575	0140	107.3	18,337	J	0042	76.3
11 Oct.	31,587	0040	92.2	18,351	J	0046	77.5
12 Oct.	31,600	0134	105.7	18,365	A	0051	78.7
13 Oct.	31,612	0033	90.6	18,379	A + J	0055	79.9
14 Oct.	31,625	0127	104.2	18,393	X	0100	81.1
15 Oct.	31,637	0027	89.0	18,407	A	0105	82.3
16 Oct.	31,650	0121	102.6	18,421	A + J	0109	83.5
17 Oct.	31,662	0020	87.4	18,435	J	0114	84.7
18 Oct.	31,675	0115	101.0	18,449	J	0119	85.9
19 Oct.	31,687	0014	85.9	18,463	A	0123	87.2
20 Oct.	31,700	0108	99.5	18,477	A + J	0128	88.4
21 Oct.	31,712	0007	84.3	18,491	X	0132	89.6
22 Oct.	31,725	0102	97.9	18,505	A	0137	90.8
23 Oct.	31,737	0001	82.7	18,519	A + J	0142	92.0
24 Oct.	31,750	0055	96.3	18,532	J	0003	67.4
25 Oct.	31,763	0149	109.9	18,546	J	0008	68.6
26 Oct.	31,775	0049	94.7	18,560	A	0012	69.8
27 Oct.	31,788	0143	108.3	18,574	A + J	0017	71.0
28 Oct.	31,800	0042	93.2	18,588	X	0022	72.2
29 Oct.	31,813	0136	106.8	18,602	A	0026	73.4
30 Oct.	31,825	0036	91.6	18,616	A + J	0031	74.6
31 Oct.	31,838	0130	105.2	18,630	J	0036	75.9
1 Nov.	31,850	0029	90.0	18,644	J	0040	77.1
2 Nov.	31,863	0124	103.6	18,658	A	0045	78.3
3 Nov.	31,875	0023	88.5	18,672	A + J	0049	79.5
4 Nov.	31,888	0117	102.0	18,686	X	0054	80.7
5 Nov.	31,900	0016	86.9	18,700	A	0059	81.9
6 Nov.	31,913	0111	100.5	18,714	A + J	0103	83.1
7 Nov.	31,925	0010	85.3	18,728	J	0108	84.3

Orbit predictions by Project OSCAR, P.O. Box 1136, Los Altos, CA 94022. To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW. AMSAT bulletins transmitted around 29.490 MHz on Mode A, 145.960 MHz on Mode B, and 435.160 Mode J, during O 7 and O 8 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz lsb); (international net at 1800 UTC Sundays on 14,280 kHz usb and 1900 UTC Sundays on 21,280 kHz).

O 7 progresses an average of 28.7372° W. per orbit in a period of 114.9415 minutes.
O 8 progresses an average of 25.8006° W. in a period of 103.1874 minutes.

O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesdays and Fridays — Mode A + J. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D. Mode A + J is simultaneous operation of both transponders.

Mode J Club

Become a member of the Mode J Club. Complete eight Mode-J contacts. QSL cards are not required. Just list the call sign of each station worked, date, orbit number and station equipment used. Send this information along with $3 in U.S. funds, a one-time charge to cover the certificate and newsletter costs, to Mode J Club, c/o Larry Roberts, W9MXC, 3300 Fernwood, Alton, IL 62002.

OSCAR 8 QSL

To receive an OSCAR 8 QSL card, send a copy of the telemetry from the 29.402- or 435.095-MHz beacons. Please send your report, along with an s.a.s.e., to ARRL Hq.

Spacecraft Frequencies

Spacecraft	*Uplink*	*Downlink*	*Beacon*
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz

Formulas for calculating approximate downlink frequencies. x = downlink frequency.

OSCAR 7

Mode A: x = uplink frequency − 116.450 MHz ± Doppler shift
Mode B: x = uplink frequency − 578.100 MHz ± Doppler shift

OSCAR 8

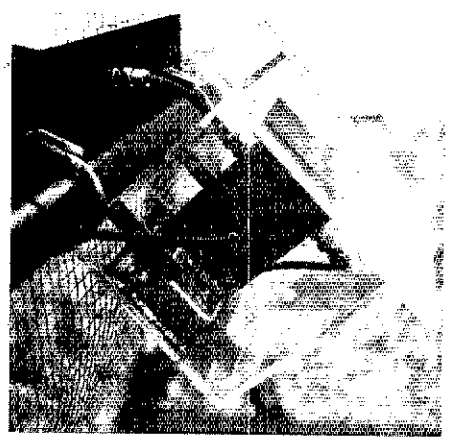
Mode A: x = uplink frequency − 116.458 MHz ± Doppler shift
Mode J: x = uplink frequency − 581.106 MHz ± Doppler shift

Note: A minus sign in front of the downlink frequency indicates that the passband of the satellite is inverted in that mode. This means that signals transmitted up to the satellite at the low end of the uplink passband will appear at the high end of the downlink passband. Additionally, upper-sideband signals transmitted on the uplink will appear as lower-sideband signals on the downlink.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL Hq. The all-new OSCARLOCATOR package is now available for $7 in the U.S., $8 elsewhere.

Strays

Nothing complements the right equipment and experienced operators more than a first-class tracking antenna. As the WA4NFY satellite antennas point almost directly overhead, spectators at the ARRL National Convention in Orlando, Florida, listen to the signals from OSCAR 8. If you find this type of Amateur Radio communication a challenge and want more information, or if you're an experienced satellite communicator and want to give a talk or demonstration, let us know. Write to the ARRL Club and Training Dept., 225 Main St., Newington, CT 06111. *(photo by WØCA)*



Shown here is a close-up view of the plastic box behind the 70-cm helix antenna shown last month on page 87. The desense filter construction is in the specialized communication chapter of the 1981 *Handbook*. The low-noise preamplifier construction details are available from the ARRL Club and Training Dept. for an s.a.s.e. To use this 70-cm antenna for transmitting, add an spdt coaxial relay at the input of the desense filter and run an additional coax cable to the shack. Another way to operate with transmit and receive in both directions is to install a dpdt relay. *(photo courtesy KA1FJR)*

I would like to get in touch with . . .

☐ former radio operators of the 334th Infantry Reg. Division who served from January 1943 to September 1945. Robert C. Phillips, WA8PSY, 1600 Lenox New Lyme Rd., Jefferson, OH 44047.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark Wilson,* AA2Z

OCTOBER

3-4

California QSO Party, Sept. *QST*, page 92.

JLRS Party Contest, Sept. *QST*, page 92.

VK/ZL/Oceania DX Contest, phone, Sept. *QST*, page 92.

10-11

ARRL CD Party, cw and phone, for Communications Department appointees. Details in the fall issue of *QCD*.

VK/ZL/Oceania DX Contest, cw, Sept. *QST*, page 92.

GARTG SSTV Contest, Sept. *QST*, page 92.

High Speed Code Test, Sept. *QST*, page 92.

21/28 MHz Contest, Sept. *QST*, page 92.

9-Land QSO Party, Sept. *QST*, page 92.

13

W1AW Qualifying Run, 10-35 wpm at 0200Z Oct. 14 (10 P.M. EDT Oct. 13). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. Underline one minute of the highest speed you copied, certify your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

17-18

AC-DC Contest, sponsored by the Canadian Ladies ARA from 1800Z Oct. 17 until 1800Z Oct. 18. Open to both YL and OM amateurs. Each station may be worked twice, either once on cw and once on phone, or on two different bands. Exchange signal report, QTH and name. Non-CLARA members count one point per YL QSO (three points if a bonus station). CLARA members count one point per QSO, YL or OM (three points per bonus station). Multiply by number of Canadian provinces/territories worked for final score. Suggested frequencies: phone — 3.775 3.900 7.200 14.280 14.160 21.300; cw — 3.690 7.035 14.035 21.035. Mail entries by Dec. 31 to Lynn Boothroyd, VE3LQL, 673 Tackaberry Dr., North Bay, ON P1B 8R1.

Jamboree on the Air, sponsored by the World Scout Bureau and the Boy Scouts of America. Look for activity all weekend on cw (3.590 7.030 14.070 21.140 28.190) and ssb (3.740 3.940 7.090 14.290 21.360 28.990).

Minnesota QSO Party, sponsored by the Paul Bunyan Wireless Assn., from 1700Z Oct. 17 until 2259Z Oct. 18. Single transmitter only; no crossband contacts. Phone and cw. No net QSOs. Exchange signal report and QTH (county for MN stations, ARRL section or country for others). Suggested frequencies: phone — 3.933 7.233 14.300 21.433 28.633; cw — 33 kHz up from lower band edge; Novice — 33 kHz up from band edge. Count one point per phone QSO, two points per cw QSO; MN stations multiply by number of sections and DXCC countries worked, others multiply by number of MN counties worked. Mail logs by Nov. 20 (include large s.a.s.e. for results) to: Steven Scott, WDØEPE, 801 6th St. North, Staples, MN 56479.

Pennsylvania QSO Party, sponsored by the Nittany ARC, from 1700Z Oct. 17 until 0400Z Oct. 18 and 1300-2200Z Oct. 18. Work stations once on each band and mode. Mobiles may be reworked as they change counties. No repeater QSOs. Exchange signal report, serial number and QTH (county for PA stations, ARRL section or country for others). Suggested frequencies: phone — 3.980 7.280 14.280 21.380 28.580; cw — 40 kHz up from lower band edge. Count one point per phone QSO, 1.5 points per cw QSO and 2 points per 80-meter cw QSO. PA stations multiply by total ARRL sections, PA counties and DXCC countries (max. 1) worked; others multiply by number of PA counties. Dupe sheets required for 100 or more contacts. Mail logs by Nov. 15 (include large s.a.s.e. for results) to: Douglas R. Maddox, W3HDH, 1187 S. Garner St., State College, PA 16801.

*Assistant Communications Manager, ARRL

QRP International QSO Party, sponsored by QRP ARC International, from 1200Z Oct. 17 until 2359Z Oct. 18. Entrants must take at least 12 hours off-time in 6-hour or greater periods. Work stations once per band, cw only. ARCI members exchange signal report, state/province/country and QRP number; nonmembers send power instead of QRP number. Suggested frequencies: 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110 50.360. Count five points per ARCI member QSO, two points per W/VE nonmember QSO, three points per Novice/Technician nonmember QSO and four points per non-W/VE QSO. Multiply QSO point total by number of states/provinces/countries worked per band. Multiply that total by power multiplier (4-5 watts out, × 2; 3-4 watts out, × 4; 2-3 watts out, × 6; 1-2 watts out, × 8; less than 1 watt out, × 10). Multiply that total by bonus multiplier (100% natural power with no storage, × 2; 100% battery power, × 1.5). Mail logs and proof of bonus multiplier (include large s.a.s.e. for results) to: William Dickerson, WA2JOC, 352 Crampton Dr., Monroe, MI 48161.

WA-Y2 Contest, sponsored by the Radioclub of the German Democratic Republic, from 1500Z Oct. 17 until 1500Z Oct. 18. Phone and cw, single or multioperator. 80-10 meters. Do not use first 10 and last 25 kHz of each band. Exchange signal report and serial number; Y2-9 stations send signal report and two-digit number indicating "Kreiskenner." Score three points per Y QSO. Multiply by sum of different districts worked per band (max. 15 per band). Districts are indicated by the last letter of the call sign (letters A through O; P = D, Q = I, R = L, S = M, T = N, U = A, V = A, V = H, W = G, X = F, Y = J). Mail logs (include signed and dated declaration that rules were followed) by November 19 to: Y21TL, RKDDR, Hosemannstr. 14, DDR 1055 Berlin, German Democratic Republic.

21-22

YL Anniversary Party, cw, sponsored by the YLRL from 1800Z Oct. 21 until 1800Z Oct. 22 (phone 1800Z Nov. 4 until 1800Z Nov. 5). YLs work YLs only. No net or repeater contacts. Work stations only once per contest. Exchange signal report, serial number and ARRL section or country. Count one point for QSOs in your ARRL section, two points for QSOs with stations outside your ARRL section. Multiply by total number of ARRL sections and DXCC countries worked. Multiply that total by 1.25 if running less than 150 W on cw (300 W PEP on phone). Mail logs by Nov. 14 to: Kay Eyman, WAØWOF, RR 2, Garnett, KS 66032.

24-25

CQ World Wide DX Contest, phone, sponsored by *CQ Magazine*, full 48-hour period UTC. 160-10 meters. Single operator, single or multiband; multioperator (all band only), single transmitter or multitransmitter. Multi-single: only one transmitter and one band permitted during a 10-minute period. Exception: *one* other band may be used during the same period for working new multipliers *only*. Exchange signal report plus *CQ* zone. A station in a call area different from that indicated by its call sign is required to sign portable. A multiplier of one for each different zone on each band and a multiplier of one for each different country contacted on each band. You may work your own country and zone for multiplier credit. CQ Zone Map, ARRL DXCC list, WAE country list and IARU WAC boundaries are standards. Contacts between stations on different continents are worth three points; between stations on the same continent but in different countries, one point. Note: For North Americans only, contacts between stations within the N.A. boundaries count two points. Contacts between stations in the same country are permitted for zone and country multiplier credit, but have zero point value. Final score is total QSO points multiplied by the sum of zone and country multiplier. For awards, single ops must operate at least 12 hours, multiops at least 24. A single-band log is eligible for a single-band award only. All transmitters must be within a 500-meter diameter circle or within limits of license address; transmitters must be directly connected to the antennas by wire. All entrants must submit dupe sheets for each band with 200 or more QSOS. Each dupe removed by the CQ Contest Committee will result in a penalty of an additional three contacts being removed. Entry forms are available from *CQ* for a large s.a.s.e. with sufficient postage. Original logs must be sent — recopies must be accompanied by photocopy of original. Mail entries by Dec. 1 for phone (Jan. 15 for cw) to: CQWW Contest Committee, 76 N. Broadway, Hicksville, NY 11801.

25

W1AW Qualifying Run, 10-35 wpm at 2400Z (7 P.M. EST). See Oct. 13 listing for more details.

NOVEMBER

4

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z Nov. 5 (9 P.M. PST Nov. 4). Frequencies are approximately 3590/7090 kHz. See Oct. 13 listing for more details.

4-5

YL Anniversary Party, phone, see Oct. 21-22 listing.

7-8

ARRL Sweepstakes, cw, this issue, page 80.

International Police Association Contest, sponsored by the IPARC United States section, from 0000-0300, 0700-1000, and 1400-1800Z on both Nov. 7 and 8. Non-IPA members work IPA stations only. Exchange signal report and serial number and state. IPA members send "IPA." Count two points per QSO on 80 and 40 meters, except eight points per DX QSO. Count four points per QSO on 20-15-10. Multiply QSO points by sum of IPA states/countries for final score. Suggested frequencies: phone — 3.650 3.775-3.800 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: Thomas D. Jenkins, WA8VDC, 3327 Cloverdale W.B., Monroe, MI 48161.

CHC International Contest, cw, sponsored by the International Certificate Hunters Club, from 0000Z Nov. 7 until 2400Z Nov. 8. Single operator all band and single band, 1.8 through 430 MHz. Exchange signal report and serial number (CHC members send membership number instead of serial number). CHC members count one point per QSO with their country, three points for DX QSOs. Nonmembers count two points per QSO with own country, five points per DX QSO. Multiply by sum of DXCC countries and prefixes worked. Mail by Jan. 15, 1982 to: CHC Contest Committee, 7-53 Midigaoka Itami Hyogo 664, Japan.

OK-DX Contest, sponsored by the Central Radio Club, for the 24-hour UTC period Nov. 8. Phone and cw, 160-10 meters. Exchange signal report and ITU zone. Count one point per QSO except OK QSOs count three points. Contacts with own country count for multiplier credit only. Multiply QSO points by sum of ITU zones worked on each band. Single operator all band and single band and multioperator categories. Usual declaration. Mail entry by Dec. 31 to: Central Radio Club, P.O. Box 69, 113 27 Praha 1, Czechoslovakia.

11

W1AW Qualifying Run, 10-35 wpm at 0300Z Nov. 12 (10 P.M. EST Nov. 11). See Oct. 13 listing for more details.

14-15

European DX Contest, RTTY, July *QST*, page 84.

North Carolina QSO Party

21

W1AW Qualifying Run

21-22

ARRL Sweepstakes, phone, this issue, page 80.

VK QRP CW Contest

28-29

CQ Worldwide DX Contest, cw.

Section Activities

A-1 OPR ≤ EC ≤ DXCC ≤ RCC ≤ WAS ≤ STM ≤ OES ≤ ORS ≤ NM

SCM ≤ ARES ≤ OVS ≤ SEC ≤ OBS ≤ TCC ≤ OO ≤ NTS ≤ WAC ≤ CP ≤

CANADIAN DIVISION

MANITOBA: SCM, Peter Guenther, VE4PG — Asst/SCM: JP. SEC: HK. STM: RO. NMs: TE NM VJ ACX. The Brandon RC set up a booth at the Austin Threshermans reunion and was well represented by hams. Credit goes to VE4XN and VE4OD. The big event was during the Dauphin Ukrainian Festival and several hundred messages were handled. Both events prove we still got it where it counts. Band conditions have been very poor and traffic has been difficult to move on most nets. Despite being retired from most activities, VE4NE handled a lot of traffic during the Dauphin celebration. MMN QNI 414, QTC 37, 30 sess. MEPN QNI 747, QTC 17, 31 sess. WRIN QNI 91, QTC 1, sess 4. MTN QNI 117, QTC 27, sess 16. Traffic: VE4NE 67, VE4PG 46, VE4TE 38, VE4AJE 25, VE4ACX 23, VE4AAD 17, VE4CR 12, VE4LB 7, VE4AAU 3, VE4AEJ 3, VE4TL 3, VE4AFZ 2, VE4RL 2, VE4NM 1.

ONTARIO: SCM, Larry Thivierge, VE3GT — A/SCM: VE3GOL. SEC: VE3GV. STM: VE3QI. I'm sure you'll agree that band conditions this past summer have been the worst for the past few years. VE2CV and VE7APU have become members of the League's Technical Advisory Committee. Regretfully the following have been reported as Silent Keys: VE3s GNV IDU MPQ PY and XI. VE3GFN's second edition of "Student notes for a comprehensive introduction to Amateur Radio" is at the printers and an index will be available shortly. VE3s FN and FSN have both moved to new locations within Ottawa. The following are the NTS nets within the Ontario Section:

Net	Freq.	Time/Day	Mgr.
OSN*	7045	2200 Dy	VE3KK
OLN	7.66/.06	2230 Dy	VE3GFN
LN*	3755	2245 Dy	VE3FPI
OPN*	3770	2300 Dy	VE3GNW
OSN*	3667	2300 Dy	VE3CYR
KTN	7.96/.36	0000 MW 0100 Fri	VE3AJN
OSN*	3667	0200 Dy	VE3CYR

*Denotes section net, all times in UTC and subject to change in the fall with Standard Time. If your club publishes any kind of a bulletin, I would appreciate receiving a copy in order to share your activities with other amateurs within the section. Traffic: (July) VE3GOL 422, VE3KK 221, VE3HGJ 204, VE3HTL 191, VE3GT 181, VE3GNW 120, VE3FGU 118, VE3QI 107, VE3DPO 91, VE3BVG 45, VE3AJN 43, VE3GFN 41, VE3WM 35, VE3LNN 30, VE3KXB 27, VE3DVE 24, VE3FPI 24, VE3AYZ 22, VE3EWD 21, VE3HOI 21, VE3AWE 20, VE3BZB 18, VE3DUK 18, VE3WG 17, VE3KLX 12, VE3DZH 10, VE3LDU 9, VE3ANJ 6, VE3LSJ 4. (June) VE3AWE 25.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2PJ. NMs: VE2PJ VE2FSA. Change of call: VE2DYD is now VE2YW. Thanks to WA1HSG and his group for the nice day a few of us had in Newport, VT on the 26th of July. With regret I have to report the passing of these amateurs: VE2GH VE2LT and VE2GKI. Malgre la mauvaise temperature, plusieurs se sont rendu passer une tres belle journee au piquenique de VE2MO pres de Trois-Rivieres. Encore cette annee la rencontre annuelle au Mont-Orford par VE2TA a ete un succes. Traffic: VE2PJ 131, VE2EDO 62, VE2EC 50, VE2BP 40, VE2EKC 32.

SASKATCHEWAN: SCM, W.C. Munday, VE5WM — STM: VE5XC. SEC: VE5II. NMs: VE5DC VE5HG VE5OI VE5SF. Net report: SATN 27 sess, 221 QNI 27 QTC. Congratulations to the North Saskatchewan Amateur Radio Club for hosting a successful hamfest on July 4th, attended by 211 hams, families and friends. Also we pass along congratulations to VE5JA on obtaining his Advance amateur certificate. Summer holidays have taken their toll of amateur activities with little news to report. Eight members of the Regina Amateur Radio Association provided communications to the 49th annual Travelers' Day parade on July 31 in Regina. Traffic: (July) VE5WM 13, VE5AAT 10, VE5QY 6. (June) VE5WM 18, VE5QT 17.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — STM: WA3WIY. SEC: W3PQ. PSHR: WA3WIY 101, K3JL 94. Congratulations to WA3QLS and his new bride, and to WA3ZBI and XYL and new son. Ex-KA3CFZ is now N3CGH and new Novices include KA3GXY KA3HAR KA3HEG KA3HFJ KA3HXT and KA3HXU. W3QQ K3JL and W3DKX represented DE at the MEPN/MDD picnic at Elk Neck St Pk. in July. Don't miss W3QQ's Delta 580 cw modification in the Aug QST Hints and Kinks. DTN QTC 48, QNI 310; DEPN QTC 3, QNI 41. Traffic: (July) W3QQ 85, WA3WIY 49, K3JL 45, W3DKX 44, WB3DUG 40, WA3ZBI 14, K3ZXP 12, WA3DUM 10, AC3T 7, W3WD 3. (June) AC3T 10.

EASTERN PENNSYLVANIA: SCM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: WB3JYZ.

Net	Freq.	Time	QNI	QTC	Sess.
EPA	3610	7/10 P.M. Dy	433	216	59
EPAEPTN	3917	6 P.M. Dy	450	199	31
PFN	3958	5 P.M. M-S	248	286	27
PTTN	3610	6:30 P.M. Dy	160	76	27

Local and vhf nets reporting: D3ARES HARCTN LUZ CO ARES MTG Co AREC and WARC with a total QNI 306, QTC 35 in 25 sessions. OBS reports: K3EBZ WB3CAI W3CL W3ID W3VA and WB3FVJ. OO reports from KC3B and W3GVR. OVS: N3CP. PSHR reports: N3BFL WA3TKU N3AZT K3JSZ WB3CAI WB3FKP W3VA WB3FYT N3AIA W3YZW AA3B WA3WPQ K3EBZ and KA3DZD. New appointments: KB3QW to OBS and N3BFL to OO and OVS congrats. EPA welcomes KA3ENK and W3OKN. EPAEPTN welcomes KA3FQT N3CGT W3HDJ and WB3LUJ. PTTN welcomes KA3GJT and N3BPY. Upgrades: WB3JZD to A and awaiting new call sign. KA3DZD to Gen and KA3FJJ to Tech. KA3AQF now KE3J. KA3HCV new YL op in Luzerne Co and KA3HGY new op in Phila. WB3FYT sporting a new tri-band beam. W3GVR new MFJ keyboard. WB3CQD a new Panasonic rcvr. KA3ALU has taken a position with Rockwell/Collins and has moved to the Boston area. N3CP QRL with vhf propagation studies, but still finds time for QRP DX on indoor Slinky ant. N3AIA/Rpt 146.79 has been designated in the York Co. EMA Amateur Radio Basic Operations Plan. W3EU spending summer repairing antennas. KA3CAT reports Hazelton ARC planning Novice classes for the fall season. K3JSZ looking for new calls on PTTN. N3AZT now operating QRP 1 watt after a visit from Murphy blew finals in main gear. The Mt. Airy VHF Club (Pack Rats) made excellent showing in June VHF Contest. WA3WQP reports band conditions very poor. W3BUR reports RF Hill ARC repeater working FB. N3BFL reports 146.265/865 repeater on Big Pocono Mt. will be used for ARES and RACES work. N3BFL is EC for Monroe Co. Nice to hear WB3HTW back in nets again after a vacation in the hospital. AF3Z is QRL with church camp. Was nice to see the EPA gang at the section picnic and enjoyed the music of WB3JYZ's Ham Band. Traffic: WA3WQP 345, K3JSZ 230, W3IPX 196, WA3EHD 135, WB3FKP 110, AA3B 108, W3FAF 102, W3VA 87, W3DP 75, WB3CAI 65, WA3OFD 63, W3ADE 35, N3CD 31, W3YZW 30, WB3FVJ 26, W3ID 23, N2BSS/3 21, W3CL 20, AF3Z 20, K3QXC 17, N3CP 14, N3AZT 13, N3BFL 12, K3EIP 10, WB3HTW 10, WA3CKA 8, N3AKQ 4, K3KW 4, K3EBZ 3, KA3FKD 3, N3AIA 2, W3HK 1.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — W3FA lost 2-100 footers 22 June in a sharp tornado like wind. Back on full, low bands this fall I hope. Lots of correspondence this month! SEC WA3TAI is laying plans for the SET. Are you? KB3NL is busy with drills in Carroll County. EC WB3LTA forwards the Montgomery County RACES/ARES bulletin with much good info. OES reports from W3CYQ, and W3EXP who included the MARC repeater users "911 Protocol" guide. WB3KJT is vacationing in Del., with QRP. W3OYY and W3DFW are two busy net managers. OO reports from K8SYH/3 and KA3CDQ. W3IK is doing fine after eye surgery. The Capital Hill ARS, K3ZJ reporting, and the Anne Arundel ARC were very pleased with this year's Field Day results. KA3AVL should be about settled in So. MD. Director W3KT and Vice Director WA3ABC are complimented by KC3W and WA3VAT in letters to me. W3JPT needs Utah and Hawaii for 6-meter WAS, but first it is a month off to 4U1ITU. KC3D is into kits this summer. W3ZNW reports Calvert County is forming a radio club, and hopes to set up a repeater on 2. KS6X gets a 3 week trip to Calif. from a busy summer school sked. W5NZ/3 is meeting a number of net skeds. W3CDQ is looking for antique radio gear to display at hamfests. WA3VPL is proud of 12 year old son, KA3EFS, upgrading from Novice to Tech. Next General and then? WB3BHE is back in the swing after a bout with illness. KA3CDQ is expanding the MEPN rester to a nice news letter. WA6EES/3 is competition in Upper Marlboro. W3FZV vacationed in New Jersey, New England and Quebec. W3DQI is MEPN bulletin editor. WB3BFK is touring the hamfests. W3LDD is having power supply troubles. WB3GZU is back in the BPL groove. N4DR/3 reports the 30-meter beacon doing well. Net/Manager Sessions/TFC/QNI average. MDC PON/W3OYY 5/20/18.6. WR PON/W3DFW 22/13/12.4. W C 2-Mtr/WB3GEJ 4/3/17. MEPN/WB3GZU 30/134/23/5 with KA3ARH WB3BFK W3DKX W3GDU WB3GZU and WA2YFM missing 3 or less. Tnx to KA3T for an MDD Bulletin and June stats for MDD's cw men at 60/150/6.2, with W3QQ doing yeoman liaison service. Traffic: (July) WB3GZU 675, KA3T 290, W3FA 135, KA3CDQ 128, N4DR/3 70, W3FZV 46, WB3BFK 43, WA3VPL 33, WA6EES/3 27, W3DQI 19, W3LDD 8, WB3LTA 4, KB3NL 2. (June) WB3IVO 149. (May) KS6X 282.

SOUTHERN NEW JERSEY SCM, Bill Luebkemann, WB2LCC — STM: WB2LCC SEC: W2HOB. Field Day 1981 was a big success with about 10 clubs sending me messages confirming their participation. It was disappointing to see that only two clubs in the entire section read the rules correctly and sent the required information. Bonus points are only awarded if the message is correct, so a lot of clubs are going to be disappointed. I am pleased to inform my readers that the long awaited SNJ RTTY repeater has finally made in into permanent operation at a height of over 500 feet on the Channel 23 TV tower in lower Camden County. To make things even nicer, the W2HOB Message Storage Operations Center Computer is now fully operable on the repeater. Message flow throughout the section has never been better, and we would love to see more ARRL members using this fine machine which has truly section wide coverage. Why not get your RTTY machine or computer fired up on 147.345 MHz and see what fun two-meter teletype can be, and at the same time you'll be performing a valuable public service by aiding in the distribution of message traffic throughout the section! Traffic: N3CER 296, KC2A 175, KA2GSL 152, W2ZQ 91, KA2BKF 53, WB2JCE 50, KM2E 47, K2UL 42, WA2TWK 25, WB2GFM 19, WA2PTQ 19, WA2CUW 9, WB2PLM 7, N2CNR 1.

WESTERN NEW YORK SCM, William W. Thompson, W2MTA — SEC: W2BCH. STM: N2APB. ASCM: W2GLH. DECs WA2AIV WA2DHZ WB2NAO WB3CUF. Appointments: (EC) WB2TXK Wyoming, K2VTT Otsego. PSHR: N2APB KA2BHR N2BXB N2CFF KA2CTU W2GLH WB2IDS WA2KOJ W2MTA WA2ZJP. No BPL in July. Silent Key: WB2UCH. Reports: (OVS) K2QR, Aurora Maine to VA and Midwest on 25th, WB2SGI experimenting. (OBS) W2GLH. New officers: ARATS-WB2WUB KA2CJS K2QB: Boonville ARC-WD2ADX KA2HWQ KA2HWS KA2HWR: Syracuse VHF-W2RHQ W2PJO W2EMW WA2ZVN. Nice goin': WA2PUU two years of planning and execution Nat'l Sports Festival; W2GJ and WB2PEE at Scouts Jamboree K2BSA/4. Congrats: K2BHR received "Clara Reger W2RUF Memorial Award." Attaboys: WA2TPU hatched 8 more Novices in Chenango; K2MGR DXCC 270; KA2AVW and 19 at Oswego parade; W2PPS antennas up; W2AET multi-editor. Batavia Fest FB WX and 1,000 hams. SKYWARN programs for Rochester and Syracuse need you, see WA2AIV or W2AET — WATSAY Binghamton/Potsdam? N2JC in Rochester General Hospital. RARA has applied for ARRL 1982 NY Convention; K2HC asks help, send him QSL card with your commitment to attend hamfest.

Net	Freq.	Time/Day	QNI	QSP	QND
NYSCN	3677	1000/Sun	42	14	4
THIN	3913	1600/Sun	21	—	3
NYPON*	3913	1700/Dy	480	366	31
NYSPTEN	3925	1800/Dy	675	113	31
ESS	3590	1800/Dy	335	51	31
OCTEN*	34/94	1830/Dy	404	85	31
STAR*	325/925	1830/Dy	130	34	30
Q NET	31/91	1830/Dy	373	10	31
BSN	93/33	1900/Dy			
NYS/E*	3677	1900/Dy	387	229	31
JCARCN	10/70	2000/Dy	455	3	28
WNYECN	3955	2000/3rd Sun (EC/DEC/SEC)			
OARCN	25/85	2015/Wed	104	1	5
SLVARES	13/91	2100/Sun			
CNYTN*	90/30	2115/Dy	482	80	31
(June data)			395	93	30
WDN*	04/64	2130/Dy	877	137	31
NYS/L*	3677	2200/Dy	300	173	28

*NTS nets. ARE YOU PREPARED? Western New York and Eastern New York Sections will actively demonstrate their preparedness during 1981 Simulated Emergency Test October 17 and 18: all Upstate NY amateurs are invited to take part in "PREPAREDNESS DUEL #5." See your county EC or one of the DEC listed above. Traffic: (July) W2MTA 323, WA2HSB 241, WA3ELD 213, W2GLH 185, N2BXB 140, N2CFF 139, KA2CTU 123, WA2ZJP 119, WB2IDS 115, W2FR 108, N2APB 91, KG2D 84, WA2KOJ 60, KA2BHR 55, W2PZL 50, WB2OWO 45, WA2MFU 36, KA2CLT 34, KI2D 31, AF2K 31, KB2GT 28, W2RQF 27, W2TZ 27, KA2BHB 26, WB2OIX 25, WA2AIV 23, WB2LJK 23, WB2TXK 23, N2ARD 20, KA2GOH 19, WB2SGI 16, K2RN 13, KB2YU 12, N2CBZ 10, WA2RXO 9, KA2DBD 8, K2VR 8, AF2A 7, KA2DQA 3, N2CSB 1, WB3CUF 1, WB2NAO 1. (June) KB2YU 14.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — Asst SCM & STM: N3EE. SEC: AB3Q. DECs: WB3JDI WB3EFQ & WB3KJH. NMs N3FM W3NEM W3MML & WA3PXA.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	31	330	122	3585	7:00 P.M. Dy
WPAPTN (June)	30	491	115	3983	6:15 P.M. Dy
WPAPTN (July)	31	446	103	3983	6:15 P.M. Dy
WPA2MTN	31	544	63	146.28/88	8:00 P.M. Dy
NWPA2MTN (June)	30	383	10	146.04/64	9:00 P.M. Dy
NWPA2MTN (July)	31	336	3	146.04/64	9:00 P.M. Dy

Beaver Valley ARA Newsletter reports that KA3AKB is a Silent Key, our sympathy to his family. WB3KAF is now KE3K. Upgrades KA3GWO to Tech. WB3HZM to Advanced. Congrats to them. New officers for the Breezeshooters for 1981-82 are WA3DYF, pres.; K3SJD, checker; N3MB, treas. Wind Gaugers W3GVI WB3JGQ W3OVM KA3ATQ and WB3CEW. We are still looking for cw and phone operators for our WPA traffic nets. The ability to handle traffic is invaluable when you are needed in emergencies, volunteers who have not done so only cause tieups and chaos when they try to take charge or do not listen to more experienced operators. AB3Q is working hard to get the river watch network set up. It will handle reports from rain gaugers on streams in the Allegheny River watershed when communications are interrupted. Traffic: (July) N3ADU 363, N3FM 192, KB3DT 162, W3EGJ 152, K3CR 119, WB3GUK 105, AC3N 103, KA3ETC 85, N3WS 62, W3SMV 58, WA3PXA 51, K3SMB 46, N3KB 34, W3RUL 34, W3KMZ 30, W3MML 25, N3BKV 23, WA3UNX 21, WB3GXG 16, K3HCT 15, WA3QNT 15, KA3DEH 14, W3EXC 14, KB3BG 12, K3VQV 12, W4KUN 11, W3KYN 11, W3YI 11, W3ZX 11, KA3BGC 8, WB3IAB 8, W3TTN 8, W3YQ 8, WB3KJH 7, WB3JGD 5, AF4B 4, KA3CDV 4, W3LOD 2, W3SN 2. (June) KA3ETC 11.

CENTRAL DIVISION

ILLINOIS: SCM, Larry M. Keeran, K9ORP —

Net	Freq.	Times/Days	QTC	Sess.
ILN	3690	2330/0300 Dy		
ILL Phone	3915	2130 Dy	164	31
NCPN	3915	1200/1700 Dy	120	39
IEN	3940	1400 Su		

K9BVE was the BPL recipient for the month of July. D9RN 100 percent stations were W9HOT W9JIJ K9BVE KA9EGW. DRN9 100 percent stations were W9HOT W9JIJ. W9ZTK has adapted his computer to tabulate the activity on WR9AFG repeater to provide an answer to periods of highest use. After Field Day, the Sterling-Rock Falls Amateur Radio Society held their fox hunt. For this event W9PX gratuitously built a half dozen hand held loop antennas for the participants. The elusive fox was located by only one mobile using his own design antenna, W9PX and WB9OUB. The Dan Hoover Memorial Net had 54 checkins that had 9 pieces of traffic. During July, Illinois amateurs lost two members, WA9LYE and W9FOO, to the ranks of the Silent Keys. Their presence in the community will be missed. N9GB and KA9KKD had a lot of QRM on Field Day, a new harmonic was born then. The Western Illinois Amateur Radio Club had the Illinois SEC, W9QBH, speak at their August 5th meeting. Traffic: K9BVE 602, W9HOT 345, W9JIJ 240, KB9X 181, W9OK 106, W9TLU 74, KN9BAM 50, WB9QFO 44, W9HPG 33, W9LNQ 32, KA9BYB 20, K9SW 18, WB9WGD 18, W9KR 16, WD9EBQ 4, W9KSU 4, AA9D 2, W9SSP 2.

INDIANA: SCM, Bruce Woodward, W9UMH — SEC: W9UMH. STM: W9JUJ. NMs: ITN W9QYY, QIN WD9GXW, ICN N9AEI, VHF W9PMT, IWN K9DCX, IPN W9DLF.

Net	Freq.	Time/UTC/Dy	QNI	QTC	Time	Sess.
ITN	3910	1330/2300	2095	304	1934	62
QIN	3656	1430/0100/0400	798	455	2218	92
ICN	3708	0014	159	42	697	31
IPN	3910	2130	1050	114	838	31
IWN	3910	1315	1212		446	31

Hoosier vhf nets report: QNI 4157, QTC 141, bulletins 42, time 4403 minutes for 20 nets. 9RN QNI: W9JUJ W9QLW WB9UYU W9XD KB9IT WD9GXW K9WWJ WA9QCF K9SFQ N9ACG W9EI N9HZ W9FC QTC 472 in 1355 min. D9RN QNI: W9DLF W9JUJ K9CGS W9QLW WB9CIS QTC 410 in 62 sess. CAND QNI: W9QLW W9DLF

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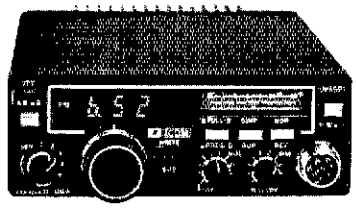

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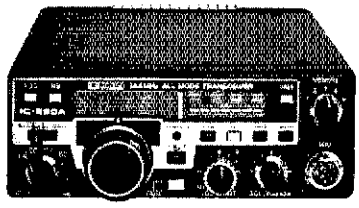

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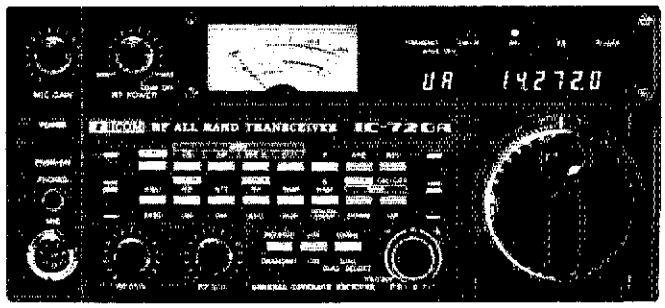

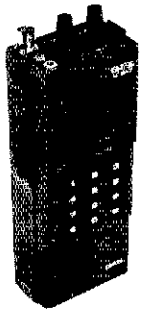

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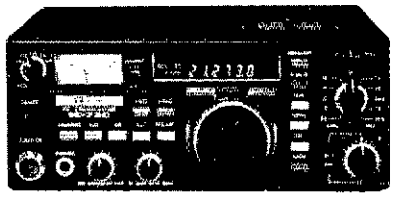

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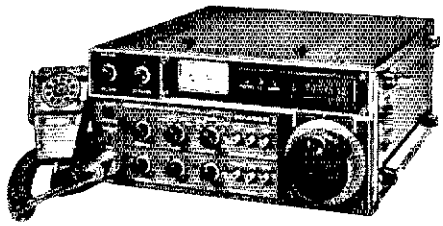

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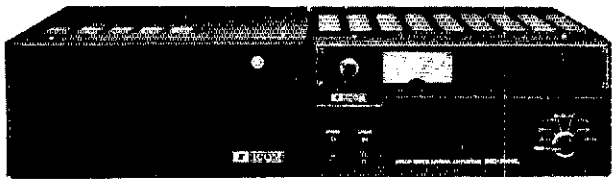

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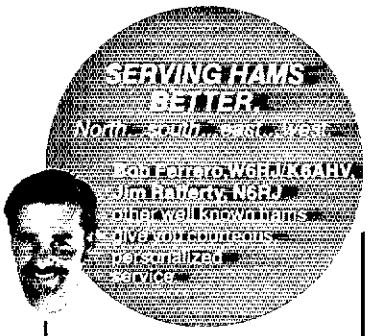

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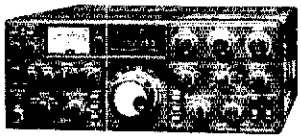
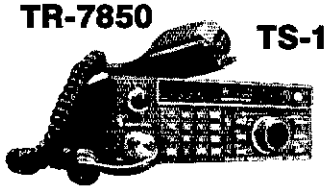


TR-7850



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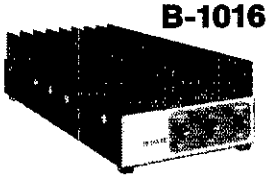

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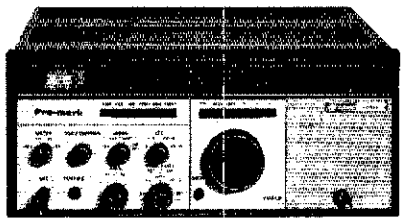

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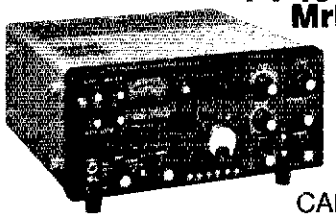

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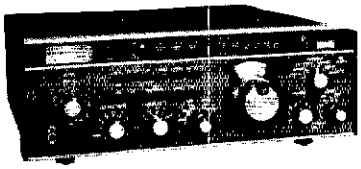

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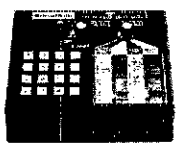

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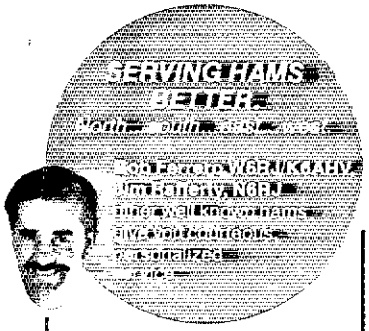

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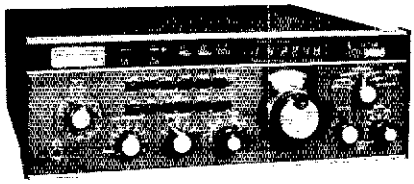
- **SSB** (w/USB/LSB), **AM, CW, RTTY.**

ASK FOR YOUR SPECIAL PRICE.

PS-7 POWER SUPPLY

for use with TR-7 transceiver
ASK FOR YOUR SPECIAL PRICE



R-7 SYNTHESIZED, GENERAL-COVERAGE RECEIVER SSB, AM, CW, RTTY.

- **FULL GENERAL COVERAGE,** 0 TO 30 MHz. No gaps or range crystals required.
- **100% SOLID STATE, BROADBAND DESIGN.**
- **SPECIAL DOUBLE BALANCED MIXER FRONT END. UP-CONVERSION** w/48 MHz FIRST I-F.
- **COMPLETE FRONT-END BANDPASS FILTERS.**
- **10db PUSH-BUTTON-CONTROLLED BROADBAND PRE-AMPLIFIER.** Low noise design
- **ELECTRONIC PASSBAND TUNING SYSTEM.**
- **TUNABLE I-F NOTCH FILTER.**
- **SPECIAL LOW DISTORTION, "SYNCHRO-PHASE" AM DETECTOR.**
- **COMPLETE TRANSCEIVE/SEPARATE FUNCTIONS** when used with DRAKE TR-7 along with separate R7 RIT control.
- **BOTH DIGITAL, ANALOG FREQ. READOUT.**
- **DIGITAL READOUT.** Usable as 150MHz counter. Access from rear panel.
- **BUILT-IN POWER SUPPLY.** 100-120-200-240VAC, 50/60Hz or nominal 13.8VDC.

ASK FOR SPECIAL PRICE

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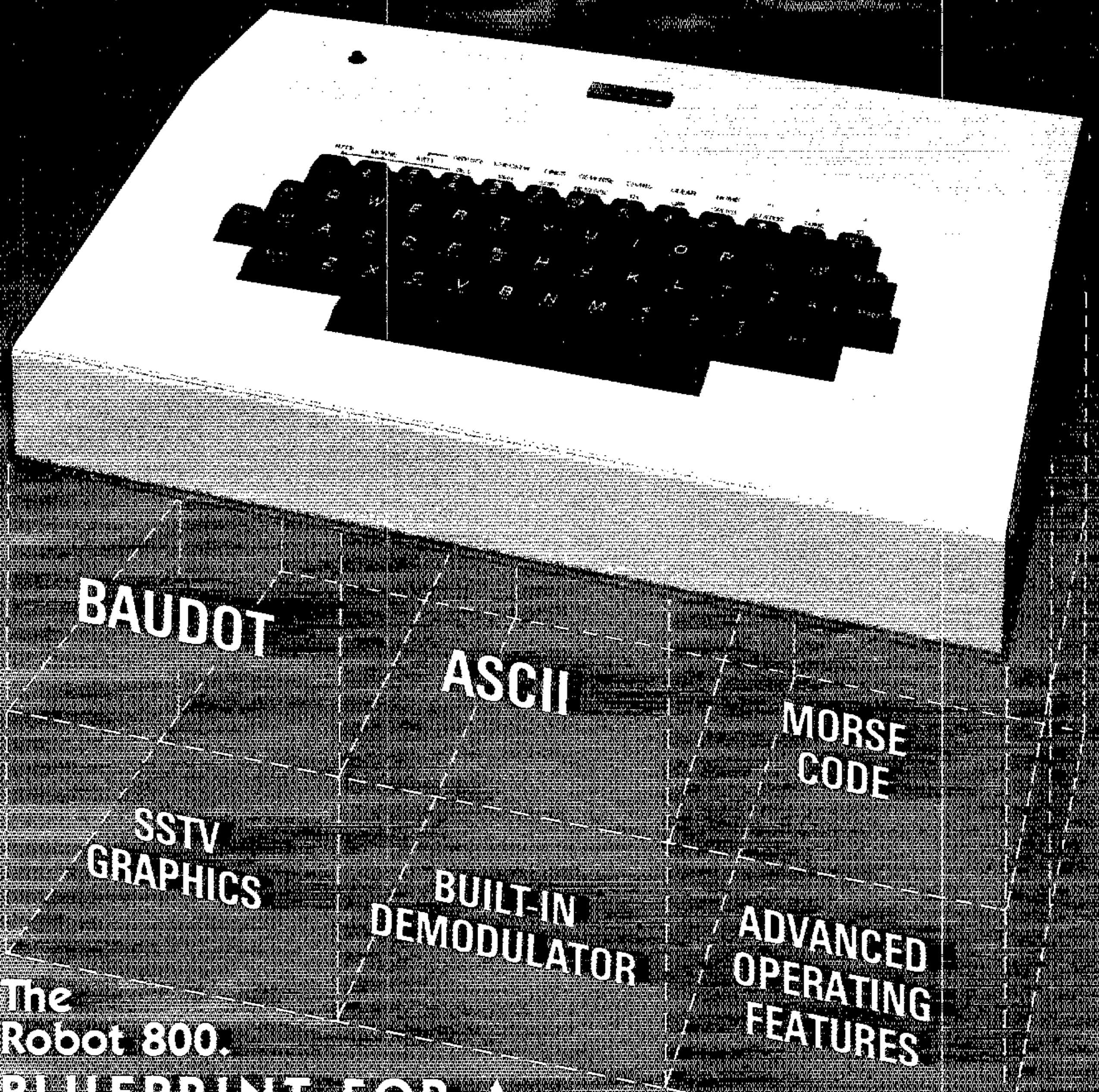

The Robot 800. BLUEPRINT FOR A SPECIALTY MODE STATION.

If you have been shopping around for RTTY equipment, you probably have asked yourself: "How can I get high performance multiple mode capabilities without spending a fortune?" Robot Research has answered this question through the use of microprocessor technology. The Model 800 is the most complete specialty mode terminal ever offered for under $1,000, yet it has features and performance capabilities which put it in the class of systems costing twice this amount or more!

HOW DID WE DO IT?

Most advanced RTTY systems on the market are designed for multiple applications. As a result, these systems are burdened with exotic features which are seldom used by amateur radio. These features add to the cost, complicate operation, and in some cases even compromise performance.

The 800 does not attempt to double as a hobby computer or a timeshare terminal. It was designed expressly for use as a specialty mode communications terminal for amateur radio, and nothing else! By focusing our attention on this single concept, we are able to provide a product which works better, costs less, and is easier to operate than those systems which try to do "everything" and end up doing nothing very well.

ONE EXAMPLE:

The single most important factor which affects RTTY receive performance is the quality of the demodulator. In the 800, we do not allow for a wide variety of shift frequencies through the use of tuneable filters. There are only two shifts which are used in amateur RTTY, and tuneable discriminator filters are both expensive and are poor in performance. The 800 uses separate mark and space discriminator filters for each of these two shifts which are precisely tuned at our factory. Even though the center frequency for the mark filter is the same for both wide and narrow shifts, the bandwidth is different and therefore requires separate filters. By giving careful attention to these details, we can equal or exceed the performance found only in expensive stand-alone terminal units.

WHAT ABOUT FEATURES?

The Model 800 has all of the advanced operating features such as split-screen, word and line editing, message memories, autostart, SELCOM, and many others. In addition, the 800 has a complete set of operating aids such as an on-screen status line, graphic tuning indicator, and a side-tone oscillator. To get a complete picture of all of the features which the 800 offers, we suggest that you contact us for a full-color brochure, or visit one of our dealers for a demonstration.

ROBOT

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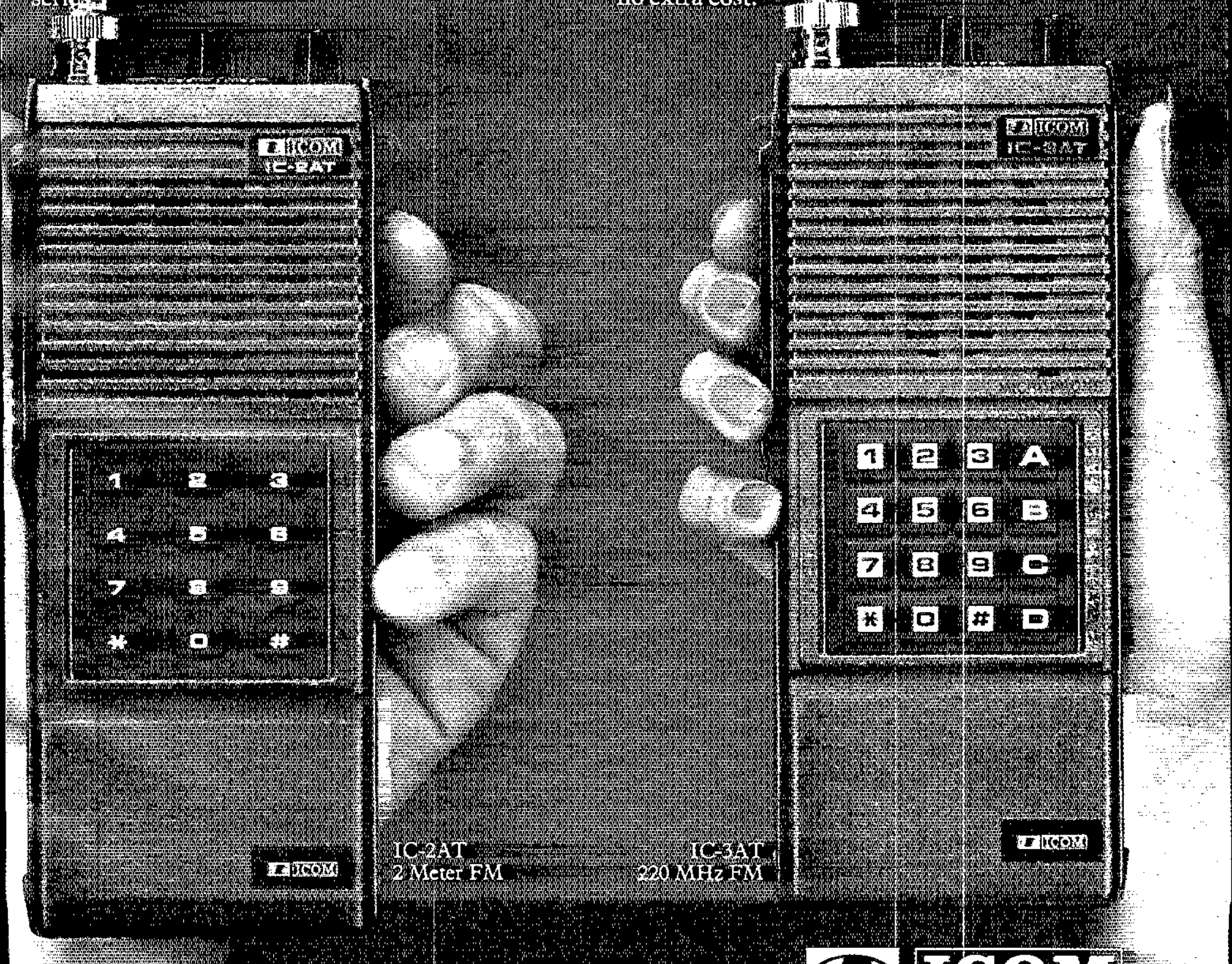
World leaders in Slow Scan TV, Phone Line TV, and Image Processing Systems.


ICOM VHF Mobile
Amateur Communications using Space Age Techniques
... the IC-25A offers ... deep) without sacrificing features: 25 watts, ... memories, 2 scanning systems, priority channel, 2 VFO's and touchtone™ HM-8 microphone standard.
The best 2 meter multimode mobile on the market today, the IC-290A has features to make multimode mobile a snap. 2 VFO's, 5 memories, priority channel, memory and band scanning, squelch on SSB, selectable AGC and NB, and RIT. Touchtone ™ encoding provided with HM-8 microphone standard.
6 meter mobile at its best with the IC-560, a multimode mobile transceiver for working FM repeaters or sideband simplex, local or DX, 3 memories, 2 VFO's, scanning, squelch on SSB.
Sensible and affordable, the IC-22U offers simplicity with ease of operation. Easy to use push buttons for up and down tuning. 800 channels at the push of a button. 4 MHz coverage. EX-199 optional remotable frequency selector.
ICOM
2112-116th Avenue NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234
All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

What's better than one ICOM in the hand?

Meet the new ICOM 220 MHz IC-3AT. Providing full coverage of the 220 MHz band, the IC-3AT is similar in appearance and size to the popular IC-2AT. All accessories, including battery packs, chargers, microphone, etc., are completely compatible between the two series.

The IC-3AT includes a 16 button Touchtone® Pad and covers 220 to 224.99MHz both simplex and duplex operation. The IC-3AT system comes complete with IC-BP3 NiCd battery pack, AC wall charger, belt clip, "rubber duckie" and wrist strap all standard at no extra cost.



IC-2AT
2 Meter FM

IC-3AT
220 MHz FM

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ICOM

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**

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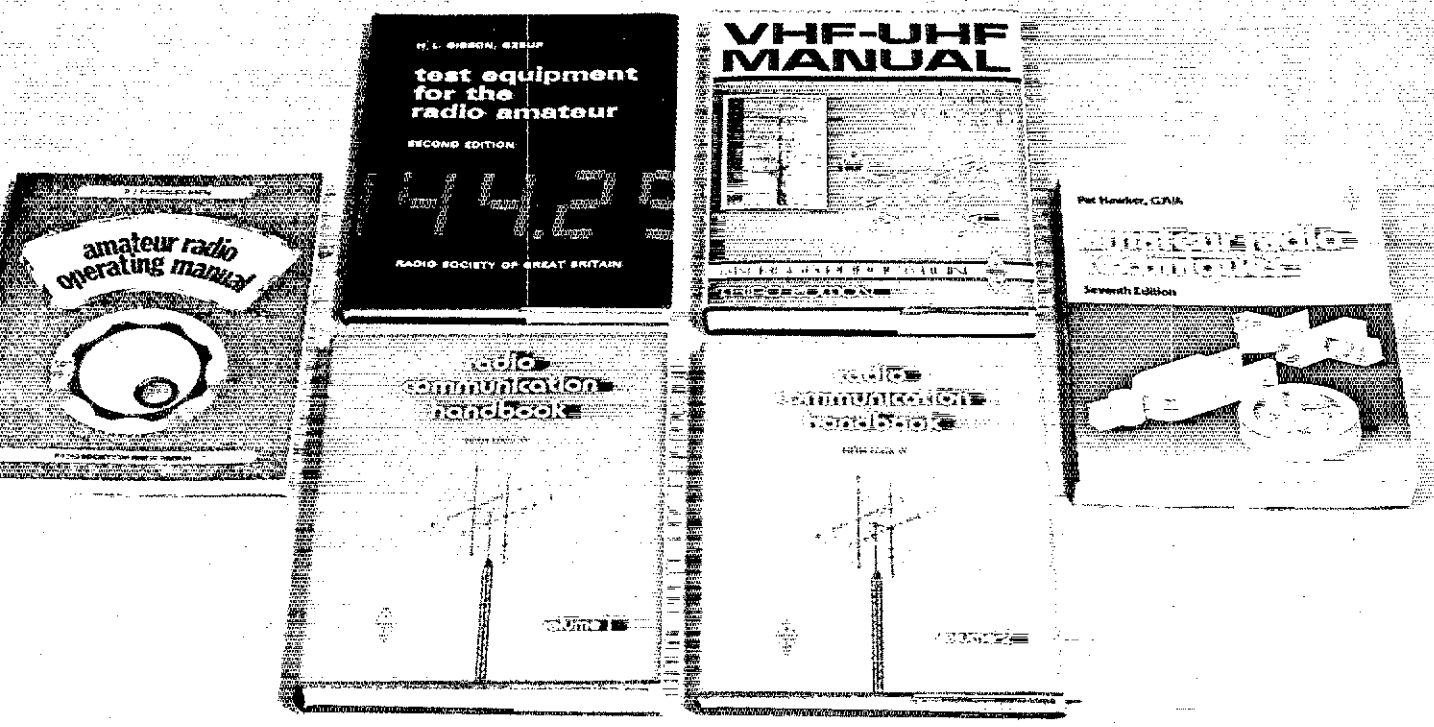

NOW AVAILABLE FROM ARRL

PUBLICATIONS FROM THE RADIO SOCIETY OF GREAT BRITAIN

☐ **VHF-UHF MANUAL** by Dain Evans, G3RPE and G. R. Jessop, G6JP. You will find the *VHF-UHF Manual* jam-packed with practical theory and construction projects for the region above 30 MHz and extending into microwave regions. In fact there are 70 pages contained in the microwave chapter alone! Receivers and Transmitters for these bands are covered in 181 pages. The balance of this 349-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.) 3rd Edition. Copyright 1976. Hardbound **$17.50.**

☐ **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. Volume 1 contains 10 chapters (460 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. Volume 2 contains 13 chapters (318 pages): 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. Both volumes are hardbound. Volume 1, Copyright 1978, **$20.00.** Volume 2, Copyright 1977, **$18.50.** Both volumes for **$35.00.**

☐ **AMATEUR RADIO OPERATING MANUAL** by R. J. Eckersley, G4FTJ. Get the British side of operating. Besides such chapters as Setting Up a Station, Operating Practices and Procedures, DX, Contests, RTTY 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, address of licensing administration and the name and address of the National Amateur Radio Society. 189 pages. Copyright 1979, 1st Edition. Soft bound **$10.00.**

☐ **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 covering measuring techniques, you will find a wealth of test equipment which 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.**

☐ **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**

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WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3985 1115Z QNI 1016, QTC 1167 WB9YPY. BEN 3985 1700Z QNI 686, QTC 153 WB9ESM. WSBN 3985 2200Z QNI 1035, QTC 315 WD9ESZ. WNN 3723 2300Z QNI 220, QTC 30 KA9HPQ. WSSN 3645 2330Z QNI 125, QTC 25 N9BYK. WIN-E 3662 0000Z QNI 347, QTC 152 W9YCV. WIN-L 3652 0300Z QNI 285, QTC 95 K9LGU. XPO 3925 1701Z QNI 417, QTC 38 WA9NIX. NWTN 3479 2330Z QNI 639, QTC 46 WB9YPY. Gr. Bay .72/.12 2330Z Wed QNI 19, QTC 1 WB9NRK. WARAC station, W9FK, had an Oscar 8 contact with K9ZLU Indiana, also made 5 contacts with natural power station. W9UW attended G. E. Radio seminar in Florence, SC. W9RTP putting up a tri-band beam. KA9LCL has Novice. KA9FAS KA9ACE have Techs. Sorry to report W9CID a Silent Key. KA9GBE now KC9CJ. KA9EMF has Advanced. W9GTJ, Beaver Dam, has had ham license for 50 years. KA9FIH W9IAL now Advanced. WB9OWR has General. WD9HWY received WPX with 400 prefixes. W9KTG WD9CQA had a nice write-up in their local paper, I noted that the editor gave credit to "Hams" in the paper, very nice job, thanks. BWN picnic was held in Rhinelander with 49 attending. KA9CPA made BPL. Traffic: KA9CPA 2130, WB9YPY 318, WD9ESZ 238, W9CXY 255, W9YCV 235, WD9DHF 182, K9FHI 138, N9BYK 128, W9IEM 113, K9AKG 106, K9GDF 98, WB9YPZ 98, W9DND 85, W9UCL 78, WD9FRI 74, N9AUG 65, WA9ZTY 62, AG9G 59, WB9ESM 51, K9JPS 50, W9IHW 49, KC9CJ 48, W9KTG 47, K9LGU 45, K9AQ 42, N9BDL 40, KA9HPQ 39, W9FDY 38, W9SO 38, KB9NG 37, W9SQJ 33, WD9CYT 32, WA9WYS 32, WA9YUC 32, N9BCX 29, WB9NRK 29, KG9B 25, WD9ERN 25, K9UTQ 25, N9ATP 24, K9HDF 24, KA9EMF 19, WB9FYK 18, W9CJE 17, WD9IMZ 15, WB9JSW 15, KA9GYD 14, W9UW 13, WD9BKT 10, KE9C 9, KA9IKR 9, WB9ICH 7, KA9IHR 4.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WB@HOX — STM: AF@O. SEC: KA@ALF.

Net	Time	Freq.	QNI	QTC	Mgr.
MSN/1	2330Z	3685 kHz	186	69	AF@O
MSN/2	0300Z	3685 kHz	135	35	K@JCF
MSPN/N	1710Z	3945 kHz	625	61	WA@AIN
MSPN/E	2245Z	3929 kHz	905	226	KC@T
MNAMWXN	2315Z	3929 kHz			WD@CGM
MSSN	2215Z	3710			WB@WXU

A group from the states of KS, WA, and MN recently attended a get-together at AD@S's QTH to hear about his recent DXpedition to Kingman and Palmyra. W@RIQ and W@OPX just attended their daughter's wedding in Memphis after which they went to a square dancing lodge. There they were asked to demonstrate ham radio. Having no radios available, they demonstrated operation, sending messages etc. with cw on the piano. Ingenuity strikes again! WA@YWA now N@CRT and WB@MJW now N@CRS. Our latest 9 year old Novice, believed to be the youngest ham in MN is KA@KYZ. Congrats. Sad to report that the Silent Key list has increased by three. Our sympathies go to the families of W@KUI W@BBY and K@GNI. W@KUI was known to all throughout the state as the State Director of Army Mars. In the unenviable position of trying to fill his shoes as the new State Director, we have K@EPT. Best of luck. News and reports have dwindled sharply, probably due to the summer season, vacations, band conditions etc. Hopefully things will pick up with the coming of fall. By the time this is published, we will know whether the Dakota Division Convention, scheduled for September, was successful. K@JCF and other Rochester amateurs have been working their tails off. Traffic: (July) WA@TFC 515, KB@MB 504, WB@HOX 188, W@DM 183, W@HZU 99, AF@O 73, KC@T 45, WB@VYE 32, KC@Z 29, WA@AIN 27, WB@NZB 27, K@JCF 23, N@CLS 21, W@RIQ 19, W@OPX 13, KA@EPY 11, N@JP 8. (May) W@GRW 22. (Apr.) W@GRW 14.

NORTH DAKOTA: SCM, Lois Jorgensen, WA@RWM — The International Peace Garden Hamfest was the highlight for July, there was very good attendance. The Ham of the Year went to WB@TEE, congrats. The committee for next year is the Williston Radio Club, good luck gang. Congrats to new Novice KA@LXH, who is father to Ki@E and grandfather to KA@APB and KA@LFH. Another family of hams that upgraded are: dad K@GUV to Adv. and four sons to General — KA@KKP KA@KIF KA@KKO and KA@LEE. Welcome to our state and amateur friends of W@ZZ, he hailed from MN and located at Beach, ND, hope to hear you as soon as located with antennas. Congrats to WA@FEU and XYL of their first harmonic.

Introducing the first fully programmable keyer

Store commands, as well as text, for automatic execution

The Heathkit μMatic Memory Keyer's custom microprocessor stores up to 240 characters of text or commands. *Variable-length buffers* eliminate wasted memory space. "Command strings" allow text to be stored in several buffers, then strung together in any sequence for most efficient use of memory. Command strings can also select speed, weight, spacing and auto-repeat count.

No external key to buy

Integral capacitive "touch" paddles unplug and store in their own compartment inside the Keyer when not in use. Left handed? A touch of the keypad and the paddles are reversed. Choose any speed between 1 and 99 words per minute, and any of 11 weight settings. Special rear-panel jack connects mechanical paddle.

Great code practice machine, too

A "practice" mode sends random code groups of random length and selectable types for a total of 6,400 different practice sessions. Each sequence sends approximately 3,000 characters before repeating.

Other features:

Built-in sidetone oscillator and speaker have pitch and volume controls. Phone jack and earphone are included for private listening. Complete details on the great new μMatic Memory Keyer are in the latest Heathkit Catalog. Or see it at your nearby Heathkit Electronic Center.*

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World Class Performance and Features

The FT-ONE is the culmination of an all-out design project by Yaesu's top engineering team. Working without the usual cost constraints, Yaesu's design group is proud to unveil the instrument they "always wanted to design," a revolutionary blend of computer and RF technology.

GENERAL COVERAGE, ALL SOLID STATE

The FT-ONE is a full-coverage all-mode transceiver, equipped for reception on any frequency between 150 kHz and 29.99 MHz, with transmit coverage on all nine present and proposed amateur bands. In countries where permitted, the FT-ONE may be programmed to transmit throughout the 1.8-29.99 MHz range.

KEYBOARD FREQUENCY ENTRY

Fully digitally synthesized, the FT-ONE uses a front panel keyboard for initial frequency entry. Frequency change is then accomplished via the main tuning dial or the pushbutton scanner, with tuning in either 10 Hz or 100 Hz steps possible. Truly the contester's dream, the FT-ONE permits extremely fine tuning and instantaneous band change with equal facility.

DUAL VFO SYSTEM

Ten digital VFO's with memory are provided, in conjunction with an A-B selection scheme that allows instant recall of any transmit, receive, or transceive frequency desired. For split-frequency operation, such as on 7 MHz SSB, the operator may select TX on VFO-A and RX on VFO-B, automatically storing the calling and listening frequencies for each pile-up. For net operations, a non-volatile memory board is available as an option, to eliminate the possibility of dumping memory.

FULL CW BREAK-IN

Recent advances in solid-state technology have finally made full CW break-in reliable enough to be incorporated into a Yaesu product. Now you can select traditional semi-break-in (for use with amplifiers not equipped for full break-in) or full high-speed break-in. When using amplifiers so equipped, the keyer output lead may be interrupted via a rear panel jack and routed to the break-in sequencing input on your amplifier.

SWITCHING REGULATOR POWER SUPPLY

Extremely compact and light in weight, the switching regulator power supply reduces substantially the space required to produce the operating voltages used in the FT-ONE. Highly efficient and uniquely stable, the switching regulator supply provides superb reliability in a field of design long neglected by amateur manufacturers.

ELITE CLASS PERFORMANCE FEATURES

In addition to the full break-in and superb receiver filters, Yaesu's design team packed the FT-ONE with subtle virtues that others might have overlooked. Rear panel jacks allow the use of both an external receiver and an independent receive antenna, such as a 160 meter Beverage. While scanning, automatic halting on a received signal may be programmed. . . perfect for watching a band for openings. If you're a DX-peditioner, an optional Curtis 8044 keyer board is available, so you won't need an external keyer that only wastes suitcase space. And if your amplifier fan is louder than it should be, there's even a microphone squelch (AMGC) to reduce background noise pickup between words and sentences!

ONE YEAR FACTORY WARRANTY

Because of the level of attention to design detail, parts selection, and factory quality control, your FT-ONE is backed by a one-year *factory* warranty for the original purchaser at retail. Prompt and meticulous attention to your warranty needs will be provided by our Ohio And California Service Centers. In addition, all units sold in the United States will be inspected and tested after clearing Customs, and will include a Service Manual in the puchase price.

GAIN/INTERCEPT OPTIMIZED RECEIVER FRONT END

Utilizing up-conversion with a first IF of 73 MHz, the FT-ONE RF amplifier stage uses push-pull power transistors configured to produce a typical output intercept of +40 dBm. The first mixer utilizes a diode ring module followed by a low noise post amp, for optimum noise figure consistent with modern day intercept requirements. The result is a receiver with a typical two-tone dynamic range well in excess of 95 dB (14 MHz, CW bandwidth). Additional gain tailoring is provided via a PIN diode attenuator controlled from the front panel.

FILTERS READY FOR COMPETITION

Three filter bandwidths are available for CW operation (two for FSK!), using optional 600 Hz or 300 Hz crystal filters. Filter insertion losses are equalized for constant IF gain. Both IF Shift and Variable Bandwidth are provided, and two CW filters may be cascaded, for competition-grade selectivity. For SSB work, the Variable Bandwidth feature eliminates the need for costly 1.5 kHz or 1.8 kHz filters, as any intermediate bandwidth may easily be programmed using the standard, cascaded SSB filters. To top it all off, a high-performance audio peak and notch filter is standard equipment.

EXPANDED OPERATING DISPLAYS

Digital displays for the VFO Frequency, memory channel, and RIT offset are provided for quick frequency identification. The large front panel meter provides easy viewing of transceiver operating parameters, including final transistor collector current, input DC voltage, FM discriminator center tuning, speech processor compression level, and forward/reflected relative power.

NOT AVAILABLE AS OPTIONS

It's hard to believe that other manufacturers still insist on making such essential items as a noise blanker or speech processor extra-cost options. We find that these are less expensive to incorporate and more reliable in operation when installed on our assembly line. No AC power supply is available as an option for the FT-ONE, either; it's equipped for operation from 100/110/117/200/220/234 volts AC or 13.5 volts DC. And it goes without saying that there will not be an external VFO offered for the FT-ONE — we're confident that ten VFO s are quite enough!

Experience the FT-ONE in your Authorized Yaesu Dealer's showroom today. This may be the last Amateur transceiver you will ever own.

Warranty policy available upon request. SASE, please.

Specifications subject to change without notice or obligation.

FT-ONE

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The radio.

1081

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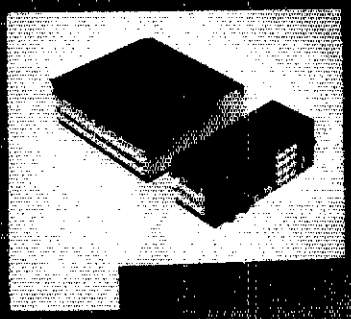

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- PUSHBUTTON FREQUENCY CONTROL FROM MICROPHONE OR PANEL: Frequency is selected by buttons on the front panel or microphone.
- 8 CHANNEL MEMORY: Each memory channel is reprogrammable and stores the frequency and offset. Memory is backed up by a NICAD battery when power is removed.
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- MEMORY SCAN: Memory channels may be continuously scanned for quick location of a busy or vacant frequency.
- PROGRAMMABLE BAND SCAN: Any section of the band may be scanned in steps of 5 or 10 kHz. Scan limits are easily reprogrammed.
- DISCRIMINATOR SCAN CONTROL (AZDEN EXCLUSIVE PATENT): The scanner stops by sensing the channel center, so the unit always lands on the correct frequency. COMPARE this with other units that claim to scan in 5-kHz steps!
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- PL TONE OSCILLATOR BUILT IN: Frequency is adjustable to access PL repeaters.
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- GREEN FREQUENCY DISPLAY: Frequency numerals are green LEDs for superior visibility.
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- SUPERIOR RECEIVER: Sensitivity is better than 0.28 uV for 20-dB quieting and 0.19 uV for 12-dB SINAD. The squelch sensitivity is superb, requiring less than 0.1 uV to open. The receiver audio circuits are designed for *maximum* intelligibility and fidelity. COMPARE!
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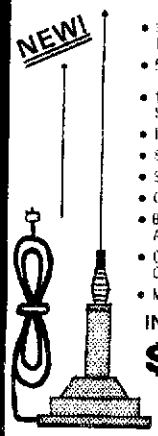

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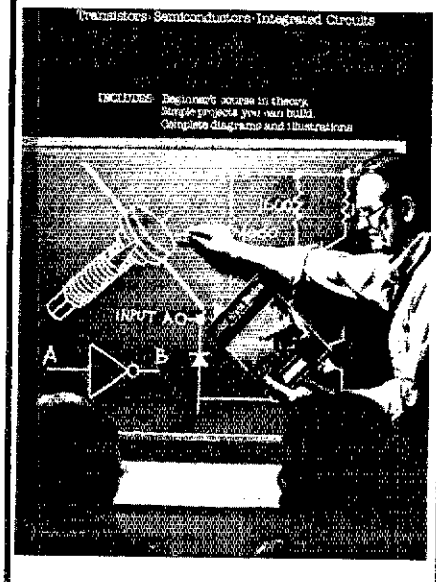

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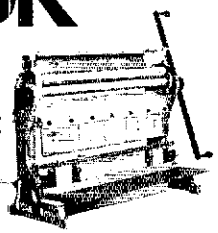

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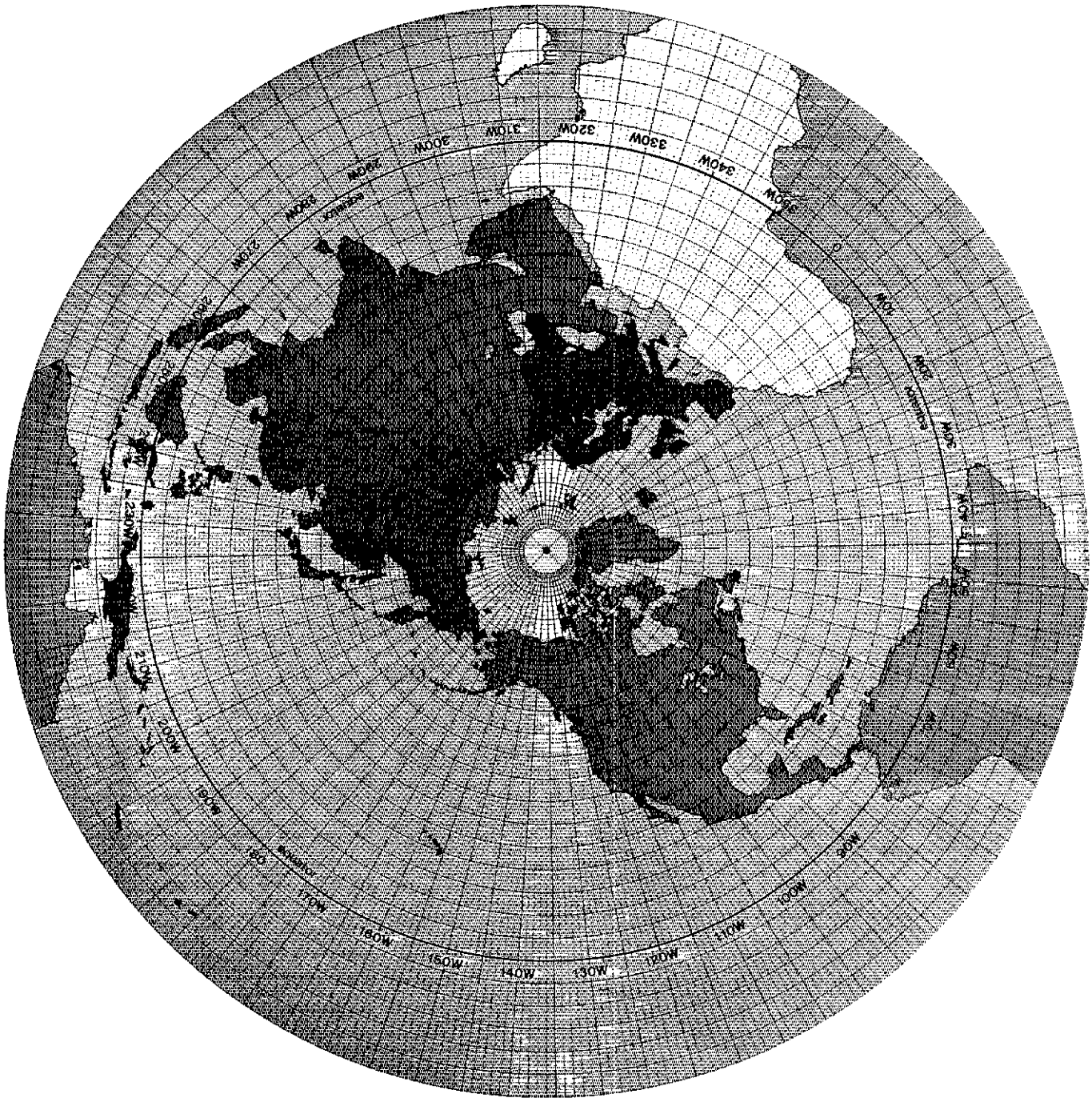

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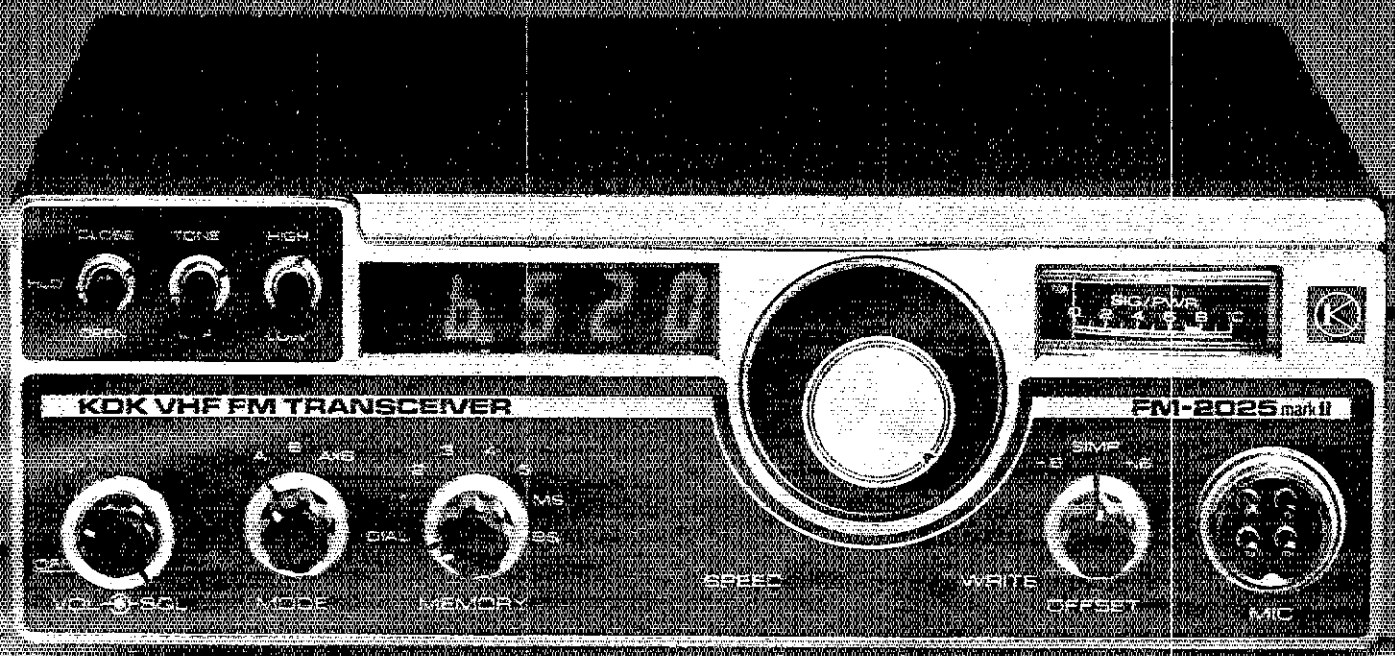
KDK MAKES 2 METER FM SIMPLE AND EASY!



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THE KDK FM-2025A MKII IS LOADED WITH FEATURES. EASE OF OPERATION IS THE DESIGN CONCEPT AT KDK.

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If you have been waiting to move up to a new model, or have shed for a radio with "everything" . . . KDK has it!

The ten channel memory is easily addressable and you have o banks of five channels each. You can even use both banks at ce for odd splits.

Standard 600 hz shift up or down — plus factory available ards for foreign shifts. Your 2025A is never obsolete!

Band scan or memory scan. Memory scan is easy. There is also nd scan with upper and lower limits you can choose yourself!

Built in nicads for the memory retention which has drain in no-amps, not milli-amps. The internal battery will hold the mory for up to one year! No other radio offers you this ture.

Fast and easy dialing. Full solid state dialing and you can oose from the front panel either a fast or slow dial rate.

No relays are used, only solid state switching. This eliminates ouble spot many radios encounter.

KDK has also eliminated another trouble spot by completely nd wiring each radio. No internal plugs to become intermittant d no wire wraps either, just good solid wiring.

KDK gives you one of the hottest receivers you can find. By ng UHF (not VHF) dual gate MOS-FETs with electronic auto ing for the RF amplifier and the first mixer, you have a com-ation of ultra sensitivity and maximum quietness.

The squelch on the 2025A MkII is highly sensitive and front nel adjustable, use it for ultra-DX or super local.

*The audio output stage in the 2025A MkII uses an integrated circuit which has internal protection against over-voltage and shorted output conditions. Plus it is a high audio output chip — just what you need in a noisy mobile situation.

*The transmitter uses direct VCO varicap modulation for true FM. Your transmitted audio sounds as it should; crisp, clear and natural.

*The power output stage of the 2025A MkII will not break down even with an infinite VSWR load, and uses heavy duty solid state antenna switching with a four stage low pass filter. All this gives you an exceptionally clean, spur free output.

*KDK has included an adjustable sub audible tone circuit which can also be used for CTCSS or tone burst on transmit. Again, more features!

*Size is 2 7/10" high, 7 1/8" wide, and 9 1/2" deep.

*You can switch from 25 watts to 3 watts low power.

*And, of course, the DC cable is included along with the matching microphone and mobile mounting bracket. A tone encoder microphone is also available to match and is, naturally, pre-wired.

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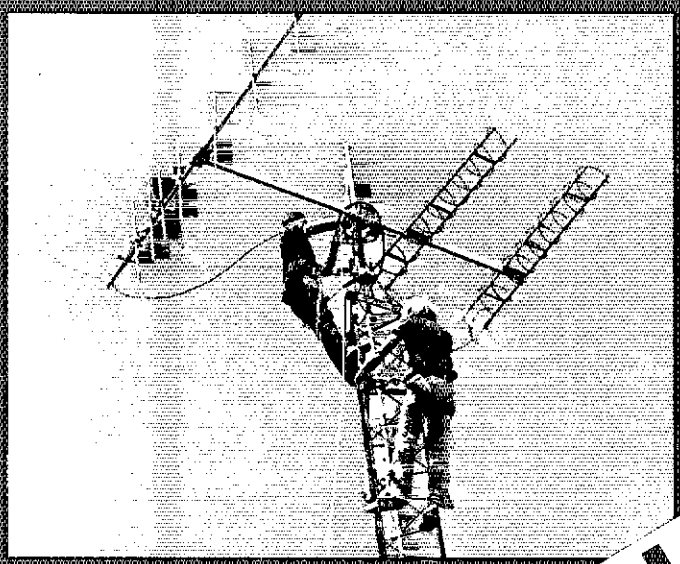
1982 THE RADIO AMATEUR'S HANDBOOK



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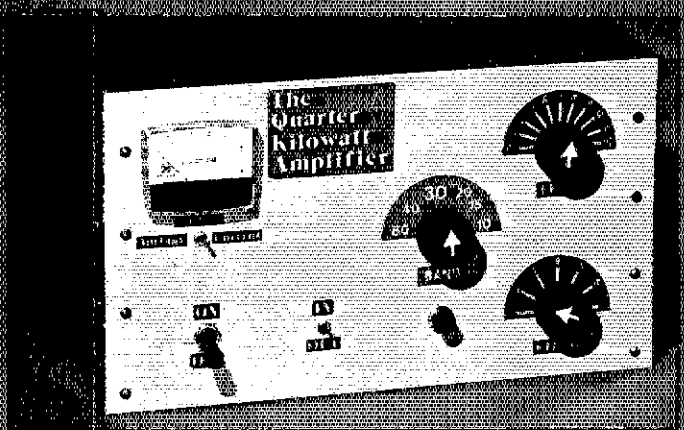

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- Two-Tone Generator
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- General-Purpose RTTY Demodulator
- Computer Serial Data Interface
- 50-MHz Transmitting Converter
- 8-Band Communications Recevier

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- 10-MHz Info Added to Several Construction Projects
- Introduction to Packet Radio and Spread Spectrum
- New RFI Chart Showing Frequency Relationships Between Amateur Bands (including WARC) and Other Services (including CATV)
- 10-GHz Gunuplexer Communications
- New Antennas for VHF FM
- Updated Parts Supplier List

CHAPTERS INCLUDE:

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- Radio Design Technique and Language
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- AC-Operated Power Supplies
- HF Transmitting
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- Receiving Systems
- VHF and UHF Receiving Techniques
- Mobile, Portable and Emergency Equpment
- Code Transmission
- Single Sideband
- Frequency Modulation and Repeaters
- Specialized Communications Systems
- Interference with Other Services
- Test Equipment and Measurements
- Construction Practices and Data Tables
- Wave Propagation
- Transmission Lines
- Antennas for High Frequency
- VHF and UHF Antennas
- Operating a Station
- Vacuum Tubes and Semiconductors (Tables)

The price of the 1982 *Handbook* remains at $10 in the U.S., $11 in Canada and $12.50 elsewhere. Clothbound copies are $15.75 in the U.S. and $18 elsewhere. All payments in U.S. funds. Books will be shipped postpaid after they come off the press in November. *Order today!*

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LEARNING YOUR NEW LANGUAGE: The Morse Code — why every ham knows it; how to learn it the right way.

UNDERSTANDING BASIC THEORY: Easy-to-learn explanation of electronic theory and what you need to know to qualify for a Novice license.

SETTING UP YOUR STATION: Choosing a location; how to select your equipment; what antenna to use; glossary.

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The booklet consists of 134 pages of text and an additional 26 pages of equipment and publication advertising. The C-60 cassette provides 60-minutes of code practice instruction. The entire package is available for $8.50 (in U.S. funds) and is available at your favorite dealer or from:

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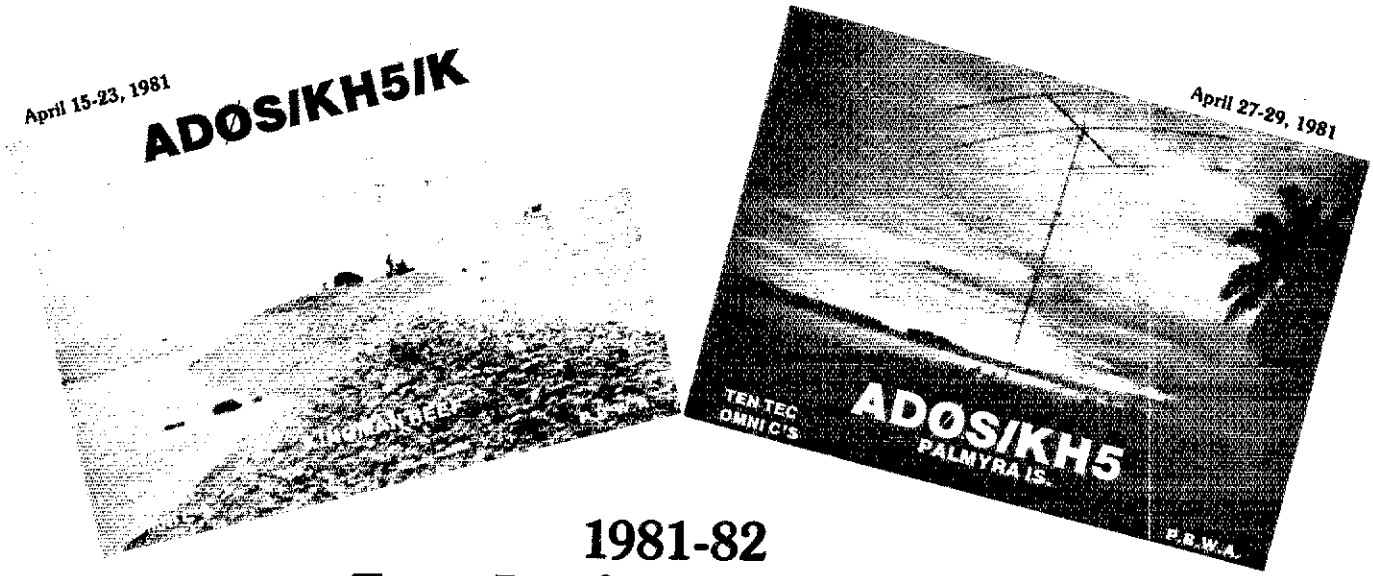


1981-82 Trans Pacific DX Expedition used TEN-TEC OMNI-C transceivers.

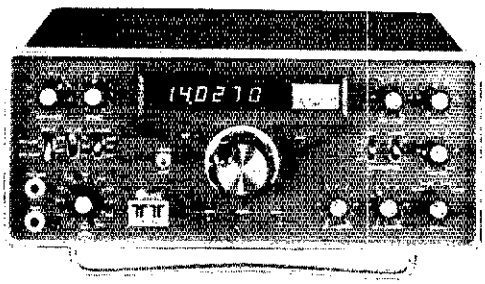
KINGMAN REEF, PALMYRA, TOKELAU — 33,000 contacts without a miss.

As George Carleton (ADØS ex KH5K) said in a letter to TEN-TEC... *"12,100 QSO's from Kingman, 8100 for me, 3100 in the first sitting with the rig on a continuous 33 hours except for 2 minute gas breaks... all other gear gave us trouble due to salt spray – the TEN-TECs just kept working great.*

"This is the most QSO's ever from Kingman and all were barefoot. A few times generators ran out of gas during rainstorms with rigs operating on TX... no problem with voltage drop, and no damage. No tuners were used... only your rigs and (antennas). The wind blew continuously from 20 knots to 50-60 knots and we literally had to open the tent to let the rain out, salt water and spray everywhere, watches quit, keyers and linear (other brands) quit after the first QSO – arcing due to salt spray, but the TEN-TECs never even got warm when the tent was around 100°F.

"... American gear is best."

The TEN-TEC OMNI-Cs went on to serve on Palmyra and Tokelau with equally impressive results and we thank the group for their letters—we couldn't have said it better.



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SOUTH DAKOTA: SCM, Erwin Helmbuck, K0TZ — I am writing this as I am returning from being gone for a month, so the news will be brief. I will put the activities in next month that I did not get in time. The vhf convention for the Central states was held in Sioux Falls and a good time was had by all. Activities included antenna measuring contests and noise figure measurements for preamps. Several tech papers were presented that were excellent. The Rapid City repeater is sporting new antennas on receive to go with the other improvements to really improve the coverage. Note to clubs: Now is the time for making plans to give Novice classes this fall/winter. The League has some excellent materials to help you. Traffic: W0KJZ 35.

DELTA DIVISION

ARKANSAS: SCM, Dale E. Temple, W5RXU — SEC: WB5IGF. NMs: KC5CE W5MYZ W5UAU WA5AWA. Northwest Arkansas Club held their annual cookout on July 10 with 58 attending for a good time. Effective Aug. 1, 1981, W5UAU Net Manager, Arkansas Phone Net. Thanks to W5POH for his many years as Ark. Phone Net Manager. WB5IGF has sent info to all Arkansas ECs. Please let him know your thoughts. Nets: OZK 171 QNI, 26 QTC, 408 min. Ark. Phone Net 498 QNI, 35 QTC, 989 min. Saline Co. Net 34 QNI, 8 QTC, 91 min. Mockingbird Net 680 QNI, 22 QTC, 450 min. Razorback Net 911 QNI, 79 QTC, 555 min. Presently have 37 ECs for Arkansas. If you're interested, contact WB5IGF. Would also like ECs to be more active on nets. Need someone to report QCWA news. Traffic: WB5GQH 43, W9YCE 23, W5UAU 9, W5KL 4.

LOUISIANA: SCM, Jim Giammanco, N5IB — Please welcome WB5IYH, who is the new manager of LSN. Latest FCC figures for LA show 916 Novices, 734 Technicians, 1554 Generals, 1169 Advanced and 347 Extras, for a grand total 4720 hams in LA. ARRL records show about 1600 members in the state, or about one ham in three. With the above in mind, how come there are only about a dozen traffic reports down below? But seriously folks, all the traffic nets need more participation, especially from the major metropolitan area. Don't deny yourself the enjoyment of traffic work just because you can't "meet the nets regularly," come when you can!! It helps to recall every once in a while that this is, after all, our hobby, and no one expects "iron-man" dedication. Don't forget the LA Section Convention Oct 17 and 18 in Kenner. FCC exams will be given Saturday. Contact the Jefferson ARC for details. This hamfest will celebrate the JARC's 25th anniversary.

Net	Freq.	Time	QNI	QTC	Mgr.
LAN	3615	7 & 10 P.M. Dy	290	127	K5TL
LTN	3910	6:30 P.M. Dy	152	41	N5EK
LSN	3703	7:30 P.M. M-F	88	3	WB5IYH
LRN	3087.5	6:30 P.M. Su, 8 P.M. W	8	0	N5RB
LEN	3910	8:00 P.M. Sun			

Traffic: N5TL 200, N5RB 114, N5BFV 70, N5IB 50, KC5SF 48, WD5FLM 32, WD5CWK 11, K5WOD 6.

MISSISSIPPI: SCM, Paul Kemp, WB5SNB — SEC: WB5FXA. Greenville Hamfest was a success. A number of appts have been cancelled due to lack of activity. New ones are in the process now. WA5OKI and WA4IQL did a fine job in getting medical assistance to a small child in Guatamala City. The child is doing well. Congrats to a FB job to the NCS of MSN, W5YRX WA5IDF WB5PSP KA5FDD & KA5GGG. CAND (W5KLV) sess 31, QTC 899, MS rep 100 percent by N5AMK W5EDT WA5OKI. DRN5 (WB5YDD) sess 31, QTC 351, MS rep 100 percent by N5AMK W5EDT WB5HAS KC5OB WB5OHN WA5OKI W5QDC. MTN (K5OAF) sess 31, QNI 103, QTC 33. MSBN (WD5EYM) sess 31, QNI 1871, QTC 58. MN (WB5RMW) sess 28, QNI 419, QTC 12. MSN (KA5GGG) sess 20, QNI 111, QTC 0. CAEN (KA5AGD) sess 4, QNI 96, QTC 4. RACES (N5AMK) sess 4, QNI 145, QTC 0. Traffic: N5AMK 452, K5OAF 141, W5EDT 87, WA5OKI 32, WD5EYM 11, WB5HAS 10, KC5LK 8.

TENNESSEE: SCM, John C. Brown, N04Q — STM: K4OYL. SEC: W4NZW. The Crossville, Oak Ridge and Nashville-Music City Hamfests are now history. Those of you who missed part or all, missed a great time. The TN Council/TN QSO party awards were made at Oak Ridge Hamfest. The usual good turnout was on the records again. The Tennessee 'Ham of the Year' award was made again this year with several nominations. The committee selected K4TKQ, NM East Tenn Hospital Emergency Traffic Net — a very deserving amateur. Congratulations on the selection. Would like to remind all amateurs in the section don't forget to cast your ballot for Delta Division Director and Vice Director and SCM for the next two years. Cw 60 sessions, QNI 671, QTC 244. Phone - LF 87 sessions, QNI 3898, QTC 187. Vhf 47 sessions, QNI 1430, QTC 734. Honor Roll for cw nets: TN - KA4BSG W4DDK W4WXH; TSN - KA4BSG WA4CMS NN4D N4DZW N4EAM N4EFB KA4FIE NG4J KY4L WA4LXP KA4OVE KA4PWU KA4RJC and WB4YSN. A net certificate was awarded to WA4BSV. We still have a few hamfests to go for the season, Cedars of Lebanon, Memphis and Chattanooga. Get out and renew old and new personal QSOs. Also talk to your SCM, STM and SEC. Give them your ideas for betterment of the section operations. Traffic: NG4J 539, WD4SIG 332, W4WXH 305, WA4NIF 269, W4ZJY 148, WB4BKF 145, W4OGG 93, W4MRD 83, K4VM 81, W4ODK 53, W4PFP 35, W4CSY 34, WD4NJR 27, K4YOL 27, K4WOP 23, NN4D 22, KY4L 18, W4NZW 18, W4TYV 17, K4ON 13, WA4GLS 10, NM4W 10, W4EWR 9, WB4ZSZ 8, WB4YPO 7, WA4BWW 5, W4DPO 1.

GREAT LAKES DIVISION

KENTUCKY: SCM, Dave Vest, KZ4G — STM: KA4GFU. SEC: N4EEL. Nets reporting:

Net	QNI	QTC	Net	QNI	QTC
KRN	502	33	MKPN	1004	93
KTN	1045	236	KNTN	421	150
KYN	252	94	KSN	209	71
KEN	112	4	KPON	56	5
5ARES	113	13	CARN	85	14
PAEWN	342	40	TSTMN	447	41
4ARES	58	2	5ARES	73	10
6ARES	110	4	11ARES	31	7
SEKEN	25	1			

D9RN/DCAN/9RN all 100 percent. New appts: WA4YJK and KA4KSV/EC Upgrades: KA4ELS KA4SPO KA4MGM N4ELS KA4KLF N4CAC N4FES. New president RCARC-WB4FSX. WA4WSM has moved to Colo. Please support your local and section nets during SET. WA4JAV has ARES going in Bowling Green area and is new net mgr for KEN. Traffic: KA4MZY 183, WD4BSC 115, KC4VB 98, WA4EBN 90, KC4XM 88, KA4GFU 80, KB4OZ 77, WB4APC 73, WB4NWS 69, N8XXI/4 61, KS4V 60, K4ZWB 59, K4JLX 48, KZ4G 36, WD4IYI 34, KA4SAA/N 34,

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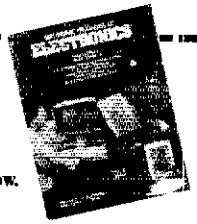

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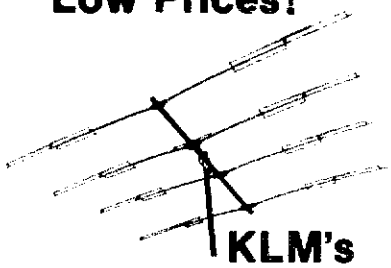

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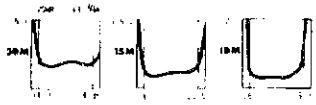

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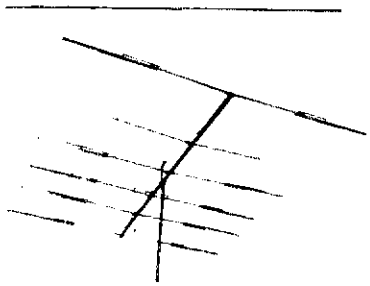

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1/2 EJ (1/2" Eye & Jaw Turnbuckle)	$9.50
3/16" Preformed Guy Grip	$1.65
1/4" Preformed Guy Grip	$1.85
6" Diam - 4 ft. Long Earth Screw Anchor	$12.50
2" Diam - 10 ft. Long Heavy Duty Steel Mast	$39.00
5000 Guy Insulator (5/32" or 3/16" Cable)	$0.95
502 Guy Insulator (1/4" Cable)	$1.95
5/8" Diam - 8 ft. Copper Clad Ground Rod w/clamp	$11.00

ANTENNA WIRE & ACCESSORIES

12 Ga. Solid Copperweld (Multiples of 50 ft.)	$6/50 ft.
14 Ga. Solid Copperweld (Multiples of 50 ft.)	$5/50 ft.
14 Ga. Stranded Copper (Multiples of 50 ft.)	$5/50 ft.
14 Ga. Stranded Copper (70 ft. coil)	$ 7.00
14 Ga. Stranded Copper (140 ft. Coil)	$ 14.00
18 Ga. Copperweld (1/4 mile spool)	$30.00
18 Ga. Copperweld (1/2 mile spool)	$58.00
Heavy Duty B&W End Insulator	$4/Pair
HYGAIN Model 155 Center Insulator	$ 5.95
HYGAIN Model 157 Center Insulator w/SO239	$11.95
450 OHM H.D. Low Loss Ladder Line	$ .14/ft.

master charge

TEXAS TOWERS

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WA4GAL 32, WA4JAV 31, WA4AGH 30, WA4JTE 30, N4EEL 27, K4HOE 27, KA4IKH 23, WA4AVV 21, KA4MBF/N 21, KC4AV 19, WD4CQF 19, N4EZE 19, KD4IF 19, K4MHL 15, N4FFS 14, W4PKX 12, NN4H 11, WD4CJQ 9, WA4YPQ 4, WB4AUN 3, K4AVX 3, KD4SN 3, KA4TDQ 3, WA4UIV 3, WD4IYH 2.

MICHIGAN: SCM, James R. Seeley, WB8MTD — ASCM: WA8DHB. SEC: WA8EFK. STM: AF8V. DECs: KC8DN K8RCT W8VWY. NMs: KA8DEZ WA8DHB K8LNE K8KMQ WD8LRT WD8NKT WA8PIM W8SCW WD8RNQ WB8YDZ WB8ZIY K8ZJU.

Net	Freq.	Time/Day	QNI	Tfc.	Sess.	Mgr.
MITN*	3953	1900 Dy	744	410	31	WD8LRT
QMN*	3663	1800 Dy**	842	323	59	WA8PIM
MACS*	3953	1100 Dy	641	193	31	K8LNE
GLETN	3932	2100 Dy	1383	182	31	WD8LSV
MNN*	3722	1730 Dy**	350	90	62	KA8DEZ
UPN*	3922	1700 Dy	603	69	35	WA8DHB
WSSBN	3935	1900 Dy	544	26	31	WB8SUR
BR	3930	1730 M/S	304	21	27	WB8ZGP
MEN	3930	0900 Sn	151	5	5	WB8ZGP
VHF Nets 10 rpts.			729	44	46	WD8NKT

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000. 3932 kHz is MI emergency frequency. Traffic workshop Sn 3953 kHz, 1600. ARES net Sn 3932 kHz 1730. UP ARES Thur 3922 kHz 1800. OO reports: K8JH W8QG KE8X. OBS report: K8NKB. Silent Keys, with deep regret: W8HKL, WD8PUZ. New officers for GLETN: WD8LSV, mgr.; WB8TAR, asst. mgr.; WD8IBY, secy. Section Certificate of Merit to WA8DHB and WD8BHE. New EC appointments: N8BGB, Calhoun Co.; W8KSX, Berrien Co.; W8MAR, Marquette Co. The trip to the U.P. Hamfest and workshops was enjoyable as always. Thanks to the U.P. hams for their fine hospitality. I especially enjoyed meeting WI SCM, K9FHI, and the group of WI hams with him. July traditionally is a slow month, which makes our net totals, individual totals, and four BPLs something to remark about. This could end up being a record year for traffic in MI. Congrats to WD8EIB, chosen U.P. "Ham of the Year" at the U.P. Hamfest. Midland's WD8OML announces he's leaving us for "tropical southern IN. Not permanently, I hope. As bulletin editor for the Midland club, he'll be hard to replace. At the request of Wayne Co. EC, W8JEJ, I am recognizing the Wayne Co. ARES Net as part of NTS and have appointed WB8ZIY as NM. This gang does a terrific job in public service in one of the most densely populated parts of the U.S., quietly, with no fanfare and with far too little recognition of their dedication and effectiveness. The Big Rapids Area ARC is sponsoring a hidden transmitter (Fox) hunt this month. Prizes for 1st, 2nd and 3rd place. BPL: KA8AID KA8CPS WD8LRT AF8V. Traffic: KA8CPS 593, AF8V 531, WD8LRT 514, WB8ITT 290, WB8MTD 280, KA8AID 279, WB8YDZ 213, KB8MX 179, WD8IBY 131, K8KMQ 91, WD8QEP 82, WA8PIM 78, WD8RNQ 77, KA8DEZ 68, K8GXV 68, W7LVB 68, W8IHX 66, WA8DHB 61, WD8MJB 57, KC8DC 56, WD8ROK 56, W8VIZ 55, N8BJD 53, W8VPW 51, N8BNC 50, W8PDP 49, W8YIQ 48, WB8YWA 42, WB8YRY 41, K8LNE 37, KA8ECT 36, KB8GT 34, WB8TTA 32, W8JXJ 31, WD8RHU 30, WD8EIB 28, WD8NKT 28, K8OCP 26, WB8ZGP 26, WD8OSE 25, KE8X 25, KI8Q 24, K8UPE 20, W8TBP 19, WD8BEN 17, WD8BSE 17, K8BZ 17, W8MOF 14, WD8RWR 13, WA8VBF 13, WB8DJS 12, W8SCW 12, K8DTG 11, WD8DRI 10, WD8JRT 10, W8LDS 10, WA8AXF 7, N8AOM 6, K8RV 6, WA8YBP 4.

OHIO: SCM, Allan L. Severson, AB8P — Asst SCM: W8MOK. SEC: K8AN. STM: K8OZ. NMs: W8EK KF8J WB8JGW WD8KFN WD8QMP WB8YGW.

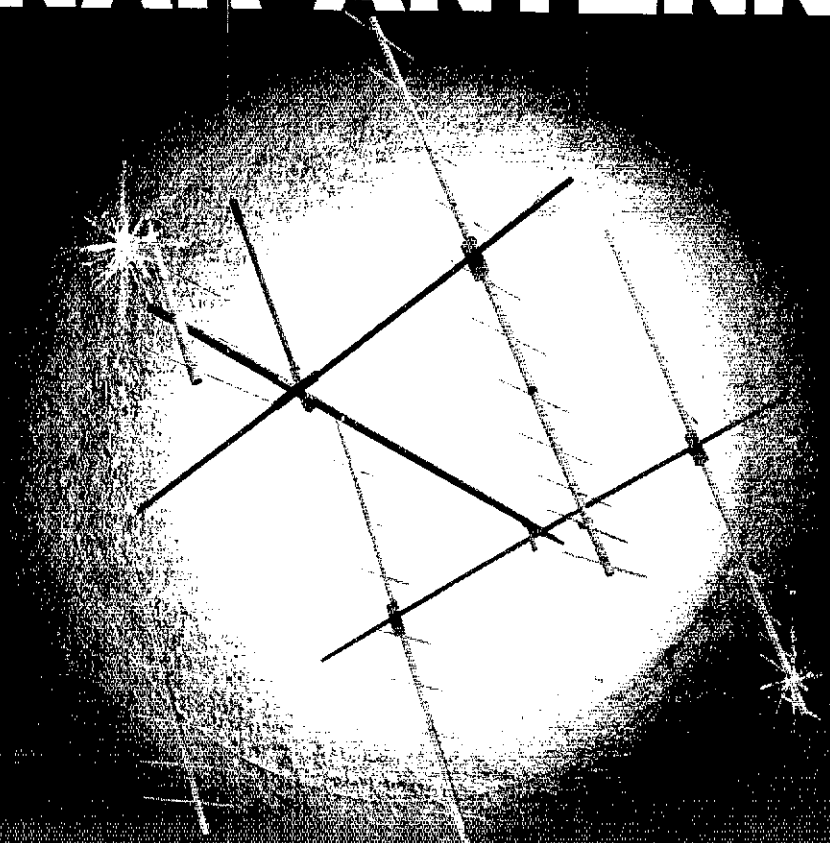
Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	479	315	62	6:45/10 P.M.	3.577
BNR	109	28	30	6 P.M.	3.605
ONN	75	14	22	6:30 P.M.	3.708
OSN	261	170	32	6:10 P.M.	3.577
OSSBN	2458	936	92	10:30 A.M. 4:15 & 6:45 P.M.	3.9725
O6MN	431	46	31	9:00 P.M.	50.160

By now, you will have noticed a number of new net managers in this section. Thanks to WB8JGW KF8J and WD8KFN for assuming the responsibilities of these most instrumental and necessary jobs. Other key leadership appts went to: K8IOW, EC for Warren County and KA8ATI, EC for Henry County. Elections: W8UPD, Univ. of Akron ARC: KK8L, pres.; KA8LVS, v.p.; KA8BQF, secy./treas.; KA8D, tech. sym. TSRAC: K8AN, pres.; WD8DDE WD8JIK, v.p.; WB8TQH, treas.; WD8PPR, secy. Congrats. Emergency operations occupied an unusually large amount of time of many Ohio amateurs during the last few months. Central Ohio amateurs rendered invaluable assistance after the small town of Cardington was almost destroyed by a tornado. WD8OYO and N8ADA assisted a Michigan amateur and his family (whose auto had overturned on the Ohio Turnpike) by obtaining police and medical assistance, and giving overnight lodging in their home. This was an example of Amateur Radio in its highest and most dedicated form. Public service events continue to increase and provide the training we all need. Over the July 4th weekend Cleveland's LEARA assisted at all-day events connected with a three day international soccer tournament, a parade, a run and a fireworks event. That's Amateur Radio spirit for you! Upgrades: N4ELS and KB8VP to Extra. Congrats.

Local Nets	QNI	QTC	Sess.
BRTN	349	183	31
COARES	90	9	4
COOMF	89	4	9
Firelands Red Cr.	36	5	5
Huron Co. ARC	44	0	4
IE Net	35	8	4
LCNWOARES	1010	491	62
MASER (June)	401	42	12
TATN	3332	150	31
TSRAC (June)	878	81	36

Traffic: WB8JGW 304, WD8KFN 300, N8XX 263, K8OZ 235, KB8YS 185, WB8WTS 182, AB8P 170, WA8HGH 160, KA8HOK 160, N8BQK 141, WD8KBW 132, KC8JJ 126, W8UJ 112, KF8J 103, WD8RIB 103, W8TP 103, N8JR 102, KK8L 101, WA8GMT 95, K8GET 75, W8MOK 75, WB8QHU 75, W8QZK 75, N8APM 69, KA8DJZ 64, WD8PEI 64, W8BHL 63, WD8DYW 63, WD8PUH 61, W8GGX 54, KA8HCT 52, WA8SSI 52, K8JDI 50, KA8HGH 49, W8EK 48, WD8NEC 47, K8DL 45, WA8JNQ 43, N8AKS 41, W8ZM 40, WA8BUW 39, KA8MFG 39, WD8NED 39, WD8OYO 39, WB8ICL 37, WB8SJE 35, WB8MRL 34, WA8LOI 33, WB8SIO 30, WB8YGW 30, N8DAD 29, WB8UBR 29, W8WEG 29, WD8ODV 27, WD9HDZ 26, KA8IUK 26, W8MGA 21, KA8KFW 20, W8UPD 20, W8WAV 20, KA8GGZ 18, WD8QMP 18, W8RG 18, N8AUH 17, WB8CJU 17, WD8MIO 17, WB8QHV 17, KA8GVZ 16, WB8WNH 15, WA8ZID 15, N8CGM 14, WD8JAJ 13, WB8PIY 12, WB8SRC 12, K8CKY 11, WB8DMF 11, W8IM 11, K8NJC 10, WB8YUS 10, W8OOL 7, W8DYF 6,

LUNAR ANTENNAS



PROVEN BEST PERFORMANCE
PROVEN HIGHEST EFFICIENCY
PROVEN SUPERIOR CONSTRUCTION

Three models available:
Model NMT 11/144 for 144MHz (2 meters)
Model NMT 11/220 for 220MHz (1.3 meters)
Model SST 0719 for 432MHz (.07 meters)

Each of these antennas has been tested and tried in the field and proven to be the top performer in its frequency range, with the highest efficiency gain for a given boom length and highest efficiency for number of elements.

For instance, the NMT 11/144 and NMT 11/220 were both used in the first moon bounce from Mexico. In addition, the NMT-11/220 were used for the first 220 MHz EME 4-Yagi QSO, and for the first 220 MHz EME SSB QSO.

The SST 0719, when compared against other leading antennas at a recent convention exhibited the highest efficiency/gain for a given boom length, besting the others by a considerable margin.

Superior mechanical construction featuring brass driven elements for high efficiency, through boom insulated element mountings, and integral TFE coaxial balun result in Lunar Antennas being the most efficient antenna available.

For a sharper, stronger signal in transmit and receive, get a Lunar antenna today.

Two way and four way power dividers also available for all three bands.

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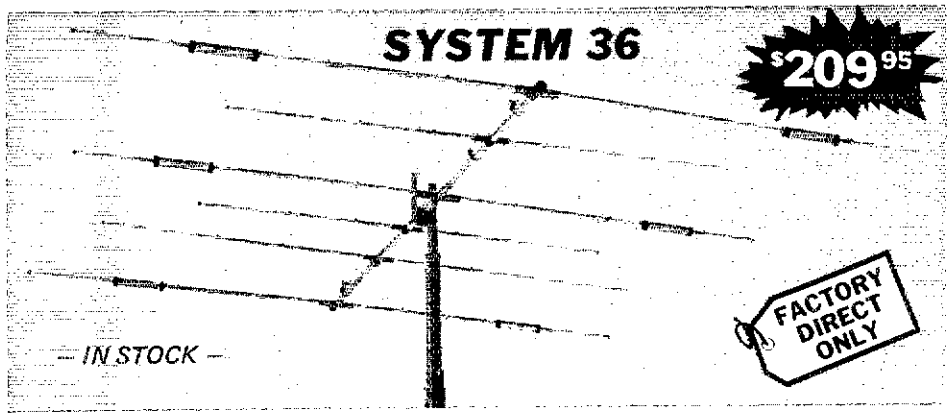
WILSON SYSTEMS INC. MULTI-BAND ANTENNAS

SYSTEM 36

$209.95



— IN STOCK —

A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15 and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Q Wilson traps. Designed to handle the maximum legal power, the traps are capped at each end to provide a weather-proof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.

SPECIFICATIONS

Band MHz	14-21-28	Boom (O.D. x Length)	2" x 24' 2½"	Wind Loading @ 80 mph	215 lbs.
Maximum power input	Legal Limit	No. of Elements	6	Maximum wind survival	100 mph
		Longest Element	28' 2½"	Feed method	Coaxial Balun (supplied)
V.SWR @ resonance	1.3:1	Turning Radius	18'6"		
Impedance	50 ohm	Maximum mast diameter	2"	Assembled weight (approx.)	53 lbs.
		Surface area	8.6 sq. ft.	Shipping weight (approx.)	62 lbs

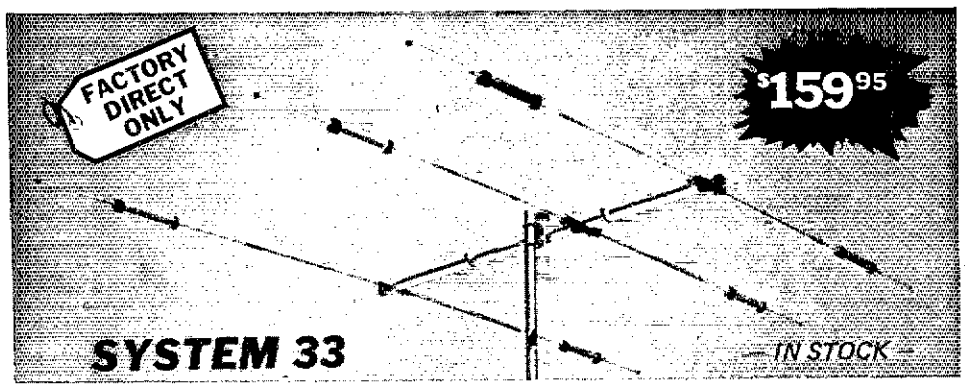
NEW!

ADD 40 OR 30 METERS TO YOUR TRI-BAND WITH THE NEW 33-6 MK

$59.95

— IN STOCK —

Now you can have the capabilities of 40-meter or 30 meter operation on the System 36 and System 33. Using the same type high quality traps, the new addition will offer 200 HKZ of bandwidth at less than 2:1 SWR. The new 33-6 MK will fit your present SY36 or SY33, and using the same single feed line.



Capable of handling the Legal Limit, the "SYSTEM 33" is the finest compact tri-bander available to the amateur. Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excells with the "SYSTEM 33". New boom-to-element mount consists of two 1/8" thick formed aluminum plates that will provide more clamping and holding strength to prevent element misalignment. Superior clamping power is obtained with the use of a rugged 1/4" thick aluminum plate for boom to mast mounting. The use of large diameter High-Q traps in the "SYSTEM 33" makes it a high performing tri-bander and at a very economical price. A complete step-by-step illustrated instruction manual guides you to easy assembly and the lightweight antenna makes installation of the "SYSTEM 33" quick and simple.

SPECIFICATIONS

Band MHz	14-21-28	Boom (O.D. x length)	2" x 14'4"	Wind loading at 80 mph	114 lbs
Maximum power input	Legal Limit	No. of elements	3	Assembled weight (approx)	37 lbs.
		Longest element	22'4"	Shipping weight (approx)	42 lbs.
V.SWR at resonance	1.3:1	Turning radius	15'9"	Direct 52 ohm feed — no balun required	
Impedance	50 ohms	Maximum mast diameter	2" O.D	Maximum wind survival	100 mph
		Surface area	5.2 sq. ft.		

WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice

ORDER FACTORY DIRECT 1-800-634-6898

$59.95

WV-1A

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a hot dipped galvanized base mount bracket to attach to vent pipe or to a mast driven in the ground.

Note:
Radials are required for peak operation.
(See GR-1 below)

SPECIFICATIONS

- 19' total height
- Self supporting — no guys required
- Weight — 14 lbs.
- Input impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q traps with large diameter coils
- Low angle radiation
- Omnidirectional performance
- Taper swaged aluminum tubing
- Automatic bandswitching
- Mast bracket furnished
- SWR: 1.1:1 or less on all bands

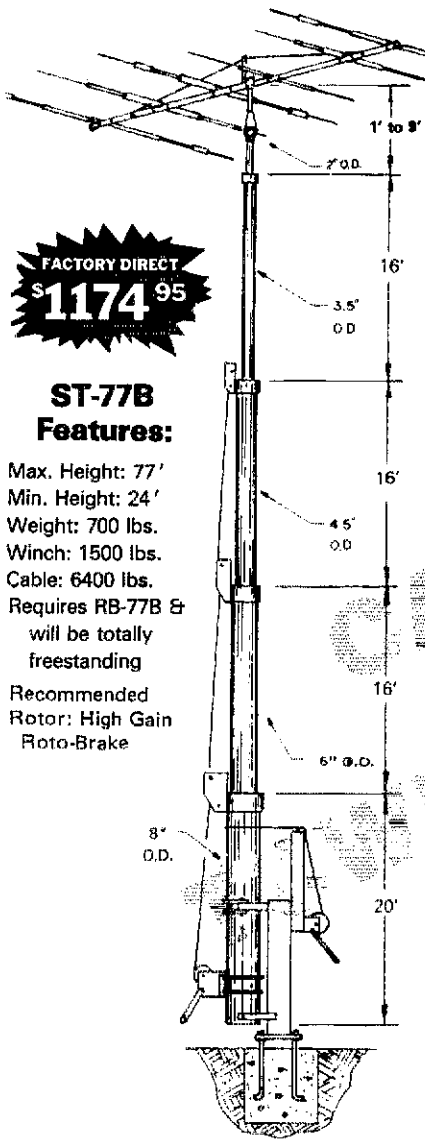
GR-1

$14.95

The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded aluminum wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the GR-1 by providing the correct counterpoise.

WILSON SYSTEMS TOWERS

— FACTORY DIRECT —

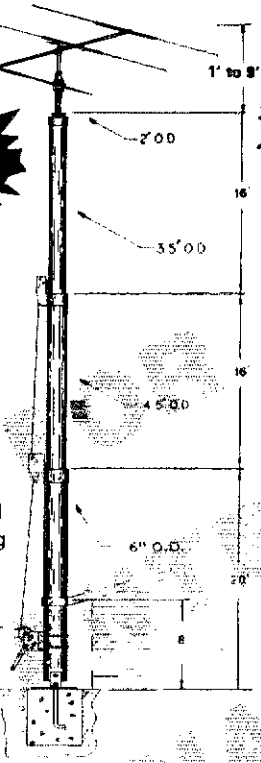


FACTORY DIRECT $1174.95

ST-77B Features:

Max. Height: 77'
Min. Height: 24'
Weight: 700 lbs.
Winch: 1500 lbs.
Cable: 6400 lbs.
Requires RB-77B & will be totally freestanding

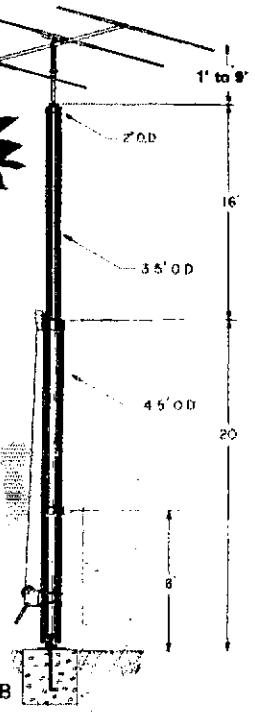
Recommended Rotor: High Gain Roto-Brake



FACTORY DIRECT $674.95

MT-61B Features:

Max. Height: 61'
Min. Height: 23'
Weight: 450 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against house.
For completely freestanding installation, use RB-61B or FB-61B below.



FACTORY DIRECT $409.95

TT-45B Features:

Max Height: 45'
Min. Height: 22'
Weight: 250 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against eve of house
For completely freestanding installation, use RB-45B or FB-45B below.

WIND LOADING			
Tower	Height	Sq. Ft	
ST-77B	69	16	Square Footage Based on 50 MPH Wind
	77	10	
MT-61B	53	18	
	61	12	
TT-45B	37	18	
	45	12	

BASE CHART		
TOWER	WIDTH	DEPTH
TT-45B	12" x 12"	30"
FB-45B	30" x 30"	4½'
RB-45B	30" x 30"	4½'
MT-61B	18" x 18"	4'
FB-61B	3' x 3'	5½'
RB-61B	3' x 3'	5½'
ST-77B	See Below	Bases
RB-77B	3½' x 3½'	6'

Wilson Systems uses a high strength carbon steel tube manufactured especially for Wilson Systems. It is 25% stronger than conventional pipe. The tubing size used is 2" & 3½" .095; 4½" & 6" , 8" .134. All tubing is cold dip galvanized. Top section is 2" O.D. for proper rotor and antenna mounting.

The TT-45B and MT-61B come complete with house bracket and hinged base plate for against-house mounting. For totally freestanding installation, use either of the tilt-over bases shown below.

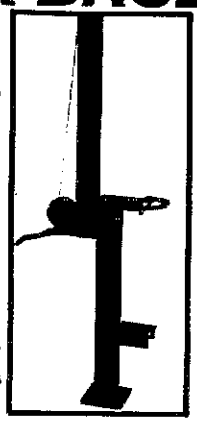
The ST-77B cannot be mounted against the house and must be used with the rotating tilt-over base RB-77B shown below.

TILT-OVER BASES FOR TOWERS

FIXED BASE

The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower.

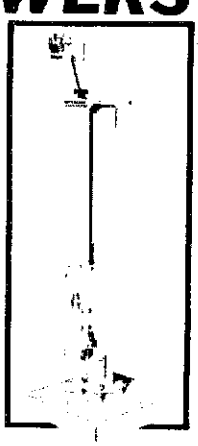
FB-45B.. 112 lbs...$209.95
FB-61B.. 169 lbs...$299.95



ROTATING BASE

The RB Series was designed for the Amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system.

RB-45B.. 144 lbs...$289.95
RB-61B,. 229 lbs...$379.95
RB-77B.. 300 lbs...$569.95



Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

ORDER FACTORY DIRECT 1-800-634-6898

Prices Effective 9-1-81 thru 9-30-81
Specifications Subject to Change Without Notice

WSI WILSON SYSTEMS, INC.
4286 S. Polaris Ave., Las Vegas, Nevada 89103

WB8YTD 6, WD8CHL 5, WD8EKI 5, WB8KKI 5, N8AJU 4, W8LZE 4, WB8NTR 4, WD8OYK 4, WB8NHV 3, WA1QAA 3, N8CJS 2, K8CMR 2, K8JE 2, WB8RUW 1.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Paul S. Vydareny, WB2VUK — SEC: KB2KW. STM: WA2SPL. ASCM: W2IT KB2TM.

Net	Time/Day	Freq.	NM
EPN	2200Z	3.902	WB2MCO
ESS	2200Z	3.590	W2WSS
NYS	2300/0200Z	3.677	KA2CTU
NYPON	2100Z	3.913	K2KQC
NYSPTEN	2200Z	3.925	AA2Y
NYS RATT	2230Z	3.5975	WA2ZJP
CDN	2230Z	146.34/94	WB2ZCM
HVN	2330Z M-F	146.37/97	N2BDW
HVN	2330Z S-S	144.535/135	N2BDW
SDN	0130Z	147.66/06	K2ZVI
SCRN	0000Z	147.735/135	WB2HDU

Great picnic at W2MTA on the 8th of August. I enjoyed meeting quite a few people and attending the meetings. NYS net covering all of New York should be in full swing. Contact WA2ZJP in case my info above is wrong. SET weekend is just about upon us with PD5 covering ENY and WNY. I hope everyone, even those not into traffic handling, will get out there and help the EC covering your county. Let's hear from those clubs who participated in public service activities during the summer! BPL: WB2EAG. PSHR: W2ACQ N2BDW WB2EAG KB2KW WB2MCO WA2SPL W2YJR. Traffic: WB2EAG 528, WA2SPL 370, KB2KW 132, W2ACQ 103, N2BDW 95, WB2MCO 73, AA2Y 66, W2EFU 62, W2YJR 53, W2IQK 46, K2ZVI 38, N2CPX 17, K2MI 12, WB2SON 12, WA2CJY 8, N2BSX 2.

NEW YORK CITY — LONG ISLAND: SCM, John Smale, K2IZ — SEC: WA2KKJ. STM: WB2BNY. The following are traffic nets around the section: NLI cw 3630 kHz 1900/2200 WB2TQC mgr; NLI phone 3928 kHz 1815 WA2SEL mgr; Nassau vhf 146.04/64 2100 M, W, Sun WA2SQE mgr; Big Apple vhf 147.915/315 M-F 2030 N2BMF mgr; Suffolk vhf 144.77/145.37 M-F N2BKK mgr; LIMARC 146.25/85 Fri 2045 WA2SOE mgr. Note: All times are local. Please try and help out by checking in whenever you can. Most of the vhf nets can be reached with one watt and a good antenna. Under "There Goes the Old Neighborhood" dept: KA2NIE is the new call of K2TB's XYL. That makes 5 active hams within a very short stones throw of each other. For those that don't know, K2TV is my next door neighboor. NY City Police Dept Civilian Amateur Radio Patrol meets Wed evening at 2030 local on N2JF rptr, 145.39/144.79. More info can be obtained from N2JF or WV2VDG at 212 476 7560. KC2DR is now KO2P, she was originally WB2QXU. WB2IDP spent the summer working at WSL as an operator. KA2ELB will be attending George Washington Univ. KA2CLQ started Aug 12 at the US Merchant Marine Academy at Kings Point. KA2KGH has a new TH5DX. High QNI for July for NL1PN. WAIMVL WA2ARC WB2BNY KA2KGH. WA2SEL is looking for NCS volunteers to fill the slots left by the stations departing for school. W2SLP is the 700th member of Metroplex. N2BKA upgraded to Advanced and N2GCL to General. Metroplex had their 4th annual picnic. The New York team was beating the New Jersey team 6-1 when the game was called on account of rain. WA2ZBE has a new Ten Tec 540 which he is trying out on the air. SIARA provided communications for two marathons held during the summer. KA1NH was out in Portland, Oregon and had a QSO with KA2T over one of the local repeaters, neither station knew the other was in the area. WA2EXI is retiring from Ma Bell and moving Down to Fla. How come most of all retired phone men either go to Fla or New England? Answers would be appreciated before I retire in another 30 years. Traffic: (July) W2AHV 273, WA2SEL 40, K2GCE 34, KA2CLQ 29, WA2ARC 25, KA2KGH 22, KA1NH 22, N2BSS 20, K2IZ 18, W2DBQ 4, WB2IDP 2. (June) WB2JAY 48.

NORTHERN NEW JERSEY: SCM, Robert Neukomm, KB2WI — ASCM: W5DTR/2. SEC: WB2VUF. STM: W2XD. NMs: W2CC N2BOP W2PSU KA2GQQ W2TCA N2XJ WB2IQJ N2BNB.

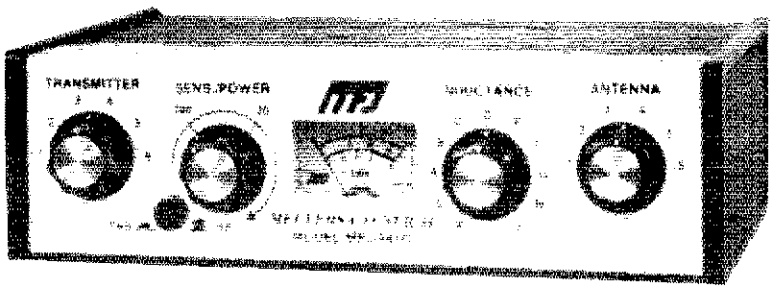
Net	Freq.	Time	Sess.	QNI	QSP
NJPN	3950	6 P.M. Dy	35	468	265
		9 P.M. Sn			
NJN/E	3695	7 P.M. Dy	31	319	143
NJN/L	3695	10 P.M. Dy	31 250	148	
NJSN	3735	6:30 P.M. Dy	30	119	40
OBTTN	72/12	8 P.M. Dy	31	558	145
UCTEN	085/685	7:30 P.M. Dy	31	310	52
NJVN	49/49	10:30 P.M. Dy	31	446	176
NNJVN	90/30	8:30 P.M. Weds	4	55	12
NJRTTY	147.51	Autostart	30		

Metroplex ACA announces N2BKA to Advanced and N2GCL to General and N2GCL's daughter recently graduated from medical school at Buffalo. Metroplex now has 707 members. Vhf traffic news: A historical link between the Robbinsville 147.075 out and Morris County 146.895 out occurred July 22nd at 10:30 P.M. with 38 checkins. KA2GSX upgraded to Advanced. Ramapo Mountain ARC held its annual picnic and campout July 24-26 in W. Milford. WA2WFF announced preliminary FD results of over 8,000 points with 42 ops. WA2STO upgraded to Advanced. The ARC of Secaucus is new and they have a new newsletter called "CQ QUA." They are seeking affiliation with the League. The club meets on 146.55 M-F 6:30-7:30 P.M. so join them! N2AQO is the new president. WB1FSN advised W2NKD following his inquiry about the "Wouff Hong" (of which he is a member) that "It is very much alive." The NJ Traffic Picnic on the 25th at Holmdel was a success. W2UEZ & AF2L both received the A-1 Op award. N2BQL new call KO2A. WA2YMK & KA2ERG presented "The Care & Feeding of Nicads" to the Greenbrook Repeater group. W2LTP is moving to Roxana, Delaware. W2IIN & XYL celebrated their 60th wedding anniversary on July 31. I received a radiogram from JSARS traffic net reporting QNI 363 and QSP 58. Sure wish they would advise what repeater they use and time, and I hope they have registered their net. Now is the time to get out and get those antennas fixed for the winter. The SET will be in progress by the time you receive this info. I sure hope you try to participate. Remember reports are due by the fifth of the month. Late report: KA2GVS is reported as a Silent Key. I hope you all had a good summer. Traffic: (July) KB2HM 367, W2GWS 263, W2XD 258, AG2R 251, KB2WI 149, N2BNB 141, KK2R 122, K2VX 99, N2XJ 95, W2TCA 90, N2BOP 67, AF2L 63, WA7DPK/2 57, WB2RMJ 49, KA2JMH 48, WA8ZNH/2 40, W5DTR/2 35, KA2HNQ/T 30, N2BC 28, KA2GSX 28, W2NKD 28, W2UH 28, KA2GMH 23, N2SU 20, W2CC 18, WB2KLF 17, KC2AK 13, KA2FXA 11, W2ZEP 3, WA2DLZ 1. (June) W2GWS 162.

MFJ ANTENNA TUNERS 16 MODELS

MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.



Ham Radio's most popular antenna tuner. Improved, too.

$89.95 (+ $4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.

Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

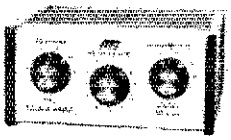
Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+ $4), like 941C less balun. **MFJ-945, $79.95** (+ $4), like 941C less antenna switch. **MFJ-944, $79.95** (+ $4), like 945, less SWR/Wattmeter, **MFJ-943, $69.95** (+ $4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER



MFJ-900

$49.95 (+ $4)

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $59.95 (+ $4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+ $4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B

$139.95 (+ $4)

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun, 300W, 50-ohm dummy load, SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel. 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962

$229.95 (+ $10)

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

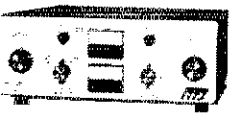
6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

4:1 balun. 250 pf 6KV cap, 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+ $10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV



MFJ-984

$329.95 (+ $10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min SWR. SWR/Wattmeter, for./ref., 2000/200W.

18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $239.95 (+ $10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+ $10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+ $10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V

MFJ-989

$329.95 (+ $10)

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf 6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

Built-in lighted 2% meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

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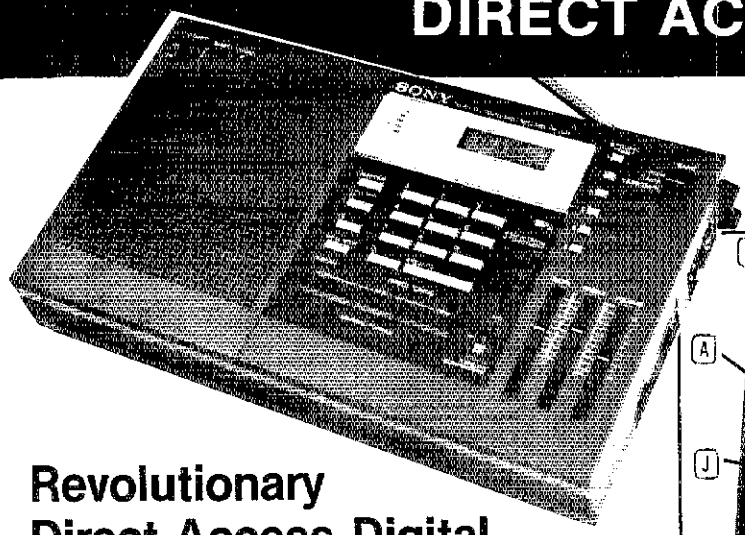

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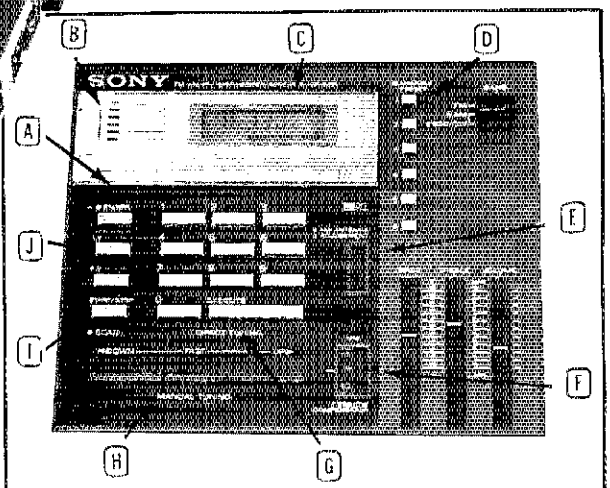
- **Instant Fingertip Tuning—No More Knobs!**
- **6 Memories for Any Mode (AM,SSB/CW, & FM)**
- **Dual PLL Frequency Synthesized—No Drift!**

A WHOLE NEW BREED OF RADIO IS HERE NOW! No other short wave receiver combines so many advanced features for both operating convenience and high performance as does the new Sony ICF-2001. Once you have operated this exciting new radio, you'll be spoiled forever! Direct access tuning eliminates conventional tuning knobs and dials with a convenient digital keyboard and Liquid Crystal Display (LCD) for accurate frequency readout to within 1 KHz. Instant fingertip tuning, up to 8 memory presets, and continuous scanning features make the ICF-2001 the ultimate in convenience.

Compare the following features against any receiver currently available and you will have to agree that the Sony ICF 2001 is the best value in shortwave receivers today:

DUAL PLL SYNTHESIZER CIRCUITRY covers entire 150 KHz to 29.999 MHz band. PLL_1 circuit has 100 KHz step while PLL_2 handles 1 KHz step, both of which are controlled by separate quartz crystal oscillators for precise, no-drift tuning. **DUAL CONVERSION SUPERHETERODYNE** circuitry assures superior AM reception and high image rejection characteristics. The 10.7 MHz IF of the FM band is utilized as the 2nd IF of the AM band. A new type of crystal filter made especially for this purpose realizes clearer reception than commonly used ceramic filters. **ALL FET FRONT END** for high sensitivity and interference rejection. Intermodulation, cross modulation, and spurious interference are effectively rejected. **FET RF AMP** contributes to superior image rejection, high sensitivity, and good signal to noise ratio. Both strong and weak stations are received with minimal distortion

EXTENDED SPECTRUM CONTINUOUS TUNING



A Enter Button
B Signal Strength Indicator
C Liquid Crystal Display
D Memory Preset Buttons
E Antenna Adjustment Dial
F SSB/CW Compensator
G Execute Bar
H Manual Tuning Buttons
I Scan Button
J High/Low Limit Buttons

OPERATIONAL FEATURES

INSTANT FINGERTIP TUNING with the calculator-type key board enables the operator to have instant access to any frequency in the LW, MW, SW, and FM bands. And the LCD digital frequency display confirms the exact, drift-free signal being received. **AUTOMATIC SCANNING** of the above bands. Continuous scanning of any desired portion of the band is achieved by setting the "L_1" and "L_2" keys to define the range to be scanned. The scanner can stop automatically on strong signals, or it can be done manually. **MANUAL SEARCH** is similar to the manual scan mode and is useful for quick signal searching. The "UP" and "DOWN" keys let the tuner search for you. The "FAST" key increases the search rate for faster signal detection. **MEMORY PRESETS.** Six memory keys hold desired stations for instant one-key tuning in any mode (AM, SSB/CW, and FM), and also, the "L_1" and "L_2" keys can give you two more memory slots when not used for scanning. **OTHER FEATURES:** Local, normal, DX sensitivity selector for AM; SSB/CW compensator; 90 min. sleep timer; AM Ant. Adjust.

SPECIFICATIONS

CIRCUIT SYSTEM: Fm Superheterodyne; AM Dual conversion superheterodyne. **SIGNAL CIRCUITRY:** 4 IC's, 11 FET's, 23 Transistors, 16 Diodes. **AUXILIARY CIRCUITRY:** 5 IC's, 1 LSI, 5 LED's, 25 Transistors, 9 Diodes. **FREQUENCY RANGE:** FM 76-108 MHz; AM 150-29,999 KHz. **INTERMEDIATE FREQUENCY:** FM 10.7 MHz.; AM 1st 66.35 MHz., 2nd 10.7 MHz. **ANTENNAS:** FM telescopic, ext. ant. terminal; AM telescopic, built-in ferrite bar, ext. ant. terminal. **POWER:** 4.5 VDC/120 VAC **DIMENSIONS:** 12¼ (W) X 2¼ (H) X 6¾ (D). **WEIGHT:** 3 lb. 15 oz. (1.8 kg)

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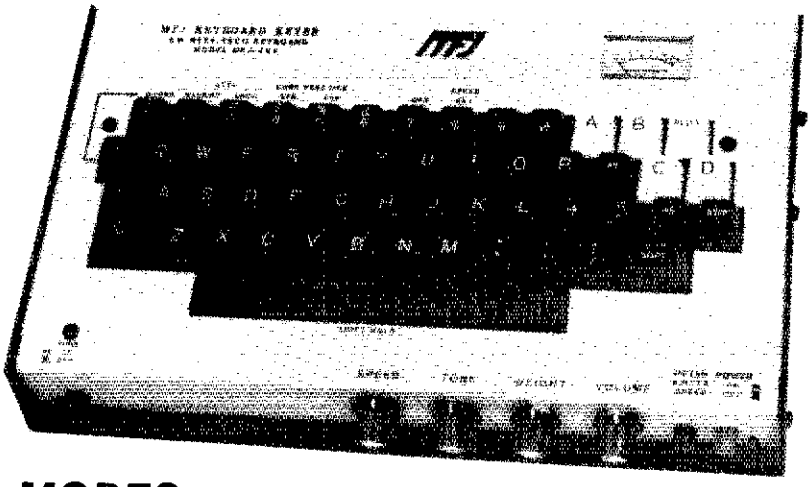
MFJ Super Keyboards



5 MODES: *CW, Baudot, ASCII, memory keyer, Morse code practice.* ***TWO MODELS: MFJ-496, $339.95.*** *256 character buffer, 256 character message memory, automatic messages, serial numbering, repeat/delay.* ***MFJ-494, $279.95.*** *50 character buffer, 30 character memory, automatic messages.*

MFJ brings you a pair of 5 Mode Super Keyboards that gives you more features per dollar than any other keyboard available. You can send CW, Baudot, ASCII. Use it as a memory keyer and for MORSE code practice.

You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold, plus much more.

MODE 1: CW

The 256 character (50 for 494) **text buffer** makes sending perfect CW effortless even if you "hunt and peck."

You can preload a message into the buffer and transmit when ready. For break-in, you can stop the buffer, send comments on key paddles and then resume sending the buffer content.

Delete errors by backspacing.

A meter gives buffer remaining or speed. Two characters before buffer full the meter lights up red and the sidetone changes pitch.

Four programmable message memories (2 for 494) give a total of 256 characters (30 for 494). Each message starts after one ends for no wasted memory. Delete errors by backspacing.

To use the **automatic messages,** type your call into message A. Then by pressing the CQ button you send CQ CQ DE (message A).

The other automatic messages work the same way: CQ TEST DE, DE, QRZ.

Special keys for KN, SK, BT, AS, AA and AR.

A lot of thought has gone into human engineering these MFJ Super Keyboards.

For example, you press only a one or two key sequence to execute any command.

All controls and keys are positioned logically and labeled clearly for instant recognition.

Pots are used for speed, volume, tone, and weight because they are more human oriented than keystroke sequences and they remember your settings when power is off.

Weight control makes your signal distinctive to penetrate QRM.

MODE 2 & 3 (RTTY): BAUDOT & ASCII

5 level Baudot is transmitted at 60 WPM. Both RTTY and CW ID are provided.

Carriage return, line feed, and "LTRS" are sent automatically on the first space after 63 characters on a line. This gives unbroken words at the receiving end and frees you from sending the carriage return. After 70 characters the function is initiated without a space.

All up and down shift is done automatically. A downshift occurs on every space to quickly clear garbled reception.

The buffer, programmable and automatic messages, backspace delete and PTT control (keys your rig) are included.

The ASCII mode includes all the features of Baudot. Transmission speed is 110 baud. Both upper and lower case are generated.

MODE 4: MEMORY KEYER

Plug in a paddle to use it as a deluxe full feature memory keyer with automatic and programmable memories, iambic operation, dot-dash memories, and all the features of the CW mode.

MODE 5: MORSE CODE PRACTICE

There are two Morse code practice modes. Mode 1: random length groups of random characters. Mode 2: pseudo random 5 character groups in 8 separate repeatable lists (with answers).

Insert space between characters and groups to form high speed characters at slower speed for easy character recognition.

Select alphabetic or alphanumeric plus punctuation. You can even pause and then resume.

MORE FEATURES

Automatic incrementing serial number from 0 to 999 can be inserted into buffer or message memory for contests.

Repeat function allows repetition of any message memory with 1 to 99 seconds delay. Lets you call CQ and repeat until answered.

Two key lockout operation prevents lost characters during typing speed bursts.

Clock option (496 only) send time in CW, Baudot, ASCII. 24 hour format.

Set CW sending speed before or while sending.

Tune switch with LED keys transmitter for tuning. Tune key provides continuous dots to save finals. Built-in sidetone and speaker.

PTT (push-to-talk) output keys transmitter for Baudot and ASCII modes.

Reliable solid state keying for CW: grid block, cathode, solid state transmitters (-300V, 10 ma Max, +300V, 100 ma Max). TTL and open collector outputs for RTTY and ASCII.

Fully shielded. RF proof. All aluminum cabinet. Black bottom, eggshell white top. 12"Dx7"Wx1¼"H (front) x3½"H (back). Red LED indicates on.

9-12 VDC or 110 VAC with optional adapter.

MFJ-494 is like MFJ-496 less sequencial numbering, repeat/delay functions. Has 50 character buffer, 30 character message memory. Clock option not available for MFJ-494.

Every single unit is tested for performance and inspected for quality. Solid American construction.

OPTIONS

MFJ-53 AFSK PLUG-IN MODULE. 170 and 850 Hz shift. Output plugs into mic or phone patch jack for FSK with SSB rigs and AFSK with FM or AM rigs. $39.95 (+ $3).

MFJ-54 LOOP KEYING PLUG-IN MODULE. 300V, 60 ma loop keying circuit drives your RTTY printer. Opto-isolated. TTL input for your computer to drive your printer. $29.95 (+ $3).

MFJ-61 CLOCK MODULE (MFJ-496 only). Press key to send time in CW, Baudot or ASCII. 24 hour format. $29.95 (+ $3).

110 VAC ADAPTER. $7.95 (+ $3).

BENCHER IAMBIC PADDLE. $42.95 (+ $4).

A PERSONAL TEST

Give the MFJ-496 or MFJ-494 Super Keyboard a personal test right in your own ham shack.

Order one from MFJ and try it — no obligation. See how easy it is to operate and how much more enjoyable CW and RTTY can be. If not delighted, return it within 30 days for refund (less shipping). One year unconditional guarantee.

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MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, K0CY — SEC: W0RPK. STM: KA0X. NM: WB0AVW WA0AUX WD0HND W0YLS. Congrats to AE0R in joining K0EVH with TCC schedule. A new leader in traffic this month is W0SS WA0AUX and W0YLS not far behind. New CIRAS officers are WD0GAT KA0D N0CFJ WD0EIF WB0ZKG. The special event station at the Grant Wood Art Festival netted 122 contact in 17 states with a nice certificate. Thanks to the CVARC Board for invitation and hospitality. WA0NMA and WA4VWV planning communications for air show in DSM. WB0MMT recovering nicely from a bad tower fall. Nice picnic in Mason City. 75-meter picnic a great success, thanks for all the help. WB0PMW to Advanced, WB0IFE to General and KA0ICU now an Extra. New calls heard from north Iowa are KC0FP KC0FQ KC0DM. Thanks to all who have acted as liaison to regional nets. Again 100 percent to TEN. Due to changes in DTRN, unable to cover the new sessions adequately, but am working on it. The IGN now on full schedule, support this teaching and slow speed cw net.

Net	Freq.	Day/Time	QNI	QTC	Sess.
75M Phone	3970	1830-2230 M-S	2007	66	54
TLCN	3560	2330-0300 Dy	381	153	62
IGN	3713	0100 T-Th-S	16	9	4

Traffic: W0SS 214, WA0AUX 153, WD0HND 129, W0YLS 123, KA0X 117, WB0OAM 56, AE0R 47, K0CY 44, W0BW 40, K0GP 40, KA0JQG 37, WB0AVW 27, WB0UPF 24, AI0K 14, K0JGI 12, WA0NMA 8, KB0OZ 8, KF0F 2.

KANSAS: SCM, Robert M. Summers, K0BXF — SEC: W0KL. NMs: KSBN/KPN W0OYH OKS W0FT, KWN WA0LBB CSTN WA0MB, OKS-SS? I think the slow speed cw net may soon be back on the air. For those interested, keep a close ear on the 3735 freq. In the event it starts before the next report is out. We are sorry to inform the Kansas gang of the passing of two of our ranks into the Silent Key column — K0RJX and W0DEP. Net reports: KPN QNI 380, QTC 30; KSBN QNI 1042, QTC 66; KWN QNI 832, QTC 477. The Concordia Hamfest was a success. For those of you not in attendance, I am happy to inform you of the presentation of the Raymond E. Baker Memorial (W0FNS) Ham of the Year award (Kansas) to W0TQ. Fine meetings were missed by those of you not in attendance. Lightning has caught a number of antennas lately and among those hit was the CKRC repeater and the .31/.91 repeater at Salina. Pittsburg Repeater group also had a fine hamfest June 14 with registration of approx 105 hams. W0FIR was the ARRL rep at this one, as your SCM was out of town in another direction. We all wish W0GFN a speedy recovery after his recent heart attack. JCARC officers for '81/82 are N0BTX, pres.; WB0YDS, v.p.; WB0CEF, secy.; WB0TIN, treas. Traffic: (July) W0OYH 103, W0QMT 103, W0FIR 75, W0HI 67, WA0LBB 66, W0FT 59, K0BXF 56, WB0ZEN 42, WB0YLP 41, AC0E 40, W0AM 39, W0CHJ 19, W0ASY 13, W0FDJ 11, W0KL 10, W0RBO 10, N0BDG 8, W0RT 7, WA0WJX 4, K0FPC 3. (June) W0HI 51.

MISSOURI: SCM, L. G. Wilson, K0RWL — Asst SCM: Joe Flowers, W0OTF. SEC: N0AJI. STM: KM0L. Several new calls this month: N0CKU is now KM0E, WB0LFY is now KM0L and KA0IAS is now N0CUG. W0VWW is in the hospital recovering nicely from his recent surgery. Field Day reports have been coming in and look quite impressive. I'm sure everyone is anxiously awaiting the final results. Thanks to those amateurs who responded so rapidly the night of the Hyatt Regency disaster. The Missouri State Highway Patrol now has 51 licensed amateurs including 3 XYLs. The PHD Radio Club graduated 13 Novices from its most recent class.

Net	QNI	QTC	Net	QNI	QTC
ACE	45	0	MOSSBN	541	51
NEMOE	150	4	MEOW	246	7
OMOEN	480	800	HBN	363	33

W0JT recently celebrated his 40th anniversary with AT&T. Congratulations. W0CJG is now sporting KK0V and a new TS530. This station is now sporting a new 2-element quad. Reports and activities, like band conditions are rather slow this month. I am presently receiving only one club newspaper from the St. Louis area and none from the Springfield or St. Joseph areas. I would really appreciate hearing about your activities and be able to reprint them. Traffic: W0OUD 88, K0SI 77, WA0EMX 70, KC0AS 65, W0BMA 59, W0OTF 56, K0BM 48, KM0L 35, K0PCK 25, K0RWL 10, KA0E 6.

NEBRASKA: SCM, Shirley M. Rice, KA0BCB — SEC: N0AIH. STM: WD0BQG. Our sympathy to family of W0FCT, our longest active ham, who became a Silent Key after 56 yrs. Congrats to Saunders Co. ARES for 2-mtr gear from c.d., to WD0HFZ & the North Platte ARC for FB NE Land Days special events station, & K0GND for attaining the status of QCWA! New upgrades are Adv: KA0BOS; Gen: KA0LAS; Tech: KA0LAR KA0KZN; Novices: KA0LEY KA0LEX KA0LMX KA0LLR. Hats off to Central NE ARC for another SUPER hamfest, Victoria Springs. Tnx to Lincoln, Holdrege, Kearney, & Hastings ARCs for supper & breakfast. See U all in Salina. Traffic: W0ZNI 37, W0HOP 32, W0NIK 22, KA0BCB 16, W0HTA 14, W0EUT 10, K0SFA 8, WB0GMO 6, WA0BOK 4, K0ODF 4, WB0GWR 3, WD0APY 2, WA0PCC 2, K0UDW 2.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, Stan Horzepa, WA1LOU — SEC: W1SY. STM: KA1KD. Asst SCM: WB1AIU.

Net	Freq.	EST	Sess.	QTC	QNI
CN	3640	1900+ 2200	62	317	410
CPN	915/ 315	1800/ 1000 Sn			
NENN	3720	1815			
NVTN	29/88	2130			
RTN	13/73	2100	28	64	259
WCN	78/18	2020	31	90	380

High QNI: CN — WB1EKV WB1ESJ WB1EKV W1QJM K1UQE. Club picnics are interrupting the summer doldrums. Eastern Connecticut ARA, Murphy's Marauders and Tri-City ARC burned the charcoal this month. New ECs: W1DFT Waterford, WB1CPF Ledyard, WA1WVB Groton. WA1BZS and WA1DWE are interested in a two-meter RTTY autostart. W1SY received Certificate of Merit from ARRL Public Information Office for publicizing ham radio in a local newspaper. Tri-City ARC will conduct Novice and General license courses this fall. South Meriden AG planning ten-meter repeater. Upgrading: N1BLL to Advanced, KA1BXX to Extra. DXpeditioning OBS K1EFI/VP9 and OO WB3GPR/1ZF1. OO K1KI was 100% accurate in recent Frequency Measuring Test. Traffic: (July) W1EFW 285, K1GF 207, WB1GXZ 151, WB1ESJ 123, K1EIC 105, K1EIR 105, K1UQE 105, WB1EKV 72, W1BDN 63, W1XX 56, WB9IHH 46, KA1BHT 21, K1EUW 21, W1DPR 20, WB1CRH 19, KA1KD 18, K1OQG 17, K1AQE 13, WA1WQG 13, WA1LOU 10, W1OD

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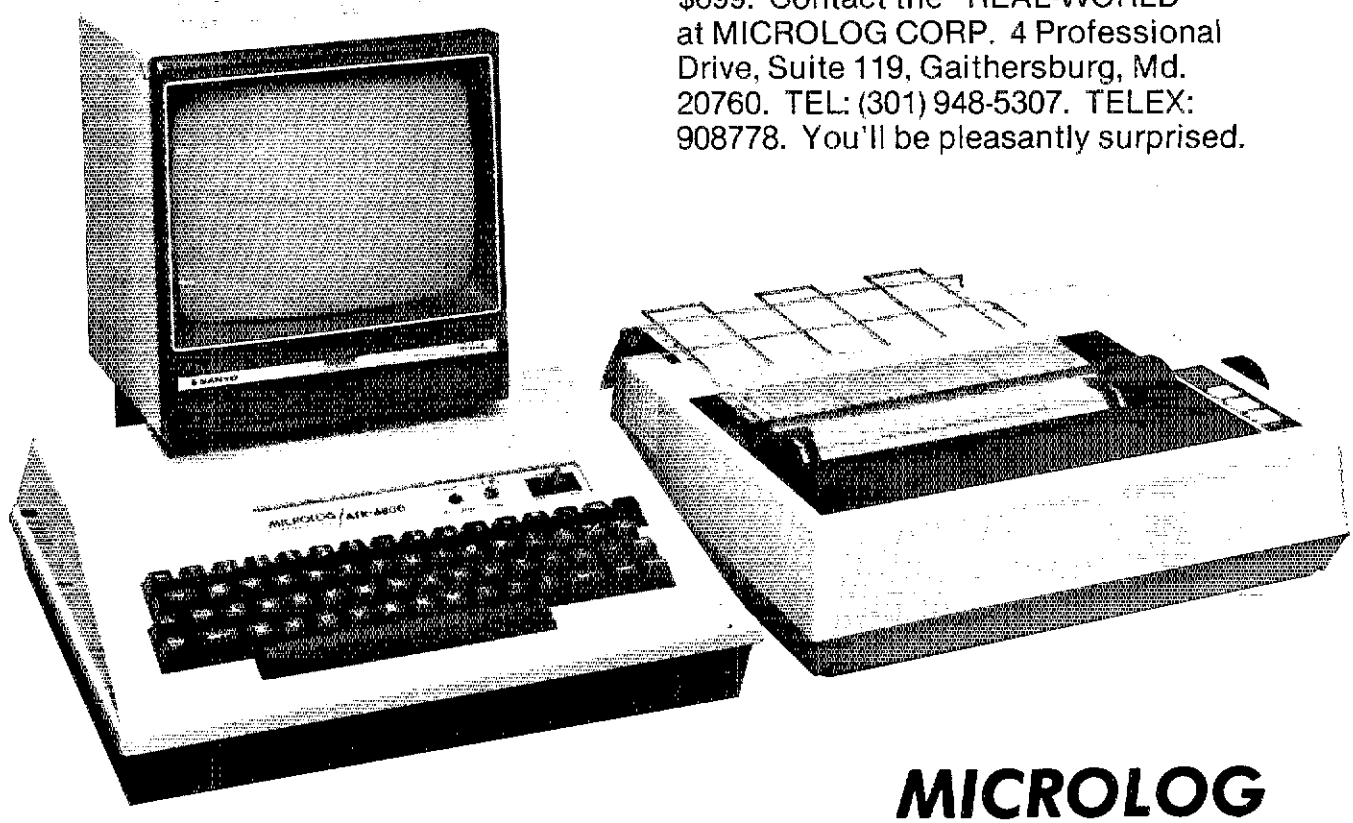

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INNOVATORS IN DIGITAL COMMUNICATION

8, W1CUH 5, W1ICF 3, W1QV 2. (June) K1AQE 46.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — SEC: WA1BLG. STM: WA1TBY. ASCM: K9HI.

Net	Mgr.	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	N1GQ	3.658	19/2200/Dy	440	344
EMRIPN	KA1BJY	3.898	1730/Dy	310	196
EM2MN	N1BNI	90/30	2000/Dy	210	55
NEEPN	K1BZD	3.945	0830/Dy	62	10
HHTN	K1BSO	04/64	2230/Dy	489	205
EMRISS	N1BHH	3.715	2030/Dy	153	72
NENN	WB1GQO	3.720	1815/Dy	304	88

As I write this I'm on vacation and therefore away from it all. Great, right? Yes, except that my mail is not coming and the deciphering and relaying of it by radio takes a little time so if I leave your tfc report, etc., out this month, please bear with me til next month. I got an interesting call from KA1BLW the other evening saying that the Whitman club is planning a Thanksgiving Day special event station operation from the Mayflower site in Plymouth. This sounds like a great idea and I'm sure they will be very popular on all bands. Keep an eye out for the specifics in the mags. Some of you may have noticed above that we have a new assitant SCM. Our old ASCM, WA9NEW, retired from the USAF in July and is in North Carolina. He was a big help to me and he'll be sorely missed. I have appointed K9HI as the new ASCM and he has consented to taking over the editorship of the Crossbander. I'm sure that he will get all of your support even if he does have a foreign callsign, hi. There will be League Officials meetings on Oct 24/25 in NH and RI respectively. All appointees are encouraged to attend and exchange ideas on how to improve ARES and NTS in the 1st Region. An added attraction this year will be the presence of W2HD at both sessions. I heard a lot of generally negative comments on the proposed plain language rewrite of the amateur rules as I travelled around the section. There were some boo boo's such as the omission of emergency communications from the Basis and Purpose section as well as a major omission having to do with antennas, but a lot of comments I heard were more general. The thought was that the FCC was trying to put one over on us and subvert all of Amateur Radio. This I don't believe and I use as evidence the fact that they extended the period for comments. What do you think? Traffic: (July) N1BHH 652, WA1TBY 297, KA1ON 187, K1GN 102, N8TM 94, K1BSO 78, WB1GQO 76, KA1MI 62, KA1EMQ 41, W1CZB 28, K1BZD 27, WA1VXZ 17, WB7TPY 12, W1PL 11, WA1FNM 10, KA1R 5. (June) W1SR 24.

MAINE: SCM, Cliff Laverty, W1RWG — STM: W1BJ. SEC: KL7IJG. WA1YNZ N1BGO K1TFX KA1ENL KA1HGS KA1CNC N1BJX KA1JC WA1URS and KA1DDG, provided comms for float race on Arrostook River from Caribou to Ft. Fairfield supporting CEP, search & rescue and JC's. Comms provided for Friendship Sloop Races by K1VFG K1YXO WA1WYT WA1JZP W1KIO W1JRS W1VYI W1BYK W1RWG WB1FAK for three days. Sandy River RC made 3322 points on Field Day. The annual ham gathering at Abbott Village was attended by 157 hams, a total of over 300 people August 9. Net sessions/QNS/QTC: PTN 31/309/124; SGN 25/850/152; MSN 13/63/14; AEN 3/41/0; SPSN 13/182/10; MPSN 8/41/5. PSHR: AK1W 106, K1NAN 70, W1RWG 63, W1BJ 62. Report your club activities to the SCM, particularly public service. Traffic: AK1W 131, W1BJ 93, W1WWG 69, KA1TJ 65, WB1BYR 61, K1NAN 58, W1KX 51, W1HDC 46, N1BCE 34, W1BMX 34, W1AHM 22, N1BJW 22, N1BCT 17, W1CTR 17, K1TVT 14, WA1FCM 13, KA1CNG 11, W1GKJ 10, KA1GGE 9, WA1YNZ 8, KA1CIB 6, KL7IJG 4, KA1ENL 2.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH/W1SWX — SEC: AK1E. STM: W1TN. NMs: N1NH K1OSM W1VTP. Seen on hyways & byways: W1JJD AJ1V G5OKT. All clubs reporting outstanding FD activities. KA1EBN now KA1TH. The GSFMN had 771 checkins & 218 traffic. Welcome new Novices KA1s HLI HKZ HLL HLG HLC HLD HLH. The Amherst Radio Club held its outing at KA1ACC's poolside. The shredded Wheaties meet daily on Mt. Washington repeater. Members heard: K1OIO W1IIO W1BTY W1BPI W1TDK. The NH Net had 107 traffic & 197 checkins. Don't forget the SET in October. W1FZ sends regards to all while cycling the Northwest USA & Canada. KA1BXA editor of the Great Bay Radio Assn. The GSPN had 54 traffic & 83 sess. Traffic: (July) W1TN 171, N1NH 118, KA1BBI 114, K1OSM 93, N1ALM 79, KA1CXP 78, AK1E 73, KB1A 48, W1FYR 47, W1MHX 41, KA1FWQ 38, W1ALE 37, W1VTP 30, KA1FMU 17, KA1CJI 16, W1NH 8. (June) W1FYR 59.

RHODE ISLAND: SCM, G. Fox, W1YNE — SEC: KA1EHR. STM: KA1FE. NM: RIEM2MTN WA1OSL. RIEM2MTN 23 sessions, 208 QNI, 30 QTC. New appointments: WA1YDU Asst. SEC: AE1S EC Prov County: K1DA EC Jamestown; WA1OSL NM RIEM2MTN; KB1G OES. Endorsements: W1YNE 00. RIEM2MTN now an official section net in the NTS. July was busy month for OSARG (10/70) gang. The group assisted at the "SAVE THE BAY" swim and also held their annual picnic at QTH of WA1STT and WA1MCJ. The Ocean State Chapter 10-10 held annual get together at K1QFD's QTH. SEC KA1EHR, assisted by ECs, is reorganizing ARES. Contact him for OES and EC appointments. Traffic: W1EOF 318, KC1G 161, KA1FE 158, W1YNE 67, KA1BTU 64, AE1S 10.

VERMONT: SCM, Bob Scott, W1RNA — SEC: WB2ABQ. STM: N1ARI. There has been inordinate errors of late in msgs; last names, addresses, tel. nbrs. Rather careless sending or receiving! Confirm the slightest questionable word or number. Accuracy is of utmost importance — NOT speed of handling. VTSSB 31/497/80; GMN 27/411/59; Carrier 26/296/30; VTN 29/81/29; RFD 4/79/8; VPN 4/66/6. W1AIM reports 7 states on 220 and 25 states, including all New England, on 2 mtrs. WB2ABQ has been hiding out on 2-mtr ssb and doing FB. If others are working vhf or uhf, we would like to receive their reports. K1BQB has competition! Traffic: K1BQB 106, N1ARI 105, WB1ABQ 51, W1RNA 47, AE1T 13.

WESTERN MASSACHUSETTS: SCM, Art Zavarella, W1KK — ASCM: K1BE. STM: W1TM. SEC: W1JP. NMs: W1UD WA1ITL W1UPH. Mt. Tom Repeater picnic at WB1ABF/W1JP a great success, 100 attended. Noteworthy: Donation of used but serviceable repeater by Mt. Tom club to hams in St. Vincent, BWI as goodwill gesture to enhance emergency comm.; appointment of Berkshire EC, WB1HIH, as county RACES RO. NOBARC Hamfest enjoyed by all, with K1BE W1JP W1TM representing the SCM and their respective activities in WM. In addition, W1TM conducted demo/session on transmission lines. ARRL Certificates of Merit were awarded W1DOY WA1DNB W1KUE W1UM. PSHR: WB1HIH 106, W1TM 63. Traffic: W1YI 186, WB1HIH 154.

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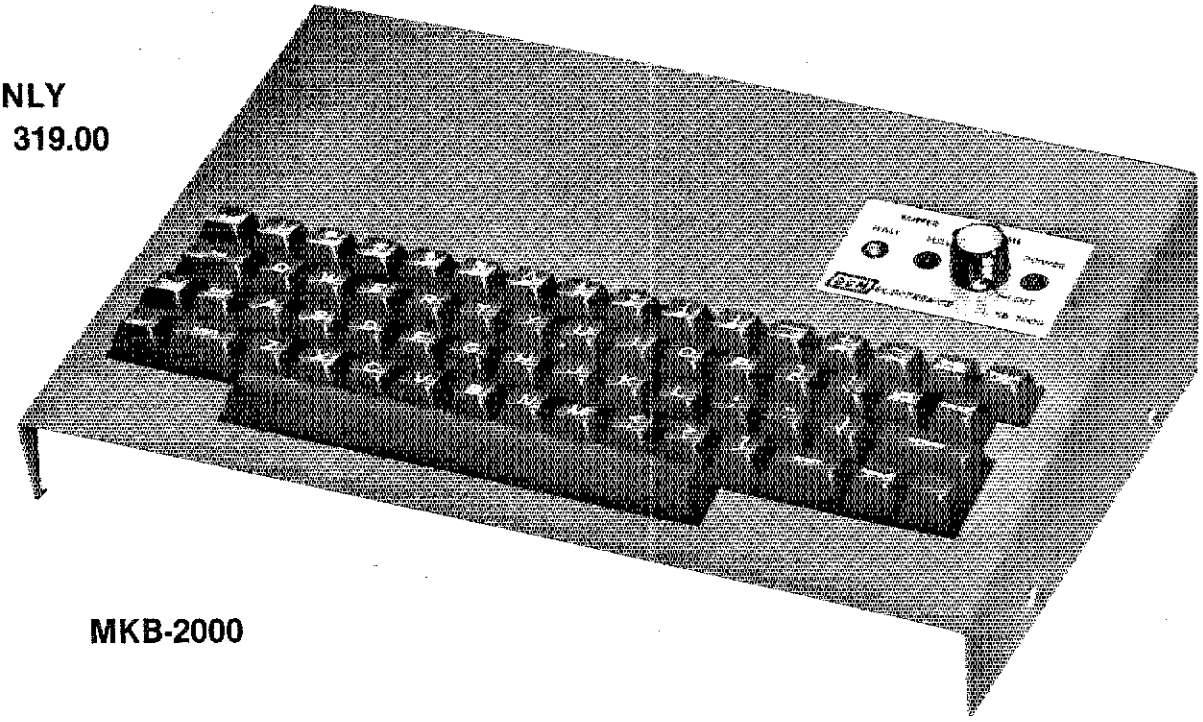

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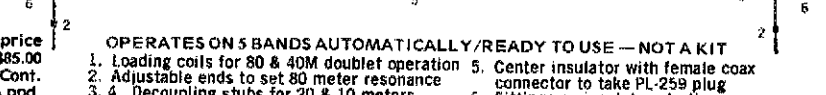

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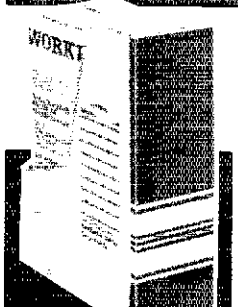

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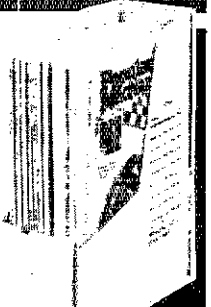

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NORTHWESTERN DIVISION

ALASKA: SCM, Fred Wegmer, KL7HFM — ASCM: AL7AC KL7IBG. SEC: AL7CM, STM: AL7O. The Alaska repeaters have been busy with calls from visitors this summer. The KL7 Snowbirds have started heading south, so you will again be hearing our reports in the lower forty-eight. KL7BJD is very happy now with the new station at the Anchorage Pioneer's Home. Thanks to the Anchorage ARC, the state of Alaska Dept. of Telecommunications and the Division of Emergency Services, AL7AW KL7IBY and AL7CM. She plans to be a regular on 14,292, the Alaska-Pacific Net. KL7CQ has been nominated as a successor for SCM. KL7GNP has retired from productive labor and is now enjoying ham radio to its fullest. He is known as the Alaska QSL Bureau. WA0LPK/KL7, the Alaska Moonbounce station, can still be worked for a few months, so grab him. Nets have been slow, it's the time of year when salmon, halibut and crab take precedence over ham radio.

IDAHO: SCM, L.H. Allen, Jr., W7JMH — The Boise clubs were pleased to host Harry Dannals, W2HD, League President on July 25. He gave us all an excellent overview of League workings and fielded many questions from local hams at the Boise Public Library auditorium. Congrats to WB6SUX, new EC Bonner County, and WB7QYU, new EC Elmore County. Also, welcome aboard to new OBS N7AYL at Mt. Home. W7HZL has new DX antenna — a Zepp — works FB!!

Net	Freq.	Time	Sess.	QNI	QTC
FARM	3935 ssb	8:00 P.M. Dy	31	1126	23
ICD	3990 ssb	8:10 A.M. M-F	23	563	13
IMN	3635 cw	9:00 P.M. M-F	23	180	123

Summer camping spots make ideal testing locations for your emergency gear. Make a sked from your fun spot. Traffic: W7GHT 313, AC7P 103, W7JMH 23.

MONTANA: SCM, Les Belyea, N7AIK — New net manager for the Montana Traffic Net is K7TQM from Billings, might look for some changes. The WIMU Hamfest held in West Yellowstone, set an all-time attendance record with over 500. Next year's WIMU will be the golden anniversary, big things are in the making already. The SCM had a very nice trip along with the division director to the northwestern part of the state. The 1981 Repeater Directory is not 100% accurate for Montana, for a correct list please s.a.s.e. to KØPP. 6M news: KB7Q worked into Japan and Turks Island. Net reports: MTN QNI 819, QTC 64; IMN QNI 180, QTC 123; BSN QNI 170, QTC 15. PSHR: WB7DZX 98. Traffic: WB7DZX 123, W7IXD 66, K7SIK 35, N7AIK 24.

OREGON: SCM, William R. Schrader, W7QMU — SEC: K7WWG. STM: W7VSE. Section nets:

Net	Time/Day	Freq.	QNI	QTC	NM
BSN	0145Z Dy	3908	773	53	K7WPC
OSN	0230/0600 Dy	3587	406	364	KB7JW
OARES	0115Z Dy	3993.5	427	77	W7HLF
OARES	0230Z Dy	3993.5	62	4	W7HLF
WCN	0330Z Dy	3706	320	107	K7ZIG
PTTN	0330Z Dy	146.76	539	124	W7LRB
PdxARES	0330Z Dy	147.32	1581	29	K7WWR
LBLARES	0330Z Dy	146.79	906	24	WB7QQH
LCARES	0330Z TWFSn	146.85	191	4	W7LRB
SOARES	0330Z MTHSa	146.94	228	177	KA7DBS
SOFM	0330Z Tu	146.64	98	2	W7FDU

Klamath Falls annual picnic big success — K7DDI has BEST (?) legs in Oregon! Upgrades: K7WPC WB7PQU WB7BCG N7BMY and KI7M Extra: N7CJQ N7CVA K7RXV WB7TAX N7CLN and KA7ELI Advanced; KA7AID General; KA7KIS KA7JKZ KA7KDB Tech. Great show and congrats to all! OTVARC won Director's contest in NW Division out of 95 affiliated clubs. Success is getting to be 'old hat' to this terrific gang. KA7ILE is in National Guard for summer, Central Ore. Radio Amateurs (Bend) participated in a realistic county wide emergency. WA7MOK has 200 DXCC countries worked. Traffic: (July) W7VSE 668, KB7JW 299, K7NTS 264, W7ZB 248, W7LRB 192, WA7LGN 179, WA7IHS 168, WB7OEX 102, W7LNE 93, KA7DBS 44, W7QMU 36, K7VM 25, W7LT 12, KA7ELI 10, W7TC 8, K7WWR 8. (June) W7ZB 168, K7VM 31, N6RY 9, W7DAN 7, WB7DSK 2.

WASHINGTON: SCM, Bob Klepper, W7IEU — STM: W7DZX. SEC: WA7RWK. NMs: WA7CBN KA7CSP W7GB W7IEU.

Net	Time(Z)	Freq.	QNI	QTC	Mgr.
NTN	1930	3970	929	56	K7AJT
WARTS	0200	3970	2899	183	W7EQY
NWSSBN	0230	3945	572	34	W7ZPK
WSN	0245/0545	3590	801	230	W7GB
EWTN	0130/0530	146.64	60	50	WA7CBN
IETN	0130/0300	147.30	46	10	KA7CSP
PSTS	0130/0630	145.33	132	92	W7IEU
SCARES	0330 (Wed)	147.18	45	7	W7ERH

WB7FGC and WB7PSO working on rotor and tri-band beam at Spokane EOC. K7SS made 19,800 points in 2A category QRP during FD. W7IDZ rcvd JARL's AJD award for 50 MHz. New WARTS Mgr is W7SFT, Asst Mgr KA7CRN. Mike and Key Radio Club paper reports K7KOT wrkd state #50 on six. WA7WZQ is new chairman of Technical Committee for RASC. Clark Cty ARC club stn, W7AIA, has gone all solid state with Kenwood TS-130s, PS-30, and AT-230. W7IDZ received 50 MHz WAS certificate #588. WB7FDE placed 2nd in US and 4th in the world in the OM/YL Contest. W7ERH involved in successful Snoqualamie Pass rescue. KA7KRB KA7KUE KA7KUD KA7KUH are new Novices in Longview area. N7AEP reports BEARS Club stn, K7NWS, lacked only Vermont and Delaware for WAS during FD. Traffic: W7DZX 693, W7FJZ 248, AD7G 142, W7IEU 140, K7GXZ 122, K7CTP 109, WA7BDD 80, WA7JEB 78, N7AFZ 66, K7KVV 64, WA7RCR 52, W7GB 46, N7AFY 40, W7BUN 31, W7LG 21, K7NWS 20, W7ERH 17, W7APS 11, WB7CFH 11, WA7EDQ 10, KB7G 2, WA7OJI 1.

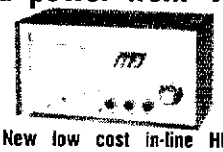
PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SCMs: W6ZF N6DHN VE2AQV/W6. SEC: WB6KQU. Late report from K6APW indicates that his FD plans fell through. Better luck next year. New LARK officers are: KD6BR, pres.; K6JAV, v.p.; KD6DT, act. chmn.; K6EKD, secy./treas.; WA6SYE & KB6BD, dir. SBARA "Ground Plane" editor, N6DUQ, is asking for help with his "shrinking" epistle. MDARC's "The Carrier" featured a six page photo spread of their incredible FD set-up. Traffic: (July) W6OA 79, WB6UZX 33, KA6ERF 5. (June) K6APW 16, WB6UZX 14.

NEVADA: SCM, Ralph E. Covington, W7SK — SEC: WA7KCD. NARA Field Day at Idlewild Park was a huge

MFJ SWR/ WATTMETERS

MFJ HF SWR/Wattmeter reads SWR, forward, reflected power from 1.8-30 MHz.



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MFJ-814

New low cost in-line HF SWR/Wattmeter. MFJ-814 lets you monitor SWR, forward, reflected average power in 2 ranges from 1.8 to 30 MHz. Read 200/2000 watts forward, 20/200 watts reflected power. SWR, 1:1-6:1.

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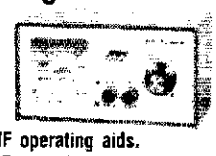
Lighted meter (requires 12V). Rugged aluminum eggshell white, black cabinet, 6¼x3¼x4¼", SO-239 coax connectors, 2 color meter scale.

MFJ VHF SWR/Wattmeter/ Field Strength Meters

$29.95

MFJ-812



New low cost VHF operating aids.

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Read forward and reflected power at 2 meters (144-148 MHZ). 2 scales (30 and 300 watts).

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MFJ-810, $24.95: similar to MFJ-812 less field strength function.

MFJ "Dry" 300 W and 1 KW Dummy Loads.

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MFJ-262

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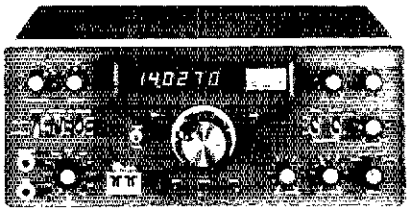
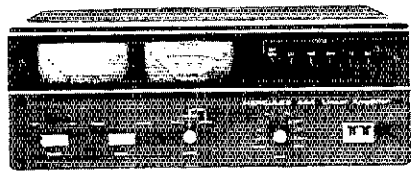


TEN-TEC Model 546 OMNI/Series-C All solid-state, 200 watt SSB/CW HF Transceiver. 9 HF bands, 160-10m including 10, 18 & 24.5 Mhz & 10 MHz WWV; 40 KHz VFO overrun. Instant band change, no tune-up. 100% duty cycle, 20 min. Digital readout, six 0.43" LEDs - reads to 100 Hz. Mosfet rf amp., sensitivity 0.3 uV for 10 db S + N/N ratio, 90 dB dynamic range; 18 dB attenuator for strong local signals. 8-pole 2.4 KHz SSB filter, 1.7 shape factor @ 6/60 dB and audio active filter. Select standard SSB filter, optional 1.8 KHz SSB filter or optional CW filter plus 450 Hz or 150 Hz of audio filtering. 50 dB notch filter, ± 500 Hz & ± 4 KHz offset tuning, 2-speed QSK instant break-in, VOX or PTT, adjustable threshold ALC, S/SWR meter, sidetone, Hi-Z mic. input, built-in spkr. 12-14 VDC/18A. 5½"h × 14½"w × 14"d, 14½ lbs.

Regular $1289 - ***Sale Price $1059***

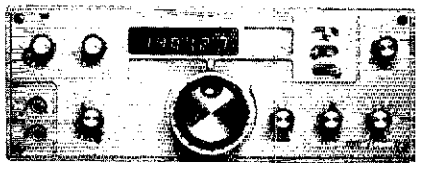
OMNI Accessories:

280	18A power supply *(Reg. $169)*.....	SALE	$152.95
255	Deluxe ps w/speaker *(Reg. $199)*...	SALE	179.95
217	500 Hz 8-pole CW filt. *(Reg. $55)*....	SALE	49.95
218	1.8 KHz 8 pole SSB filt. *(Reg. $55)*..	SALE	49.95
219	250 Hz 6-pole CW filter *(Reg. $55)*..	SALE	49.95
243	Remote VFO *(Regular $189)*.....	SALE	169.95
1140	DC circuit breaker.....		10.00



TEN-TEC Model 444 HERCULES All Solid-State, KW Linear Amplifier for 160 to 15 meters - 1.8 to 21.5 MHz with provisions for 4 Aux. bands. Broadbanded, no tune-up, instant break-in. 1000 watts input, 500-600 watts output typical, all bands; 50 watts drive. Duty cycle - SSB: Continuous voice modulation; CW/RTTY: 50%, 5 minutes maximum key down. Manual bandswitching, or automatic when using the OMNI. Separate 45 VDC @ 24 A power supply and built-in control power supply, forced air cooled, automatic line voltage correction and exciter by-pass, two meters for collector I/E and forward/reverse power, adj. ALC, 6 LED monitors. Amplifier: 5¾"h × 16"w × 15½"d, 22 lbs; Supply: 7½"h × 15¾"w × 13½"d, 50 lbs.

Regular $1575 - ***Sale Price $1349***

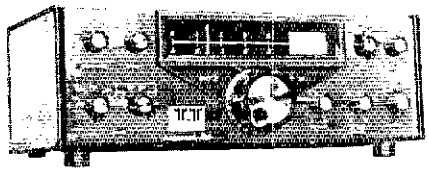


TEN-TEC Model 580 DELTA All solid-state, 200 watt SSB/CW HF Transceiver. 9 HF bands, 160-10m including 10, 18 & 24.5 Mhz & 10 MHz WWV; 40 KHz VFO overrun. Instant band change, no tune-up. 100% duty cycle, 20 minutes. Digital readout, six 0.3" LEDs - reads to 100 Hz. Sensitivity 0.3 uV for 10 db S + N/N ratio, 85 dB or better dynamic range. 8-pole 2.4 KHz SSB filter & audio active filters. Select the standard SSB filter, standard SSB filter with one section of audio filter, optional 250 Hz or 500 Hz CW filter or CW filter with four audio active filter sections. 50 dB notch, ± 1 Khz offset tuning, QSK instant break-in, VOX or PTT, adj. AGC & drive, 20 dB atten., S/SWR meter, extra receiver jack, sidetone, Hi-Z mic. input, built-in spkr. 12-14 VDC @ 18A. 4¾"h × 11¾"w × 15"d, 12½ lbs.

Regular $869 - ***Sale Price $769.95***

DELTA Accessories:

280	18A power supply *(Regular $169)*..	SALE	$152.95
255	Deluxe ps w/speaker *(Reg. $199)*...	SALE	179.95
282	250 Hz 6-pole CW filter.....		50.00
285	500 Hz 6 pole CW filter.....		45.00
283	Remote VFO *(Regular $189)*.....	SALE	169.95
289	Noise blanker.....		39.00
1140	DC circuit breaker.....		10.00



TEN-TEC Model 515 ARGONAUT All solid-state, 5 watt (QRPp) SSB/CW HF Transceiver. 5 HF bands, 80-10m plus 10 & 15 MHz WWV. No tune, broadbanded final - instant band change. Analog dial, 4-pole 2.4 KHz crystal SSB filter. Typical receiver sensitivity 0.35 uV for 10 db S + N/N ratio. Built-in SWR/S meter. QSK instant CW break-in and PTT on SSB.. ± 4 KHz offset tuning, adjustable sidetone, built-in speaker, Hi-Z mic input, LED output and offset indicator. 12-14 VDC @ 1A. 4½" × 13"w × 7½"d, 6 lbs.

Regular $469 - ***Sale Price $399.95***

ARGONAUT Accessories:

210	Power supply.....	$34.00
210/E	110/230v - 13v/1A power supply.....	39.00
206A	External 25 KHz calibrator.....	39.00
208A	External Notch & 150 Hz CW filter	59.00
212	29-29.5 MHz crystal	5.00
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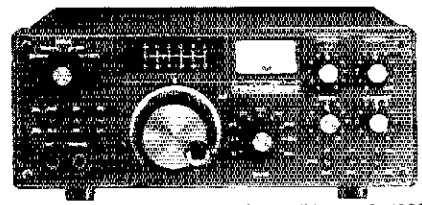

TEN-TEC Model 525 ARGOSY All solid-state, 10/100 watt SSB/CW HF Transceiver. 6 HF bands 80-10m, including the new 30m band & 10 MHz WWV; 40 kHz VFO overrun on each band edge. Switchable, 10 watts or 100 watts input. 100% duty cycle, 20 minutes. Instant band change, broadbanded, no receiver front end or final tuning. Analog dial accurate to ± 2 kHz. 4-pole 2.5 KHz crystal SSB filter, sensitivity 0.3 uV for 10 db S + N/N ratio. Meter shows forward/reverse power, SWR and received signal strength. Offset tuning ± 3 KHz, notch filter, QSK instant CW break-in and PTT on SSB, sidetone, adjustable ALC. 12-14 VDC @ 9A. 4"h × 9½"w × 12"d, 8 lbs.

Regular $549 - ***Sale Price $499.95***

ARGOSY Accessories:

225	9A power supply *(Regular $129)*....	SALE	$119.95
217	500 Hz 8 pole CW filt *(Reg. $55)*.....	SALE	49.95
218	1.8 KHz 6-pole SSB filter *(Reg. $55)*..	SALE	49.95
219	500 Hz 8 pole CW filter *(Reg. $55)*...	SALE	49.95
220	2.4 KHz 8 pole SSB filt. *(Reg. $55)*...	SALE	49.95
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Rivals long wires

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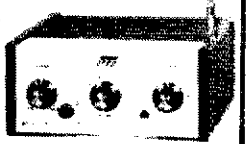
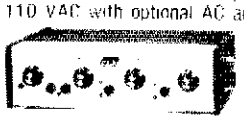


MFJ-1020 NEW INDOOR ACTIVE ANTENNA sits on your desk ready to listen to the world. Rivals can often exceed reception of outside long wire. Unique **Tuned** Active Antenna minimizes intermod provides RF selectivity, reduces noise outside tuned band. Also use as preselector for external antenna. Covers 300 kHz to 30 MHz in five bands. Adjustable telescoping antenna. Controls: Tune, Band Selector, Gain, On-Off/Bypass. LED. FET bipolar circuitry. Phono jack for external ant. 6x2x6 inches. 9-12 VDC or 9 V battery for portable use. 110 VAC with optional AC adapter, $9.95.



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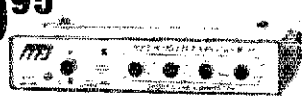
MFJ-1040 RECEIVER PRESELECTOR. Improves weak signal reception, rejects out-of-band signals, reduces image response, 1.8 to 54 MHz. Up to 20 db gain. Low noise MOSFET. Gain control. Bandswitch. Can use 2 ant., 2 rcvrs. ON-OFF/Bypass. 20 db attenuator. LED. Coax, phono jacks. 8x2x6 in. Also for XCVRS to 350 watts input. Auto bypass. Delay control. PTT jack. **MFJ-1045, $69.95.** Same as MFJ-1040, less attenuator, xcvr auto bypass, delay control, PTT. Use 1 ant., 1 rcvr. 5x2x6 in. 9V bat. Both requires 9-18 VDC or 110 VAC with optional AC adapter, $9.95.

$89.95



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MFJ-10, 3 foot coax with connectors, $4.95.

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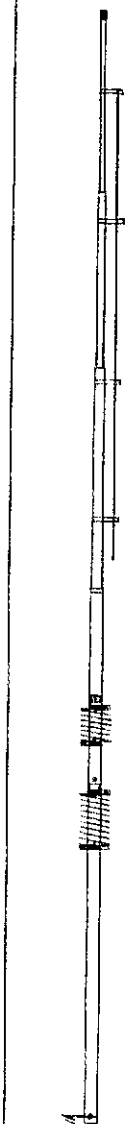

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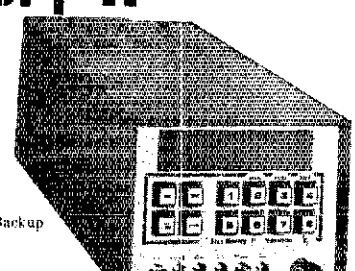

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success this year. No mosquitoes and all were thankful for that. KA7IUI busy with new 19 element 2-meter beam. Ham radio is for everybody. KA7ITW (harmonic of W7ZS) is all of 9 years old and can be found burning the airways on 40/15 meters cw. W6FMO of Pahrump with super antenna system (reported with 6000 foot wire ground). W7CKH still being heard from Henderson and still conducting classes. Nevada Sagebrush Net meets weekdays at 7:30 P.M. Pacific Time on 3906 kHz. Traffic: N7AKX 426, W7BS 94, W7SK 9.

PACIFIC: SCM, Pat Corrigan, K6DD — EC: Kauai County, KH6S. Please lend all support you can to him in keeping Kauai ARES rolling. OH2BH visited in early Aug., along with OH2BC. K5KT (ex-KH1GJ) also came thru. WD6BTY visited from the Bay Area. EARC has moved .04/.64 repeater to Molokai for trial period. Seems good coverage. KH6BWE KH6FV and others put rare Kalalau County on the air again recently for many happy hams around the world. Increased professional committments have dictated that I not seek another term as SCM. It has been my privilege to service the members of this section for 4 terms (8 years). With the help of those members, more significant changes and improvements took place during this period than at any other time the history of the section. It was an interesting and instructive period in my amateur career and I am grateful for the support and cooperation of most hams in the Pacific.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: N6AUB. ASCM: KI6T. N6AUB reports that the Volunteers In Prevention program (VIP), involving the California Division of Forestry, is well under way in the Nevada, Placer and Yuba County areas. ORS W6SX has been transferred to Edwards AFB. Many thanks for a FB job. Welcome to N6CCS as the new EC of Yuba/Sutter Counties. WD6ANX will be his Asst. EC. Congratulations to new upgrades: Extras — KV6H NB6V NB8X and KB6MD; Advanced — N6COQ N6DDO N6DDP KE6DG and KA6CQH; Tech — KA6ETL. The North Hills RC has set Oct. 16 as their 2nd annual Old Timers Night. Yuba/Sutter ARC won their Field Day competition with the Oroville RC. The Nevada County ARC reports that W6HKG is a Silent Key. Traffic: W6SX 12, N6AUB 8, W6RSP 7, W6KZI 4.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: KE6CD (ex-WB6ZRK). STM: K6TP. W6CYM W6DTV received 50-year QCWA certificates. W2VQ new ORS. Officers of Redwood Empire DX Assn: K6ANP, pres.; KD6LC, v.p.; N6DCJ, secy/treas.; VP2ML, club reporter. K6GWE/R held fine dinner. Welcome new hams KA6OPY N6DZU KA6DUG KA6OWM N6EDI KA6PKR KA6OPO. Sonoma County RA and Sonoma County ARS helped out at Kenwood Valley of the Moon Race. San Francisco RC assisted with SF Marathon, Marin ARC with Kiwanis Native Son Parade; MARC also received Battered Shoe Award for efforts in March of Dimes Superwalk. PSHR: W6RNL. Traffic: (July) W6NL 419, W6IPL 270, W6RNL 182, K6TP 69, K6TWJ 69, W6GGR 10, WA6OXV 6, WA6PYN 3. (June) W6NL 251, W6RNL 228, K6TP 106, W6GGR 2. (May) W6NL 208. (April) W6NL 357.

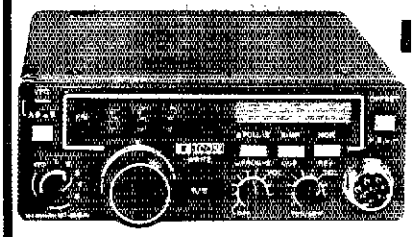
SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. New appts: EC KD6QM; ORS W6SX. Renewed appts: EC W6BWM; OVS K6YK; OBS W6XK N6AM W6NTK. New officers of Turlock ARC are WB6MDN, pres.; KB6DJ, v.p.; WA6RHT, secy.; W6SM, treas.; WA6OYF, sgt. at arms. The Central Cal DXC held a formative meeting in Visalia. KA6JIM is a Silent Key. NCN QNI 1740, QTC 702. Recent upgrades: Novice — KA6QLQ; Tech — KA6FSR KA6OEZ KA6LXM; General — WD6DYR; Advanced — KA6GCA WD6FUF WD6CNV N6BVP; Extra — WA6YVR. New calls: WA6YVR is KQ6O, WB6HEQ is KE6CS, WB6KUO is KE6DK, WD6BJK is KE6CZ, WB6KHR is KD6TY, WA6YUU is N6EXK, KA6IXC is N6EVJ, WB6FPR is N6EVF. WA6JDB is chasing DX. JA1EOD visited W6GR. KP4BZ visited in Fresno. Traffic: N6AWH 147, WA6YAB 20, KV6W 14, W6DPD 13, WA6JDB 5, K9YBM 5, WB6WYA 4, KB6CC 2, WD6FRS 2.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. W6ZRJ has accepted an appointment as Section Traffic Manager for SCV, your cooperation with him would be appreciated. WB6IZF reports many ARES members on fire patrol for the Forest Service! N6FN spoke before San Lorenzo Valley ARC on add-on features for repeaters, and their new Board members are N6FN N6RZ and K6TCN. SPARK had a slide show of the Space Shuttle Landing, presented by N6BIS. SCCARA was treated to an interesting discussion and slide show on the Stanford Linear Accelerator. KA6CWE described his trip to Peru to West Valley ARA. Computer/ham radio interface problems were discussed before PAARA, with a demo of Apple computers. KA6POV has joined PAARA. KD6ZL is now Advanced. Memorex ARC's club station is in full operation with local and DX contacts and is preparing to go on RTTY. K6EUB spoke before SCVRS on Uniform Electrical Code as it relates to ham radio. New officers of SCVRS are: WA6MZF, pres.; WA2IBM, v.p.; KD6VO, treas.; WA6AQA, treas. San Mateo RC visited the United Air Lines airport facilities with W6PCP as tour guide. W6ZRJ working on shack during vacation time. W6ASH and 20 SPECS members participated in the Calif Div of Forestry fire prevention Patrol (VIP). W6ASH active during Mt. Diablo fire, and made PS Honor Roll. WA6HAD recovering from surgery and activity on the air is limited. W6MMG active on ARINC group and skeds W6OWP. W6KZJ glad to get big traffic total for a change. W6YBV has largest SCV traffic total as usual. Traffic: (July) W6YBV 356, W6KZJ 215, W6ZRJ 62, W6ASH 58, W6RFF 41, WA6HAD 10, WB6IZF 8, W6PRI 2. (June) W6ASH 6.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ed Stephenson, AB4S — ASCM: N4UE. STM: NJ4L. SEC: WA4BFT. NMs: CN AB4V, CMN NJ4L, then WD4CNR, JFK WB4WII, NCSSB WB4CES. Upgrades reported: WD4LRG KA4HAM KA4HTM and N4FGB all to Advanced. Congrats. Cape Fear ARS busy on July 4th with two activities — ht demonstration at Fayetteville VA Hosp. and supplied communications for the Autryville 10,000 meter run. Super job. CFARS, AB4V and N4EII converting a 2-m fm XCTR to cw for OSCAR access. Good luck. Rockingham County ARC stepped in to provide communications for the Rockingham Co. Ambulance Service when lightening knocked out the dispatcher's console. They performed from 8:00 P.M. until 10:15 A.M. There were 14 participating and more standing by, if needed. Taking part were: WD4HSN WB4EQF WA4QOI KA4HFE WB4UPV WA4DWL NN4P WA4CHW WA4NNA WA4QBG K4OZV WD4OKZ KA4KOP and N4CRH. Great work, all. A club activity they had the previous month made the whole operation easier. It pays to be prepared — even the little things count in emergencies! Personality of the month: WB4CYN, Badin, NC. Born and raised in Badin in 19##. Licensed in 1966. Retired from ALCOA, in Badin, where

NEW FROM ICOM



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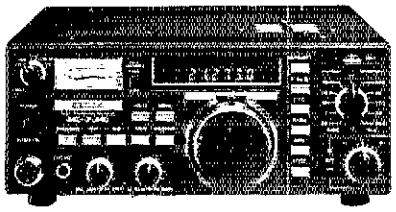

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IC-22U	2 M. 10 W. SYN. MOBILE	$ 299.00	$ 269.00
IC-290A	2 M. MULTIMODE XCVR 10 W.	$ 549.00	$ 494.00
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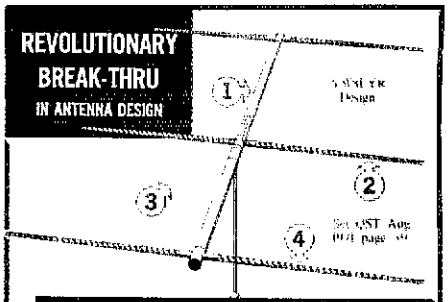

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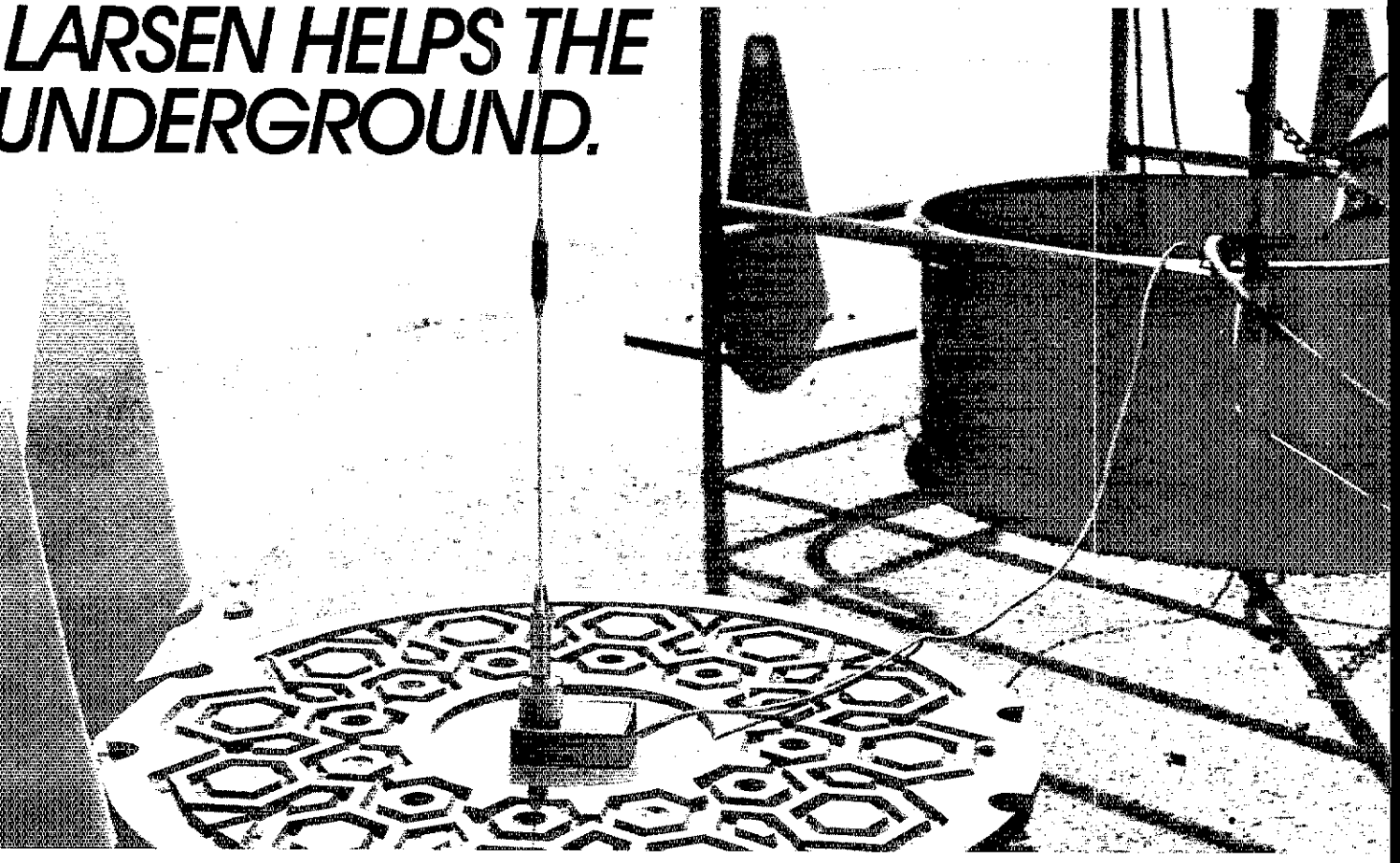

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he worked 38 years. Enjoys gardening, golf, and Amateur Radio. Active in TFC nets. Setup regular radiogram service from Montgomery Nursing Home in Biscoe, NC. Always a fine gentlemen. Jot down W. Car. Hamfest, October 10, Asheville. How was your month? Traffic: (July) WD4CNQ 438, NJ4L 418, WD4CNR 268, AB4V 224, K4IWW 215, WB4WII 200, W4PCN 188, AB4S 181, W4EAT 180, K4DHX 132, WB4UJH 90, WA4SRD 90, KF4R 80, WA4UTC 80, KU4W 74, K4MC/KL7 68, K4EVY 63, WD4EIQ 58, WD4JJK 49, K4FTB 46, NE4J 45, NB4L 44, WB4DAR 40, WA4OBR 30, WB4CYN 28, KC4AM 21, KZ4A 20, WA4PID 20, W4RVE 20, W8PJS 18, KA4ATK 16, WD4LOO 16, N4CCK 15, N4CJJ 15, N4UE 13, KC4MI 11, N4EHM 10, KA4KJI 8. (June) WD4AIE 41, KC4AM 14, N6DR/4 2, WB4SLF 1.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — Asst SCM: WB4UDK. SEC: WD4HLZ. STM: W4ANK. NM: K4PFC W4ODE KA4AUR. Congrats to the upgrades: NQ4N KA4AUR W4NZR WD4LOD N4DJE KD4PA KA4UFJ KA4PQA WD4GBB WD4RHB KC4KQ KA4NBW KD4PB. Sorry to hear that W4NQL became a Silent Key. He will be missed. Tnx to all who attended the SCM & SEC meetings at the Charleston Hamfest. Check-ins/traffic: SC SSBN 1088/127; Blue Ridge 2-Meter Net 2280/67 (congrats to this net for a good report). Can anyone top it? Lancaster County 2-Meter Net 187/14; Newberry County ARES Net 101/7; CNN 120/36; TRIDENT ARC ARES Net 90/0; SC ARES Net 20/0; Spartanburg ARC 2-Meter Net 350/20. Traffic: K4ZN 401, W4ANK 157, W4NTO 117, K4ZB 89, W4FMZ 52, KA4AUR 47, K4FRX 46, W4MTK 34, WB8TCT/4 27, AF4E 23, WA4JWS 12, KA4LRM 11, NQ4N 10, W4DRF 9, WD4DOL 8, KA4ADI 1, WB4NBK 1, WD4OLV 1.

VIRGINIA: SCM, Luck Hurder, WA4STO — SEC: KZ4K. STM: KY4K. Chief OVS: N4CD. Chief OO: W4HU. Chief OBS: K3RZR.

Net	Time	Freq.	Sess.	QTC	QNI	NM
VNTN	Noon	3907	31	190	217	WD4FTK
VSBN	6:00	3947	31	287	502	W4NWM
VSN	6:30	3705	31	136	296	WB4KSG
VN	7/10	3680	62	620	541	W4SUS
VLN	10:15	3947	31	508	474	WD4ALY
WARC	8:30 Sn	3748	5	6	25	K4JST

Kudos to the VA Section multitudes who assisted K2BSA in their massive efforts! Particular thanks to KA4ERP for his many trips to Ft. A.P. Hill and for his perserverance. A purple heart to KA3DTE for her resistance to the odors of cooking crabs while at the operating position. And, finally, thanks to W2CS and N2YL for arranging extra TCC skeds to help us clear the more than 2200 jamboree messages. Congrats to WD4RIE for assuming rigorous duties of DEC, and our best to N1PG who is nursing broken wrist. 11 ORS and 6 OES appointees cancelled during July. Remember, mutual support translates to a report every month. Congrats to new ORS N4YE N4BJX KD4FP and W4NFA. Same to our 6 BPLs this month — WB4PNY KA3DTE W3ATQ KA4ERP KY4K and WA4STO. A tip of the hat to new SVEN NM N4EVV! Rumor has it that the Wilson boys (K4BAV & K4DHB) sent out 55,000 mailers in preparation for September Novice class — phew! NM W4NWM vacationing in Cape Cod and N4NK enjoying new 27 foot toy. The Dunnsville duet K3RZR and KA3DTE are back in town for good and lathering the ether with RTTY. Traffic: WB4PNY 1010, KA3DTE 818, W3ATQ 627, WA4STO 571, KA4ERP 553, KY4K 508, KZ4K 326, K4JST 248, WA4CCK 225, WA4LJI 217, WD4ALY 166, W4SUS 164, WD4FTK 127, KA4IUM 119, KB4PW 91, W4NWM 82, K3RZR 82, KB4WT 77, WB4FDT 69, W4NFA 68, N4DYY 60, W3BBN 58, N4EVV 58, K4JM 58, KA4HLI 53, K4EJ 47, N4YE 47, K4VWK 40, WB4ZTJ 38, K4LMB 35, WA4QWC 33, N4BJX 29, W4UQ 28, W3BBQ 23, W4YVG 22, NN4I 21, WB4KIT 21, K8LGA 19, WA1VRL 17, N4YQ 16, N4BFI 14, WB4ODZ 14, WA4YIU 14, WA4MAE 12, W4LXB 11, WB4DQZ 9, W4KFC 9, N4LE 9, WB4UHC 8, WB4ZNB 8, WA4RTS 7, WB4RWY 7, WA4TVS 5, WD4DUU 4, W4OKN 4, W4TZC 4, W4YE 4, WA4EQW 2, KC4HN 2, WB4LAB 2, W4PVA 2, WB4RKN 2, KI4W 2, W4KXE 1. (June) N4YE 69, N4BFI 45, K4LMB 28, W4KX 4.

WEST VIRGINIA: SCM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. NMs: K8MHR W8FZP KD8X WD8LDY. New Novices: KA8NSY KA8MVG KA8MZU. KB8XM is not KN8W. KC8FW is new EC for Raleigh Co. K8DF is new EC for Harrison Co. Jackson Co. Hamfest on Aug. 9 was very nice. Thanks to K8EXI and H.F. Committee. KA8AHT is now KC8KV. WD8DHC was heard operating portable from Mason Co. WD8LDY and KA8HAL are looking for new Novices on WVNN at 6:15 daily on 3730. Midday Phone Net 249 WNI, 25 QTC; WVFN 403 QNI, 96 QTC; Hillbilly Net 117 QNI, 24 QTC; WVN 179 QNI, 68 QTC; RACES nets 218 QNI, 41 QTC. 2-mtr nets: KFC 102 QNI, 21 QTC; PARA 79 QNI, 14 QTC; Blk. Dia. 36 QNI, 4 QTC. Traffic: KD8X 80, WD8PQG 54, WD8G 47, KC8CR 36, K8QEW 36, N8AJC 31, WD8DHC 31, K8KT 31, WB8SAW 30, N8CFX 25, W8CKX 21, K8MS 15, KC8CS 14, KN8W 8, WA8YTM 1.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Lawrence E. Steimel, WØACD — SEC: K3PUR. STM: WBØMCL. NMs: NØAXQ WDØAIT WØEJD WAØHYL KBØZ. Squaw Mountain located 35 miles WSW of Denver, home of the second highest repeater site in the United States, is losing its long time trustee. The man of the mountain, WØWYX and his loving wife, known to literally thousands of amateurs, are moving from their 11,500 ft. home. The many amateurs from every state in the USA and many foreign countries that visited the WØWYX home and signed the visitors log will be long remembered by the hosts. The mountain home construction was started in 1942 and progressed as time would permit. In 1947 the first Amateur Radio equipment was installed and the first commercial repeater was installed in 1948. Since that time there has been a good number of commercial repeaters at the site, and always one or more amateur repeaters. In 1960, WØWYX moved to the mountain where he and his wife have lived until now. He has been very active in the Colorado Amateur Radio weather net from his vantage point as well as acting as net manager for one of the oldest 10-meter ARES nets in the country. The amateurs do thank WØWYX for his most generous hospitality to the Amateur Radio fraternity. Nets: HNN 31 sess, QNI 1055, QTC 137, Inf 122, QNF 1228; TWN 31 sess, QNI 177, QTC 191, QNF 836; Colombine 27 sess, QNI 953, QTC 80, Inf 158, QNF 972. Traffic: WØWYX 2485, NØBQP 1529, WAØHJZ 1317, WDØAIT 352, KØDJ 345, WØEJD 268, WØHXB 220, KBØZ 118, WØNFW 90, KDØM 50, WØLAE 36, W5HRS 25, WØGO 12.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs: WB5NNG KG5L & W5VFQ. Southwest Net (SWN) meets daily on 7.083 at 1930 local and handled 158 msgs with 207 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3.939 kHz at 0100 Zulu and

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200PS Portable ps 69 w
DMK Mobile mt 19 m
110L Xcvr (RX+TX) 199 mf
PS-110H 12v ps 69 m
MT-1 Transformer 19 e
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Astro 200 Xcvr $379 m
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F455FA08 800 Hz filter 99 w
51J-4 SW Rcvr sn 3223 695 w
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32S-1 Transmitter 275 f
32S-3 Transmitter 450 wf
KWM-1 20-10m Xcvr 199 c
Spkr/patch for KWM-1 59 c
516E-1 KWM-1 DC ps 69 mf
351D-1 Mobile mt 49 wf
KWM-2 Xcvr 575 mw
516F-2 AC supply 189 mf
CC-2 Carrying case 69 f
DENTRON
160-XV 160m Xvtr $ 99 e
160-10AT-3kw Tuner 99 w
GLA-1000/tuned input 249 w
DTR-2000L Linear (air) 799 m
W-2 Wattmeter 79 w
WVP-2A VHF PEP meter 59 m
AF-1A Rcv audio proc 89 wf
DRAKE
SW-4A SWL Rcvr $179 f
SPR-4 SW Rcvr 269 f
2B Ham Rcvr 169 e
2C Ham Rcvr 179 mwe
2AQ Spkr/Q-mult 29 e
R-4 Ham Rcvr 229 mfe
R-4A Ham Rcvr 259 mwf
R-4B Ham Rcvr 289 mwfc
R-4C Ham Rcvr 389 fcve
MS-4 Speaker 19 wce
4NB Blanker 49 me
SC-2 2m rcv conv 69 w
2NT Transmitter 89 mw
T-4x Transmitter 289 mwfc
T-4XC Transmitter 399 cve
TR-3 Xcvr 249 m
TR-4 Xcvr 329 mwfe
TR-4/NB Xcvr 379 mve
TR-4C Xcvr 379 fc
TR-4C/NB Xcvr 429 f
RV-4C Remote VFO 89 c
FF-1 Xtal adaptor 19 f
TR-6 6m Xcvr 469 w
TR-6/NB 6m Xcvr 549 e
AC-3 AC supply 59 mwf
AC-4 AC supply 89 afl
DC-3 DC supply 65 m
DC-4 DC supply 85 m
PS-7 Power supply 199 m
MN-75 Ant tuner 179 m
TR-22 2m FM Xcvr 99 e
TR-22C 2m FM Xcvr 119 m
TR-33C 2m FM Xcvr 129 m
AA-22 2m amp/preamp 49 w
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IC-701 Xcvr w/ps 769 f
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EX-1 701 Y-interface 29 m
IC-720 Xcvr 895 mw
PS-15 Power supply 99 mw
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IC-502 2m SSB port 149 e
IC-22A 2m FM Xcvr 139 m
IC-22S 2m FM Xcvr 149 m
IC-211 2m FM Xcvr 399 m
IC-230 2m FM Xcvr 149 v
IC-245 2m FM Xcvr 249 mv
IC-255A 2m FM Xcvr 229 w
IC-280 2m FM Xcvr 249 w
IC-245/SSB 2m Xcvr 299 m
IC-251A 2m SSB/FM 499 wv
IC-260A 2m SSB/FM 299 e
IC-202 2m SSB port 169 e
IC-202S 2m SSB port 189 m
IC-30A 450 FM Xcvr 249 v
SM-2 Desk mic 29 e
KLM
661 6m Xcvr $369 m
2-70B 2m 2/70w amp 89 w
4-80BL 2m 4/80w amp 149 w
10-70B 2m10/70w amp 99 e
KANTRONICS
Field Day 2 Reader $299 m
KENWOOD
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R-599A Ham Rcvr 249 m
R-599D Ham Rcvr 269 fe
T-599D Transmitter 349 ve
TS-900 Xcvr/PS-900 ps 399 mf
DS-900 DC supply 99 f
TS-120S Xcvr 489 mwe
PS-30 Power supply 99 m
SP-120 Speaker 29 m
VFO-120 Remote VFO 119 m
TS-180S/DFC/2 filters 599 m
VFO-180 Remote VFO 99 e
TS-520 Xcvr 469 c
TS-520S Xcvr 499 w
TS-520S w/CW filter 539 m
SP-520 Speaker 19 w
DG-5 Digital display 139 w
TS-820 Xcvr/DG-1 dig 649 f
TS-820/DG-1/CW filt 679 w
TS-820S Dig Xcvr 699 mwf
TS-820S/CW filter 699 m
VFO-820 Remote VFO 129 f
PC-1 Phone patch 44 e
AT-200 Ant tuner 115 mw
R-300 SW Rcvr 199 mw
TV-502 2m Xvtr 179 m
TS-600 6m Xcvr 489 e
TS-700A 2m Xcvr 399 fc
TS-700SP 2m Xcvr 479 f
TR-2200A 2m FM Xcvr 129 mc
TR-7400A 2m FM Xcvr 249 wfve
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350C Xcvr 289 m
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700CX Xcvr 329 m
HF-700S Xcvr 329 f
117X Basic AC ps 59 m
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230XC 110/220 ps 95 m
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VX-1 VOX 19 m
VX-2 VOX 29 m
600T Transmitter 289 fe
600R Custom Rcvr 249 e
600SP Spkr/patch 59 m
ICAF Audio notch 19 m
NB-500 Blanker 29 f
FP-1 Phone patch 39 e
ST-2 Ant tuner 159 e
ST-2A Ant tuner 169 m
ST-3 Ant tuner 119 v
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210 1A supply 19 f
570 Century/21 Xcvr 239 mwv
574 Century/21 Digital 289 w
670 Keyer 19 w
276 Calibrator 19 me
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544 Digital Xcvr 449 e
544 w/CW filt/NB 479 m
252G AC supply 99 w
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244 Digital display 129 we
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280 18A supply 99 m
285 CW filter 35 m
Omni-A series B Xcvr 589 f
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FT-101B Xcvr 499 ve
FT-101E Xcvr 599 mtve
FT-101E w/CW filter 629 mw
FT-101EE Xcvr 549 m
FT-101EE w/processor 579 m
FTV-250 2m Xvtr 189 m
FTV-650 6m Xvtr 169 c
FT-301S DIG 20w Xcvr 369 w
FT-301 Xcvr/CW/AM 469 w
FT-301 DIG Xcvr 469 w
FT-301AD Dig Xcvr 469 f
FP-301 AC supply 99 mw
FT-301D Deluxe ps 149 m
ERB Relay box 19 m
FT-7 20w Xcvr 329 mce
FT-901DM Xcvr 799 mwf
FT-901D Xcvr 649 f
FT-902DM Xcvr 999 m
FV-901DM Remote VFO 289 m
FT-107M/DMS w/int ps 799 v
SP-107P Spkr/patch 49 v
FV-107 Remote VFO 99 me
FT-707 Xcvr 549 e
FC-707 Ant tuner 89 e
FT-620B 6m Xcvr 299 e
FT-221 2m Xcvr 349 mw
FT-227R 2m FM Xcvr 169 w
FT-227R/CES scanner 199 f
FT-227RA 2m FM Xcvr 199 v
CPU-2500R 2m FM Xcvr 269 c
CPU-2500RK 2m FM 289 mv
FT-207R 2m FM HT 199 m
PA-2 Mobile adapt/cgr 29 m
FT-127RA 220 FM Xcvr 329 m
FRG-7 SW Rcvr 199 f
FRG-7000 SW Rcvr 349 fe
YC-355D Counter 119 m

8-15-81

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment special, Closeouts, etc.

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f = **Orlando, FL** 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = **Clearwater, FL** 33515; 1898 Drew Street.....	(813) 461-4267		
v = **Las Vegas, NV** 89106; 1072 N. Rancho Drive.....	(702) 647-3114	1-800-634-6227	
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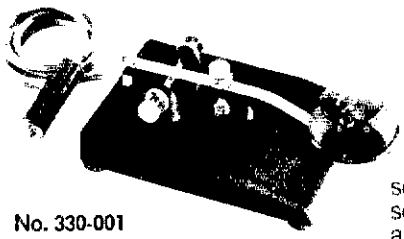

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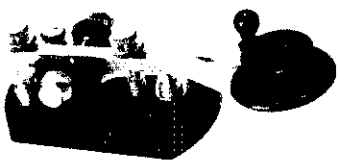

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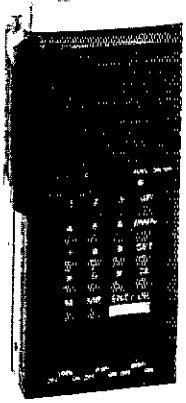

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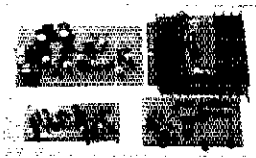

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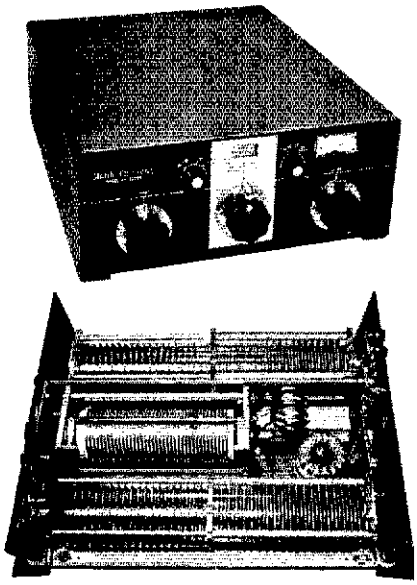

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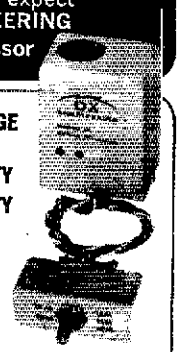

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handled 103 msgs with 846 stations in. New Mexico Breakfast Club meets daily on 3.940 kHz at 0700 local and handled 70 msgs with 709 checkins. Yucca 2-Mtr Net, 146.01/61 handled 31 msgs with 737 checkins. K5MAT reports WAS low power on 6 mtrs. Yucca Net held annual picnic at Lovington. Pres. Harry Dannals, W2HD, honored us with a rewarding visit. A great pleasure to have him and the ARRL forum was well attended and was color video taped for play at any future club meetings. Traffic: W5DAD 292, KA5DDW 123, W5JOV 111, W5ENI 97, N5NG 85, WA5MIY 44, KB5LI 24.

UTAH: SCM, Leonard M. Norman, W7PBV — SEC: George A. Mackley, WB7BZJ, P.O. Box 523, Sunset Estates, Ivins, UT 84738, phone 801-673-9420. Utah ARC steakfry was enjoyed by 150 or so radio amateurs at Jordan Pines. K7JH and crew won first place in 10M contest for Utah. K7UM copied 46 wpm in WIMU cw contest. N7SM gave W2HD a cooks tour of SLC. W7SP 146.01/61 repeater operating from KSL site. K$PGM, Division Director, visited clubs at Cedar City and SLC. WA7ZBO is AMSAT coordinator for UT. WA7MTF setting up comms for world land speed record attempt at Salt Flats. WIMU scheduled as joint Northwestern and Rocky Mtn Division Convention Aug. 6, 7, 8, 1982. Traffic: K7HLR 232, WA7KHE 166, WA7TEH 134, WA7MEL 68, WA7JRC 49, W7RO 34, W7OCX 22, WB7NVO 16, W7PBV 4.

WYOMING: SCM, Dick Wunder, WA7WFC — SEC: WB7EIN. The Wyoming Hamfest, at Meadow Lark Lake, was well attended with over 90 at the evening meal Saturday. A good time was had by all and our thanks to the Sheridan Amateur Radio League for putting on a very nice hamfest. The Wyoming YL's have asked to sponsor the 1982 Wyoming Hamfest and it looks like it will be at Meadow Lark Lake again. Congratulations to KA7LEM & KA7LET, new Novices in Cheyenne. WB7NHR reports the Wyo. Cowboy Net held 23 sess with 455 QNI & 18 QTC. WA$PFJ reports the Wyo. Jackalope Net held 24 sess with 407 QNI. Let's advertise the ham classes for this fall. Traffic: WA7GYQ 306, WB7NHR 163, W$OGH 140.

SOUTHEASTERN DIVISION

ALABAMA: SCM, James M. Bonner, K4UMD — SEC: W4IBU. It was a slow month. No severe weather, a few stand-by alerts. AENM, 2468 check-ins, 115 messages in 35 sess. AENB, 236 check-ins, 109 messages in 31 sess. AEND, 178 check-ins, 140 messages, in 29 sess. AENR, six-meter net, (June) 52 check-ins, 1 message. AENJ (June), 176 check-ins, 17 messages, 30 sess. West Ala. Amateur Radio Society (WAARS) is now an affiliated club of ARRL. Muscle Schoals ARC (MSARC) has a new van provided by Civil Defense. Local hams equipped it, they are ready for all emergencies. We are nearing our hurricane season, but hope they will not need it. The big news of HARC was their first Huntsville Hamfest, it was a great success. The club did a fine job, more details next issue. It seems a few are bringing six meters into use — check-in 50.4 Sunday @ P.M. local. They will make you a SMART—Six-Meter Amateur Radio Turkey. It is good to see the band getting good use. BARC started their Novice thru Advanced classes Sept. 22. Will last 12 weeks at Birmingham Red Cross bldg on Tuesday nites. Ala was 93.0% into DRN5 by W4CKS W4IBU and KD4KT. Ala 100% into CAND with W4CKS. AENZ 174 QNI. It's always good to see our 2-meter nets active with good participation, so please check-in to these nets. Traffic: (July) WA4JDH 915, W4CKS 156, NO4E 97, WA4PIZ 86, WA4LXP 82, K4AOZ 38, K4UMD 31, W4IBU 22, AA4J 19, WB4TVY 15, WD4DHI 13, W4RNX 11, WA4RMP 10, KC4GS 4, K4HJX 4. (June) NO4E 64, W4IBU 38, WA4JPK 24, WA4ZPZ 16, WB4EKJ 8.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM/SEC: K4VHC. ASEC/NVOAD: WA4PUP. STM: W4WXA. Chief OBS: W4BIA. Conyers ARG, IBM RC & John Ross ARC new ARRL club affiliates. Atlanta area hams again did FB job with Peachtree Road Race & "Salute to America" parade. Warner Robins on the 17th & 18th & Savannah on the 24th & 25th are the two section hamfests this month. Both need your support. Colquitt County Novice class in full swing. Central GA ARC busy with many public service events. Columbus ARC elected the following 1981-82 officers: WD4CCE, pres; K4RHU, v.p.; KA4SWL, secy.; KD4NZ treas.; WD4BEH, act mgr. Atlanta RC's leadership is: W4MRJ, pres.; WA4OAU, v.p.; WA4PNY, secy.; KC4BX, treas.; W4ZUE WA4KWC, activities. K4EV & AA4TT spent the summer in the N.E. Now that the summer season is over, please remember about the need for you to check into our many section nets. S.E. DX club was this year's host for DXPO 81. I hope that by now all who plan to participate in the SET have everything ready to go. Info just received states that well over 7000 attended the 1981 Atlanta Hamfestival. W4WXA & K4EV are looking for 4RN NCSs. Many of you out there more than qualify. Contact either Tom or Steve & volunteer. Winners of the scholarship awards given by the Atlanta RC have been announced. AK2N of Great Neck, NY won the Michael Zuckerman, K4AEJ Memorial award & plans to attend Cornell U. WD4AEI was the recipient of the *Clifford Q. Tritcher*, W4IO Memorial award and will attend VPI. Gud luck to both on their education. Albany ARC planning 1982 hamfest and named W4YWP chairman. Current plans are for the month of August. Raft races in Atlanta, Columbus & Savannah were furnished gud communications by their local clubs. For an evening of real fun, tune to 3975 at 9 P.M. local on Sunday evenings for the "Fish Head Net." K4ZYK assures that you will laugh with tears in your eyes before the session ends. He plans to start on the 4th of October. Traffic: (July) W4WXA 183, W4PIM 126, W4GH 50, WB4LBM 50, K4JNL 49, KA4ATM 36, W4HON 24, K4BAI 20, WB4RJJ 19, W4BIA 18, W4FIZ 15, W4LCB 8, K4EV 6, WA4PUP 5, N4UZ 4, K4PIK 3, AK4T 3. (June) N4UZ 30, AA4EI 21, W4AAY 4.

NORTHERN FLORIDA: SCM, Billy Williams, N4UF — Enjoyed meeting members at the Northern Fla. ARRL Convention in Jacksonville in Aug. Good turnout and lots of things to buy. Congrats to NO4A and the committee. Pileup contest won by K4UTE. WN4IIV took the QLF plaque & WD4RPB won the Rabbit Hunt. New officers of the Playground ARC (Ft. Walton Beach) are WD4JDU, pres.; N4EZU, v.p.; N4GQ, secy.; KD4NV, treas.; WD4HDT, act. mgr.; W4LRC W4RH WD4HDT, trustees. N7SD teaching fall Amateur Radio classes at "Hambone College" in Daytona Beach. KT4O and N4EBH are looking for 220 MHz RTTY QSOs in Pasco-Hernando Co. area. W4DTV chosen as OARC Ham of the Month for work with ham licensing classes. KD4KU is compiling a list of past presidents of OARC and would appreciate any info. A new rptr in Tallahassee is owned by K4MZA and active on 147.63/.03 MHz. W4WYR, SE Div. Vice Director, spoke to Aug. TARS meeting. New editor of

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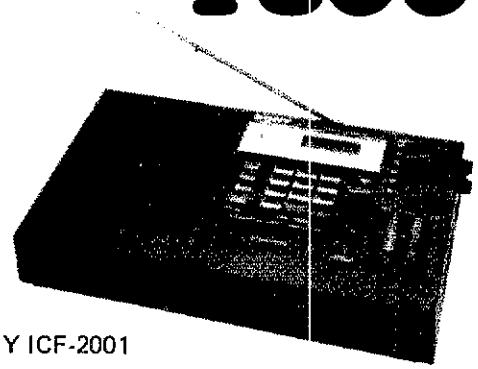

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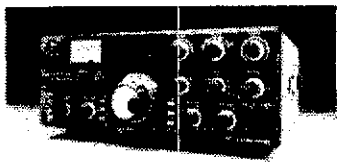

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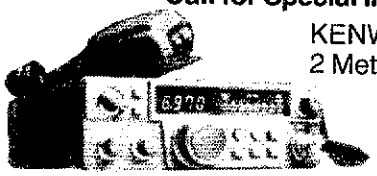

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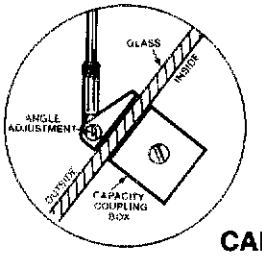

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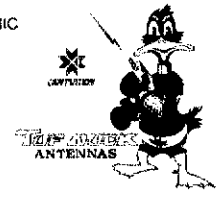

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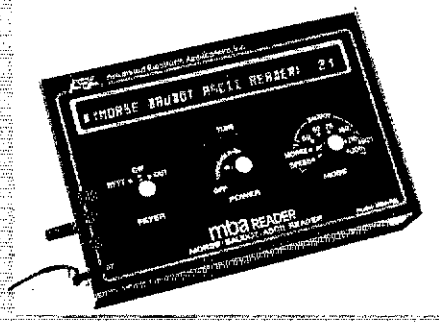

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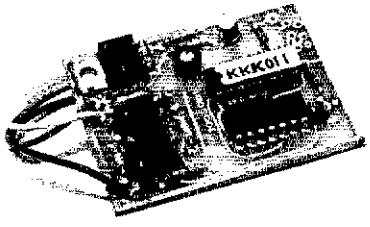

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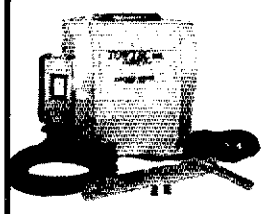

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GCARC Bulletin is KC4CP. In Panama City, PCARC got a comm trailer with tower, thanks to WB4VBV K4JJE K4PMO N4CDY WA4SHN and WD4MAF. The 34/94 rptr there is active again. WD4ASW is moving to Jax from Gainesville and will be replaced by WA4AXJ as Asst SCM. Tnx to ASW for an outstanding job as ASCM. He and WA4FVD appeared on TV for FD interview. New Techs in Gainesville are KA4TYF KA4NSJ & KA4OTG. BARS provided comm for Jax Bch fishing tournament. NOFARS will have new meeting place this month. Active ARRL members are invited to apply for League appts. Traffic: WD4HIF 784, N4PL 374, W4SIZ 252, WA4EYU 207, WD4IIO 182, KF4U 143, N4EDH 133, WA4QXT 107, WB4TZR 72, W4JL 65, W4BSP 64, W4MGO 58, N4UF 46, N4AXN 32, WB4DTS 27, WA4STZ 27, W3IDO 22, W2QWC 13, WB4GHU 7.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. STM: WA4PFK. KB4QW reports he received WAC WAS 5BWAS and DXCC. This in addition to all the outstanding work he is doing as EC, public service and public relations, with a big picture and write-up in the paper on Amateur Radio in hurricane readiness. Not bad. Wish we have a lot more like you! FMTN had another good month, leading all Florida nets in traffic totals as well as check-ins. This in spite of bad band conditions reported by manager, WB4AID. Or is it because generally bad conditions on the evening nets cause more traffic to be routed to the daytime nets? N2WX of Palm Bay reports he is attending college and expects to be in Florida for next 3 years. Nice to have you. He is a real expert cw traffic handler. KC4OT assumed duties as Manager of SWFTN Aug 1st, relieving WA4HXU, who has done an outstanding job pioneering this excellent 2-meter traffic net in the Fort Myers area. Thanks, and congrats to the new manager. KA4GUS reports the last July session of Dade Emergency Net was a hurricane drill. I hope all the emergency nets, and others as well, are geared up for hurricane emergencies, as it is that time of year. W3TLV reports he is "going north" — didn't say for how long. W4IYT reports Miami Red Cross, K4IWT, getting new equipment and more antennas. W4JM has up a new 80-40 meter trap diode replacing parallel dipoles and is pleased with results. W3VR reports TENTEC Hercules amplifier still going fine. K4SCL helping move the kids. Made one trip to Miami to tow trailer full of furniture. Now has to go to Houston, TX hauling a truck-load of household goods. Traffic: W3CUL 2984, W3VR 601, WD4COL 517, WB4FVV 488, K4SCL 348, WA4PFK 315, K4ZK 219, WD4AWN 194, NC4H 189, W4GPL 156, KA4LNA 125, WB4AID 124, K4EUK 99, KA4ASZ 98, KE4O 93, W3TLV 90, WB4PIB 76, W4DVO 71, WA4EIC 65, WB4WYG 59, KD4DC 48, WA4GYR 42, WB4SNX 39, N2WX 39, NJ4O 33, K5IHH 32, WB4GCK 31, W4IYT 26, W4ESH 21, KA4BBA 18, WB8VLR 5, W8BZY 3, KM4G 3.

WEST INDIES: SCM, Julio Negroni, KP4CV — ARES is busily reorganizing under SEC KP4CU and getting ready for next SET. New ARES Net meets Tuesdays at 8 P.M. on La Santa repeater (147.69/09). Emergency plan is being updated and will be published in a forthcoming edition of ONDA Terrestre, the PRARC bulletin. A new Novice course is scheduled to start Sept. 1 at the PRARC clubhouse at San Patricio. Classes will be conducted by KP4CA and KP4CV. A new traffic net will soon be started on 80 meters ssb supplementing WINS. BPL: WP4AOH NP4F. PSHR: NP4F 131, WP4AOH 114, NP4D 61. Traffic: WP4AOH 675, NP4F 522, WP4BDS 192, KP4FJS 117, NP4FBT 83, KP4DJ 73.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Erich J. Holzer, N7EH — STM: W7EP. NM: WA7KQE W7UQQ. Another Ft. Tuthill Hamfest is history now. I would like to congratulate WB7DJT on being selected as Arizona's "Ham of the Year." I enjoyed the many eyeball QSOs at Ft. Tuthill. Thanks to the SW Division Director, W6EJJ, for his presentation at the hamfest. New field organization appointees: W7LUX OO, OVS and WA7NXL ORS, OBS. I regret to report the following Silent Keys: W3CUY KA7DLY and WN7ZPF (all via Superstition ARC). WB7CRK is NCS for Slow Speed Net (cw) held on Sundays at 1800 MST on 3.735 MHz. This net is a good place to build up your code speed and get on the air. Try it. New calls: KA7KSL and KA7KTC in Flagstaff; KA7KOR KA7KXC and KA7KWV in Tucson. WB7EYU is now N7CXF. KB7NK (ex-WA7NEV) reports he will be home in AZ during the month of November on the way to new QTH in DUT-Land. WA7EI is reported to be planning a trip to Hawaii with his new PCS3000. Still looking for public service communications reports for beefing up this column. I encourage appointees to submit their monthly reports on a regular basis. ATEN: QNI 835, QTC 170. SWN: QNI 207, QTC 156. Traffic: W7EP 111, K7MC 97, K7NTG 80, WA7KGE 74, KB7HA 43, K7JKM 36, W7OIF 20, K7NMQ 10, WA7NXL 9, N7EH 7, WA7YUL 4, K7GLA 1.

LOS ANGELES: SCM, Stan Broki, N2YQ — ASCM: N6UK. SEC: WB6FAK. STM: W6INH. A wildfire at Johnstone Peak almost did in the W6ORG ATV repeater. Fortunately the only damage was to a telephone pole that held up the antenna, it burned through putting the antenna at a 45 degree angle. The Tri-County ARC proposed at the last Los Angeles Council of Radio Clubs meeting a local area hamfest possibly next spring at the Los Angeles County Fairgrounds. All those interested in this proposal please send me a note for forwarding. Other clubs are invited and needed to make this proposal work. OO reports: K6CL 1, WB6YID 3, K4WGW 11, K6KA 80+. Traffic: (July) K6OWA 111, WA6OCM 102, N6DZQ 62, W6INH 62, K5DY 54, N6PZ 47, KB6OT 39, WA6LVO 36, K6INK 27, N6HE 20, K6CL 13, N3EG/6 8, KT6D 4. (June) N6PZ 53, K5DY 48, K6INK 10.

ORANGE: SCM, Fried Heyn, WA6WZN — ASCM: WA6WZN. STM: KA5A. SEC: W6UBQ. Get ready for the Simulated Emergency Test (SET) to be held Oct 17. Contact one of the ECs listed below to find out what you can do. Inyo County: W6DHK W6DQR; Orange County: WD6CSL KA6HVY W6RE WA6TLE; Riverside County: N6ANL W6BAE WD8DGI WA6HFE AI6I WA6KOM AE6N WA6QMW WB6VMR W6WWP; San Bernardino County: WD6BNG N6BXY WB6BZZ W6GAE WA6IKH W6PZD WB6SEL KS6T WA6ZVS W6ZZZ. W6DHK is EC for South Inyo Co. while W6TD continues as OO. The grand opening activities of Yucaipa Valley Park were supported by ARES members WB6RDP WA6SAQ WA6WBM WA6UVW WA6WGW W6SJL WB6PIW WB6AYU WA6EBK WB6ADL K6AHK headed by EC WB6BZZ. New officers for Golden Bear ARN (dy 7 P.M. 3975 kHz): K6OJJ, pres.; KF6T, v.p.; WA6NQF, secy./treas.; WB6QAK, south dir. The new NC of the Org Co ARES net (Sun 9 A.M. 3965 kHz) is WA6RVM. Citrus Belt ARC officers: W6HDY, pres.; K6YCI, v.p.; WA6YRF, secy.; WB6QRF, treas.; WA4GTB, act. Orange County Contest Society officers: N6PE,

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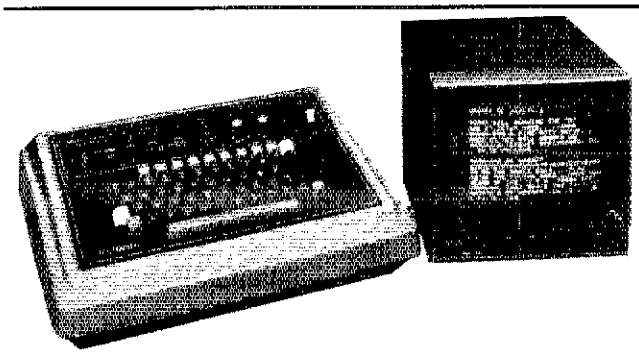

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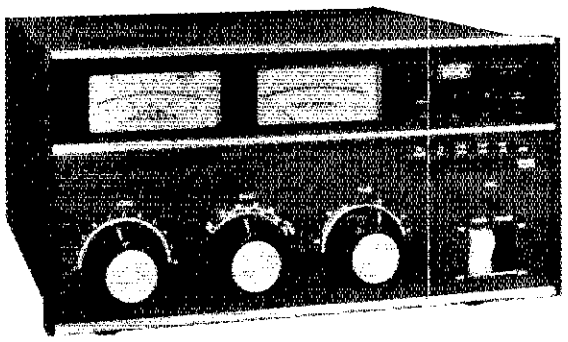
Suggested Retail Price _____ $1095 Monitor _____ $185



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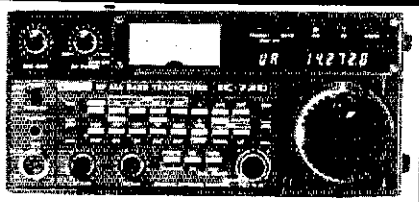
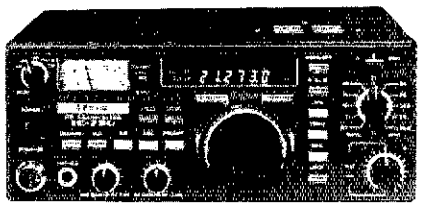


IC-720A Solid state, digital HF Transceiver. 9 HF Ham bands, receives 1 to 30 Mhz. 100w output, cont. LED readout. 2 VFO's, AM, CW, SSB & RTTY filters. PBT, RIT, VOX, semi break-in, blanker & processor. 13.5v/20A 4½"h × 9¾"w × 12½"d, 17 lbs..... **Regular $1349.00**

FL-32 500Hz CW filter 59.50
FL-34 5.2 KHz AM filter..... 49.50



IC-730 Solid-state 80-10m (WARC) HF Transceiver. 200w PEP input. 2 VFOs, 8 freq. memory. IF shift with PBT optional UP/DN tuning with optional microphone. 9½"w × 3¾"h × 10¾"d, 10 lbs..... **Regular $829.00**

FL-30 SSB filter (passband tuning)..... 59.50
FL-44 455 KHz SSB filter 159.00
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Accessories for 720/730

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Adaptor cable - PS-20 to 720/730 ..... 10.00
CF-1 Cooling fan - PS-15/20 ..... 45.00
EX-144 Adaptor for CF-1 on PS-15..... 6.50
MB-5 Mobile mount 19.50
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SP-3 External speaker 49.50
SM-5 Electret desk microphone 39.00
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IC-2KL 160-15m (WARC) solid-state linear, 500 watts output. With AC supply ..... **Regular $1795.00**

IC-290A All Mode 2m mobile. 143.8-148.199 Mhz, 1 or 10 watts. RIT, prog. offsets, 5 memories, 2 VFOs, 2 scanning systems, SSB squelch, priority channel, sidetone, blanker, memory retention provision, T/T microphone. 6¼"w × 2½"h × 8⅝"d... **Regular $549.00**

IC-251A Microprocessor controlled 2 meter All-mode Transceiver for 143.8-148.1999 Mhz. 7 digit display. 10 watts, 3 memories, mem. scan & programmable band scan. 600 KHz offsets, variable splits with two built-in VFO's, 13.8vdc or 117vac. w/amplified hand mic. 4½"h × 9¾"w × 10½"d, 11 lbs..... **Regular $749.00**

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IC-551 All mode, microprocessor cont. 6m transceiver for 50-53.999 MHz. 6 digit display, 10w. 3 mem. ch. w/var. scan, 2 VFO's & blanker. 13.8vdc & 117vac 4½"h × 9¾"w × 10½"d, 14 lb ..... **Regular $479.00**

EX-107 VOX unit 55.00
EX-108 Passband tuning & RF processor 105.00
EX-106 FM adaptor for 551/551D..... 125.00

IC-551D same as 551 but 80 watts. EX-107 & EX-108 built-in. 13.8vdc @ 18A ..... **Regular $699.00**

PS-20 20A AC power supply 229.00
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IC-22U The 800 channel synthesized successor to the IC-22S. Frequency selection by a pushbutton, 1 or 10 watts. Microphone, mobile mount, DC cord & plugs. 6¼"w × 2⅛"w × 8½"d, 3¾ lbs ..... **Regular $299.00**

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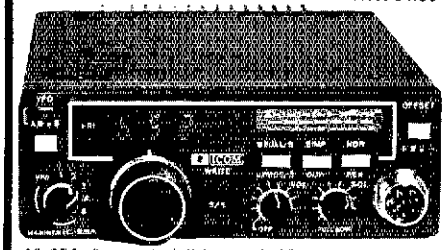
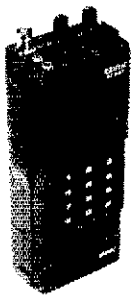


IC-25A Compact, full-featured 25w 2 meter rig. 5 memories 2 VFOs, priority channel, 2 scanning systems, automatic scan resume, provision for memory backup. With T/T mic. 2"h × 5½"w × 7"d..... **Regular $349.00**



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IC-2A 2m HT w/nicad & wall chgr .	$239.50	**$214.50**

BC-30 Drop-in charger for BP-2,3 & 5..... 69.00
BP-2* 450 ma, 7.2v nicad pk, 1W output..... 39.50
BP-3 Extra 250 ma nicad pk, 1.5W output..... 29.50
BP-4 Alkaline battery case..... 12.50
BP-5* 450 ma, 10.8v nicad pk, 2.3W output... 49.50
CP-1 Cig lighter plug & cord (BP-3)..... 9.50
DC-1 DC operation module 17.50
FA-2 2m flexible antenna..... 10.00
HM-9 Speaker/microphone..... 34.50
LC-2A Leather case for IC-2A 34.95
LC-2AT Leather case for IC-2AT..... 34.95
2A-TTN TT pad 39.50
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IC-202S 2 meter portable SSB Transceiver. 3W PEP output. Uses regular "C" cells, optional Nicad pack & charger or IC-3PS AC supply/speaker. With hand mic. whip antenna and strap ..... **Regular $279.00**
IC-20L 2m amplifier. 10w SSB/FM..... 98.00
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IC-30L 432 Mhz amp., 10w SSB/FM..... 105.00
IC-502A 3W SSB 6m portable, as above.... **$239.00**

IC-3PE 3A power supply/speaker..... 95.00
IC-3PS AC supply/spkr for portables..... 95.00

HM-3 Deluxe mobile microphone..... 17.50
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HM-7 Amplified mobile microphone 29.00
HM-8 Touch-tone microphone..... 49.50
HM-10 Scanning microphone 39.50
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pres.; NC6T, v.p.; KA6HNY, secy./treas. Hughes ARC emergency communications team is headed by N6AXN. OES WB6DCB reports SET held by Placentia Neighborhood Radio Watch. The largest ever NTS meeting at KA6A (asked for increased ARES support). Cal Div of Forestry met with ARES to organize the CDF-VIP program for San Bernardino Co. The city of Riverside has settled the antenna issue in favor of the hams, including declaring the week of Field Day "Amateur Radio Weekend." ARES W6RE W6UBQ KA6HNY KA6IHV WB6BZW WD8CSL WB6AXT WB6ARK WB6ULU WB6JBI KA6IIJ supplied comms for mass evacuation from chemical spill in Tustin. See everyone at the convention in Scottsdale Oct. 9-11!

Net	Freq.	Time	QNI	QTC	Rec.
SCN/1(>20)	3598 kHz	7 P.M. Dy	353	277	K6FI
SCN/2(<13)	3598 kHz	8:15 P.M.	276	117	K6HAP
SCN/V(FM)	146.045/645	9 P.M. Dy	482	171	WA6QCA
SCN/RTTY	3637.5 kHz	8 P.M. Dy			WB5EKU

(K5DY SCN NM — KA6A Asst. NM) Traffic: WB6EIG 742, KS6T 564, KN6C 271, WA6WZO 230, W6NTN 201, W6CPB 160, WB6QBZ 132, K6ZCE 62, WA6QCA 47, N6DNH 40, W6TTG 10, WA8WZN 4.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW. Asst SEC: N6RD. WB6YQU is looking for members for Teenage Amateur Radio Society. Call him at 440-8872 after 1500. New San Diego DX Club officers are: WA6EJL, pres.; W6OGC, v.p.; KM6K, secy./treas. WESTLINK is a news service by and for Amateur Radio. Transmissions are aired as follows in San Diego County:

Sunday	0900	3.905 MHz	ARES Net
	1000	29.275 MHz	ARES Net
	2000	146.04/64 MHz	SANDRA Net
Monday	1930	147.795/195 MHz	RACES Net
	2000	146.865/265 MHz	SANDRA Rptr
	2030	223.30/4.90 MHz	220 Club Net
Wednesday	1930	147.75/15	SANDRA Net

WANTED! Written message traffic handlers. Break into this public service thru Palomar ARC's net at 2000 daily on 146.13/73 MHz. ARC of El Cajon is making survey of members' ham activities. Palomar ARC's membership is 313. Lookout SANDRA! Don't forget Palomar's flea mart on third Saturday at 0800, Valley Drive in Theatre, Mission Ave, Oceanside. Traffic: KT6A 579, N6GW 296, K6HAP 88, N6AT 64, KB6AI 43, KU6D 34.

SANTA BARBARA: SCM, Robert N. Dyruff, W6POU — San Luis Obispo County ARES organized for Diablo Canyon nuclear facility startup. Need for added volunteers not foreseen. SBAR So. County EC, KA6Q, forming emerg. planning unit with area reps. Lompoc requested disaster comm. plan. 37 ARES ops enrolled. AVERT council schedules downed aircraft ELT training with CAP, 4WD, ARES. SBAR Co. County new YL EC, WD6NH, divides area into geog. units and agency reps. WA6ZQJ, NTS rep. KA6EUS NTS liaison. Recent Gamboa Fire critique had much learned by all. Conejo Valley ARC now at SBS&L Westlake Village. SBARC's bazaar most successful — AB6S chairman. Simi Settlers ARC claims 3864 FD points including 80 mtr. YL station. SBAR County Fair comms provided by No. County ARES. Lompoc hams provided comms. for 100 mile motorcycle rally. SRO performance for WB6ACU's Eagles concert at County Bowl. 25 watts plus 911 autodialer featured on N6CFO/R 222.58/224.18 SBAR Painted Cave. Hosted: 3D6BJ 3D6AE by W6PN; G3MFE by W6ZRR. Traffic: (July) W6ZRR 108, K6YD 97, W6JGS 69, N6YH 10. (June) N6MA 16.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — Asst SCM: WA5QFD. STM: W5VMP. SEC: W5GPO. NMs: AE5I AA5J KA5IWF WD5JYI. Your SEC and I attended the "Golden Spread Hamfest" in Canyon, Texas; sponsored by the Panhandle ARC of Amarillo. This is the main chance we get to "eyeball QSO" with the panhandle gang each year, and we really look forward to and enjoy the great hospitality. A major ARES meeting was held, and a good turnout of ECs and DECs from the area attended, followed by a Q&A session. W5CBT followed with a fine show-and-tell featuring his super ATV Slow Scan RTTY station. Lots of swapping, SKYWARN training and the usual socializing ... be sure and mark down the first weekend in August and attend next year! ECs — by now you have received your SET Bulletin ... it is hoped that all ARES groups will have a planned activity of some kind during the period of Sept. 1-Nov. 30, and describe same on the SET report & send to W5GPO. By having the SET in the fall, it gives us a chance to check out the emergency gear that may have not been used since Field Day, and take advantage of the better WX during this time of year. PSHR: KA5IWF KC5FX KA5AVQ W5VMP and WD5JYI. Traffic: K5BNH 215, WB5OXE 152, WD5JYI 77, W5TI 75, KC5FX 71, N5BT 64, W5VMP 60, KA5AZK 57, W5HMR 40, KA5IWF 40, WA5KHE 40, K5QKM 38, AE5I 37, W5GPO 20, K5PC 19, W5ERT 16, K9MX 12, K5HGX 10, KA5AVQ 9, W5PBN 6, AJ5F 5.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Asst SCM: Ray Miller, W5REC. Ham Holiday/West Gulf Convention was a rousing success. We were honored by the presence of Mr. Dannals and the members of the Long Range Planning Committee. They added much to the convention. I wish to congratulate K5JB W5KE N5MS and W5REC for the awards presented to them by Pres. Dannals. They are richly deserved. Next gathering of the clan will be at the Texoma Hamarama in October. New calls in the Woodward area: KA5LTW KA5LTT KA5LTU KA5LTV. Understand they had a 'ball' on Field Day. Hope you all got your reports in on time. I am sorry to

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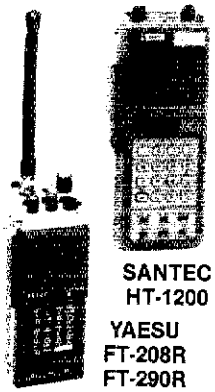

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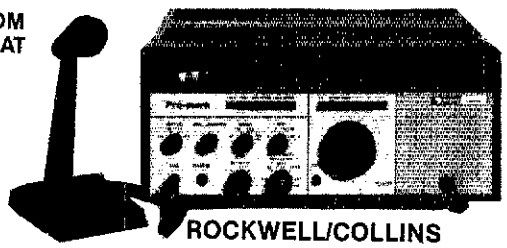
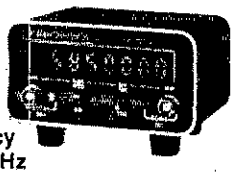


ROCKWELL/COLLINS KWM-380



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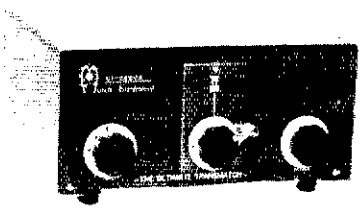
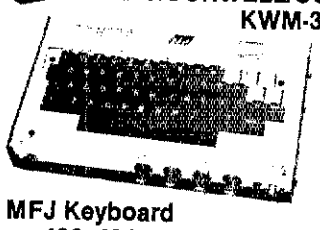
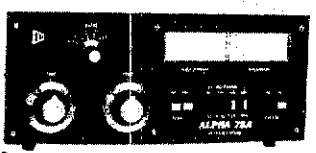


MURCH Model UT2000B



MFJ Keyboard 496, 494



ALPHA 76CA
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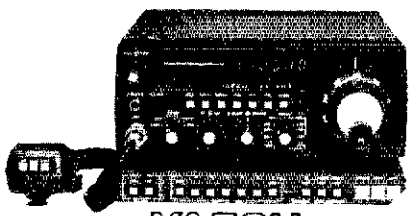

YAESU
FT-101ZD MARK III, FT-480R, FT-707, FT-720RU, FT-720RVH, FT-902DM, YR-901-CW/RTTY

BIRD Wattmeters & Elements in stock

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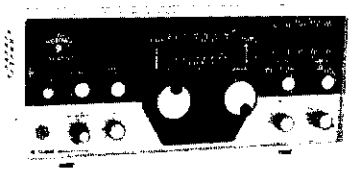
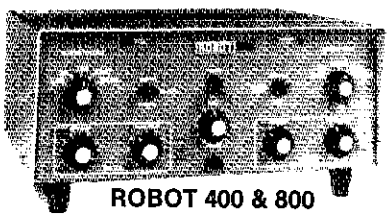
ICOM IC-720A, IC-730 IC-25A, IC-290A

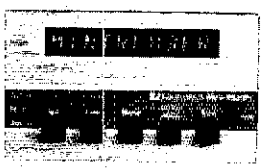


ASTRO 103 150A & 100 MXA
DIPLOMAT 150



ROBOT 400 & 800

HY-GAIN TOWERS & ANTENNAS



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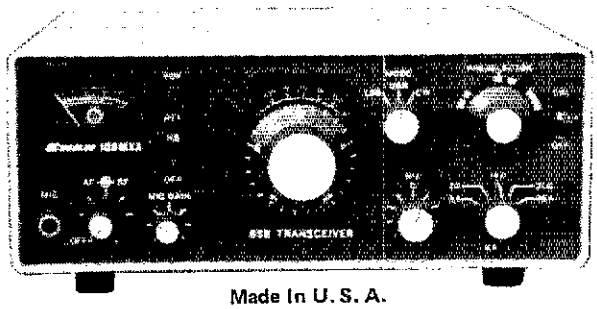

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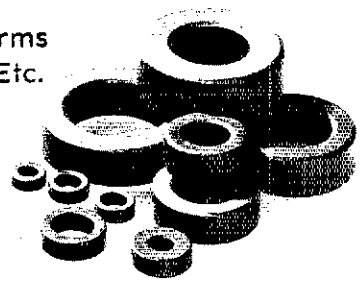

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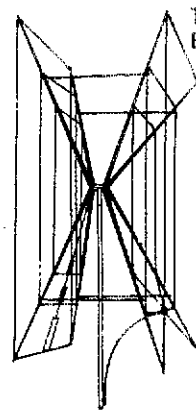

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We give you excellent service because CE distributes more scanners worldwide than *anyone* else. Our warehouse facilities are equipped to process thousands of scanner orders every week. We also export scanners to over 300 countries and military installations. Almost all items are **in stock** for **quick shipment,** so if you're a person who prefers fact to fantasy and who needs to know what's *really* happening around you, order your scanner today from **CE!**

NEW! Bearcat®† 350

The Ultimate Synthesized Scanner!

Allow 30-120 days for delivery after receipt of order due to the high demand for this product.

List price $599.95/**CE price $419.00**

7-Band, 50 Channel • Alpha-Numeric • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 30-50, 118-136 AM, 144-174, 421-512 MHz.

The new *Bearcat* 350 introduces an incredible breakthrough in synthesized scanning: Alpha-Numeric Display. Push a button—and the Vacuum Fluorescent Display switches from "numeric" to word descriptions of what's being monitored. 50 channels in 5 banks. Plus, Auto & Manual Search, Search Direction, Limit & Count. Direct Channel Access. Selective Scan Delay. Dual Scan Speeds. Automatic Lockout. Automatic Squelch. Non-Volatile Memory. Reserve your *Bearcat* 350 today!

Bearcat® 300

List price $549.95/**CE price $349.00**

7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.

The *Bearcat* 300 is the most advanced automatic scanning radio that has ever been offered to the public. The *Bearcat* 300 uses a bright green fluorescent digital display, so it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.

NEW! Bearcat® 350

Bearcat® 250

List price $429.95/**CE price $279.00**

6-Band, 50 Channel • Crystalless • Searches Stores • Recalls • Digital clock • AC/DC Priority Channel • Delay • Count Feature

Frequency range 32-50, 146-174, 420-512 MHz.

The *Bearcat* 250 performs any scanning function you could possibly want. With push button ease you can program up to 50 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear. A special search feature of the *Bearcat* 250 actually stores 64 frequencies and recalls them, one at a time. Overseas customers should order the *Bearcat* **250FB** at $379.00 each. This model has 220 V AC/12 V DC power supply and 66-88 MHz low band coverage.

NEW! Bearcat® 20/20

List price $449.95/**CE price $289.00**

7-Band, 40 Channel • Crystalless • Searches AM Aircraft and Public Service bands • AC/DC Priority Channel • Direct Channel Access • Delay

Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.

The *Bearcat* 20/20 automatic scanning radio replaces the *Bearcat* 220 and monitors 40 frequencies from 7 bands, including aircraft. A two-position switch, located on the front panel, allows monitoring of 20 channels at a time.

Bearcat® 210XL

List price $349.95/**CE price $229.00**

6-Band, 18 Channel • Crystalless • AC/DC

Frequency range: 32-50, 144-174, 421-512 MHz.

The *Bearcat* 210XL scanning radio is the second generation scanner that replaces the popular *Bearcat* 210 and 211. It has almost twice the scanning capacity of the *Bearcat* 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more!

Bearcat® 160

List price $299.95/**CE price $189.00**

5-Band, 16 Channel • AC only • Priority Dual Scan Speeds • Direct Channel Access

Frequency range: 32-50, 144-174, 440-512 MHz.

Would you believe...the *Bearcat* 160 is the least expensive *Bearcat* crystalless scanner.

This scanner presents a new dimension in scanning form and function. Look at the smooth keyboard. No buttons to punch. No knobs to turn. Instead, finger-tip pads provide control of *all* scanning operations, including On/Off, Volume and Squelch. Of course the *Bearcat* 160 incorporates other advanced *Bearcat* features such as Priority, Direct Channel Access, Dual Scan Speeds, Lockout, Scan Delay and more.

NEW! Bearcat® 100

The first no-crystal programmable handheld scanner.

Allow 60-150 days for delivery after receipt of order due to the high demand for this product.

List price $449.95/**CE price $299.00**

8-Band, 16 Channel • Liquid Crystal Display Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 138-174, 406-512 MHz.

The world's first no-crystal handheld scanner has compressed into a 3" x 7" x 1¼" case more scanning power than is found in many base or mobile scanners. The *Bearcat* 100 has a full 16 channels with frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the 2-Meter and 70 cm. Amateur bands, *plus* Military and Federal Government frequencies. It has chrome-plated keys for functions that are user controlled, such as lockout, manual and automatic scan. Even search is provided, both manual and automatic. Wow...what a scanner!

The *Bearcat* 100 produces audio power output of 300 milliwatts, is track-tuned and has selectivity of better than 50 dB down and sensitivity of 0.6 microvolts on VHF and 1.0 microvolts on UHF. Power consumption is kept extremely low by using a liquid crystal display and exclusive low power integrated circuits.

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. For earliest delivery from **CE**, reserve your *Bearcat* 100 today.

Bearcat® 5

List price $134.95/**CE price $94.00**

4-Band, 8 Crystal Channels • Lockout • AC only

Frequency range: 33-50, 146-174, 450-508 MHz.

The *Bearcat* 5 is a value-packed crystal scanner built for the scanning professional — at a price the first-time buyer can afford. Individual lockout switches. Order one crystal certificate for each channel.

Bearcat® Four-Six ThinScan™

List price $189.95/**CE price $124.00**

Frequency range: 33-47, 152-164, 450-508 MHz.

The incredible, *Bearcat* Four-Six Thin Scan™ is like having an information center in your pocket. This four band, 6 channel crystal controlled scanner has patented Track Tuning on UHF. Scan Delay and Channel Lockout. Measures 2⅜ x 6¼ x 1." Includes rubber ducky antenna. Order crystal certificate for each channel. Made in Japan.

TEST ANY SCANNER

Test any scanner purchased from **Communications Electronics™** for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in original condition with all parts in 31 days, for a prompt refund (less shipping/handling charges and rebate credits).

Fanon Slimline 6-HLU

List price $169.95/**CE price $109.00**

Low cost 6-channel, 4-band scanner!

The *Fanon* Slimline 6-HLU gives you six channels of crystal controlled excitement. Unique Automatic Peak Tuning Circuit adjusts the receiver front end for maximum sensitivity across the entire UHF band. Individual channel lockout switches. Frequency range 30-50, 146-175 and 450-512 MHz. Size 2¾ x6¼ x 1." Includes rubber ducky antenna. Order crystal certificates for each channel. Made in Japan.

Fanon Slimline 6-HL

List price $149.95/**CE price $99.00**

6-Channel performance at 4-channel cost!

Frequency range: 30-50, 146-175 MHz.

If you *don't* need the UHF band, get this model and save money. Same high performance and features as the model HLU without the UHF band. Order crystal certificates for each channel. Made in Japan.

OTHER SCANNERS & ACCESSORIES

***NEW!* Regency®‡ D810 Scanner**	$319.00
***NEW!* Regency® D300 Scanner**	$219.00
***NEW!* Regency® D100 Scanner**	$169.00
***NEW!* Regency® H604 Scanner**	$129.00
Regency® M400 Scanner.	$259.00
Regency® M100 Scanner.	$199.00
Regency® R1040 Scanner.	$149.00
SCMA-6 Fanon Mobile Adapter/Battery Charger	$49.00
CHB-6 Fanon AC Adapter/Battery Charger	$15.00
CAT-6 Fanon carrying case with belt clip	$15.00
AUC-3 Fanon auto lighter adapter/Battery Charger	$15.00
PSK-6 Base Power Supply/Bracket for SCMA-6	$20.00
SP50 *Bearcat* AC Adapter	$9.00
SP51 *Bearcat* Battery Charger	$9.00
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MA506 *Regency* carrying case for H604	$15.00
FB-E Frequency Directory for Eastern U.S.A.	$12.00
FB-W Frequency Directory for Western U.S.A.	$12.00
FFD Federal Frequency Directory for U.S.A.	$12.00
TSG "Top Secret" Registry of U.S. Government Freq.	$10.00
B-4 1.2 V AAA Ni-Cad batteries (set of four)	$9.00
A-135cc Crystal certificate	$3.00

Add $3.00 shipping for all *accessories* ordered at the same time.

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If you want the utmost in performance from your scanner, it is essential that you use an external antenna. We have six base and mobile antennas specifically designed for receiving all bands. Order **#A60** is a magnet mount mobile antenna. Order **#A61** is a gutter clip mobile antenna. Order **#A62** is a trunk-lip mobile antenna. Order **#A63** is a ¾ inch hole mount. Order **#A64** is a ⅜ inch snap-in mount, and **#A70** is an all band base station antenna. All antennas are $35.00 and $3.00 for UPS shipping in the continental United States.

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home a nice looking RF 1000 solid state kW amplifier for hf. K5GDP is a new resident of the Brazosport area. He was welcomed to the area by being invited to hand pour a base for a Rohn 45 tower in 95 degree weather along with several others. W4FZT owns the tower and is also new to Freeport. K5II has just become active on 2-meter fm. K5RVF reports that the Port Arthur ARC has installed a hf and 2-meter station at P.A. Red Cross headquarters. It is a pleasure to announce the appointment of WD5CVX as EC for Hardin County. KA$CSM is back home in Texas. WD5EXC has been a visitor to Lake Jackson lately. N5AF reports some interesting 6-meter activity. W5QJM continues to stir the fires for QRP activity in the state. I also received a note that said KC5EV writes a newsletter for a loosely knit group of QRPers in the Houston area. You can write him at PO Box 383, Spring, Texas 77373. Traffic: W5KLV 538, W5SHN 406, WB5YDD 403, W5SBE 193, K5HZR 174, W5CTZ 146, WA5RVT 98, KB5NX 89, N5TC 78, WB5MMI 66, N5DAA 53, N5FN 45, WB5EFJ 38, K5RG 33, K5ZC 31, KA5GYJ 29, KA5KRI 24, WD5AAH 22, W5BGE 16, KC5RP 16, N5CRU 13, WD5GKH 12, AK5M 11, KA$CSM 10, WD5DQR 9, KB5KZ 2, K5RVF 2.

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permited in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

CQ and QST 1950-1978 also 73 and Ham Radio issues for sale. Two dollar minimum order. Cost 50 cents each 1976 and later issues all other 30 cents each including USA shipping. Send s.a.s.e., chronological order and payment to W6LS, 2814 Empire Ave., Burbank, CA 91504. Available issues and refund sent within one month.

YAESU OWNERS — join the ten-year old international Fox-Tango Club. Receive valuable newsletter monthly, catalogue of modifications, free advertisements, technical consultation, FT Net, more. Annual dues now $8 per year US, $9 Canada, $12 overseas airmail. Send to N4ML, Box 15944, West Palm Beach, FL 33406.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a nonprofit organization of communications people founded in 1925, invites your inquiries and application for membership. Write V.W.O.A., 118 River Drive — Bay Ridge, Annapolis, MD 21403.

MUSEUM for radio historians and collectors now open. Free admission. Old time amateur (W2AN) and commercial station exhibits, 1925 store and telegraph displays, 15,000 items. Write for details. Antique Wireless Assn., Holcomb, NY 14469.

"PERFORATOR," quarterly journal of the non-profit, social, research, and information society "Worldwide Keyboard Operators." Send $1 for sample copy and membership application. All operators of cable, wireless, IBM Radiotype, and Radioteletype are welcome. Arnold J. Madiol, WD8JIV, Box 555, Grand Haven, MI 49417.

THE NORTHWEST Ohio Amateur Radio Club will hold its annual hamfest on Sunday October 11, 1981 at the Allen County Fairgrounds in Lima, Ohio. Doors open 6:00 A.M. Tickets $2. advance, $2.50 at the door. Camping available at the fairgrounds. Talk in on 52/52, 07/67, and 34/94. To reserve table space or for more information write N.O.A.R.C. P. O. Box 211, Lima, Ohio 45802 or call 419-645-5381.

NEW JERSEY Computer Fleamarket, Oct. 24th and 25th. Holiday Inn/North, Exit 14 NJ Turnpike. Sellers $5, Buyers $3. W2TGH, 201-297-2526.

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TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill NY 12198.

DELUXE QSLs, Samples 25c. Petty, W2HAZ, P. O. Box 5237, Trenton NJ 08638.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: will give quote. Little Print Shop, Box 9848, Austin TX 78766.

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QSLs, Catalog 45c N&S Print, 2523 West Orangewood Avenue, Phoenix AZ 85061.

QSLs with class! Unbeatable quality, reasonable price. Samples, 50c refundable. QSLs Unlimited, P. O. Box 27553, Atlanta, Georgia 30327

QSLs Second to none. Same day service. Samples 50 cents. Include your call for free decal. Ray, K7HLR, Box 331, Clearfield, UT 84015.

QSL cards — Eyeball cards — Rubber stamps — Name tags — Emblems — gift items — free catalog — Rusprint, Box 7575, Kansas City, MO 64116.

BE SURPRISED — Get a variety of cards — 100 for $7 or 200 for $11. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

QSLs by W7HUL. Samples 50c. 8511 19th Ave. N.W., Seattle, WA 98117.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

CLUB Call pins: 3 lines, 1-1/4, $1.55 each. Call, first name and club, colors: blue black or red with white letters. Catalog — Arnold Linzner 2041 Linden St., Ridgewood NY 11385.

WOODGRAINED QSLs. Beautifully printed. You have to see them. Write for free samples. Ham Graphics, Box 244Q, Camden, NY 13316.

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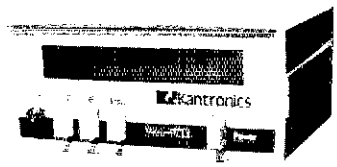

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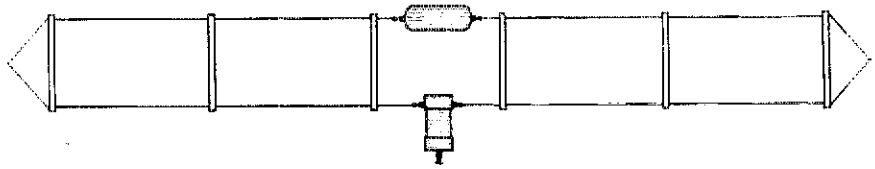

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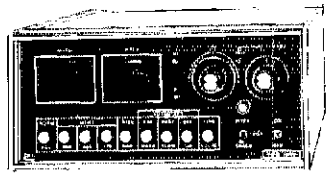

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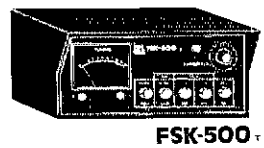

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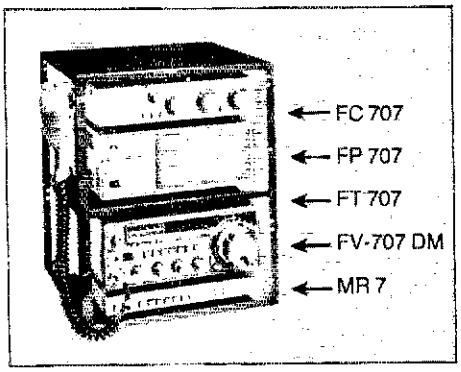

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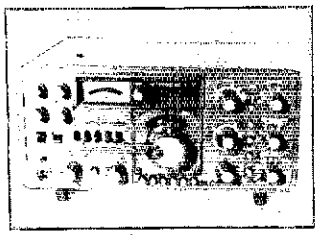

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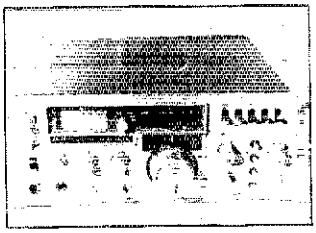

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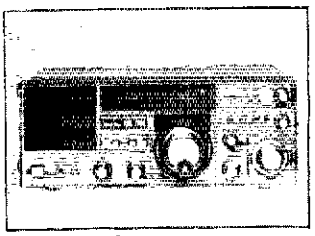

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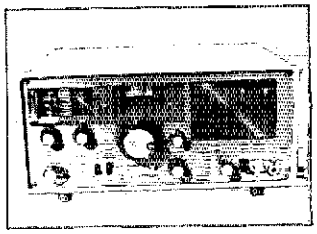

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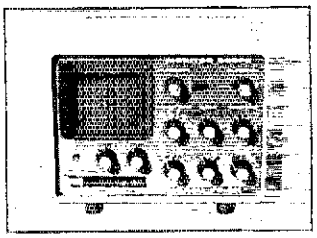
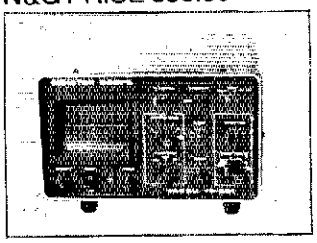
LIST 300.00
N&G PRICE 270.00



YO 101 SCOPE
LIST 320.00
N&G PRICE 220.00



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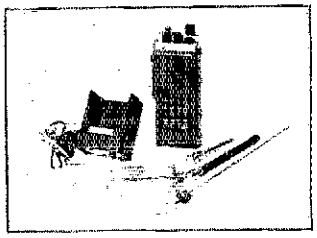
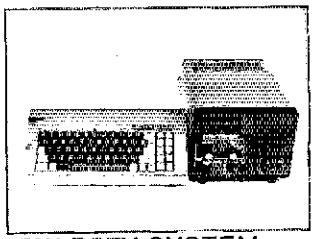
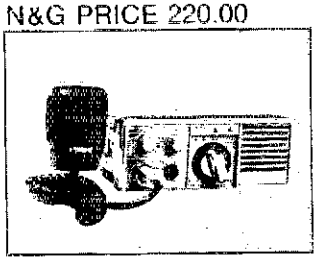
N&G PRICE 220.00



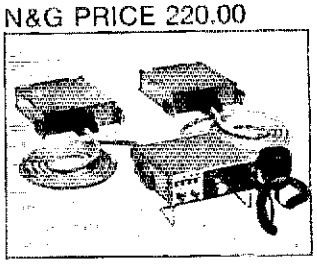
FT 207 HANDIE
LIST 339.00
N&G PRICE 250.00



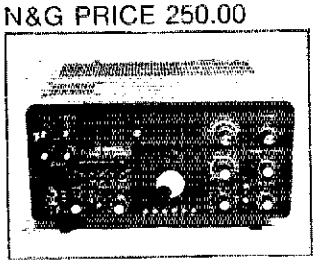
CW-RTTY SYSTEM
YK-901 LIST 175.00
YR-901 LIST 730.00



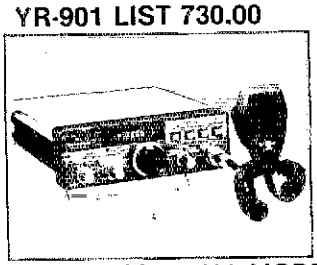
FT 127 220 MHz
LIST 350.00
N&G PRICE 265.00



FT-720 RVH
LIST 429.00



FT-101 ZD-III
LIST 925.00



FT 480 2-Meter ALL MODE
LIST 529.00

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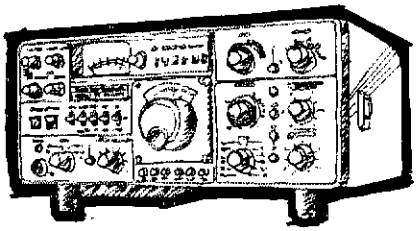
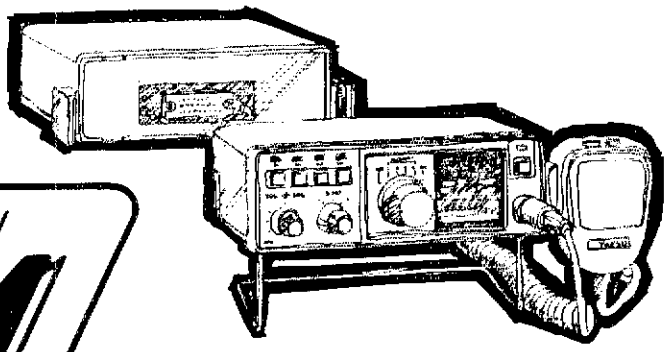
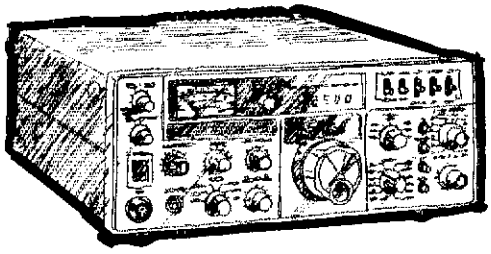


FT-902DM

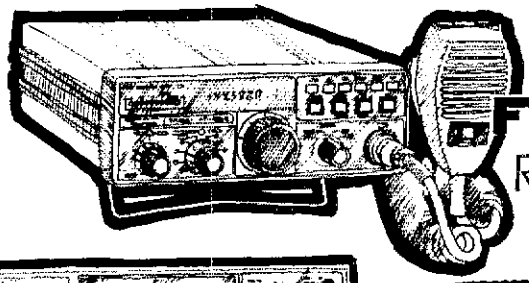


FT-680R 50MHz
FT-480R 144MHz
FT-780R 430MHz

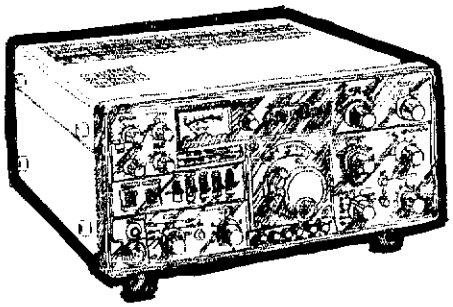
YAESU



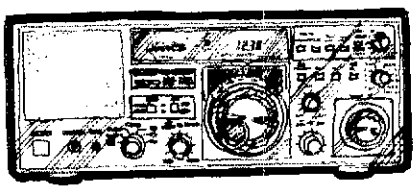
FT-107M



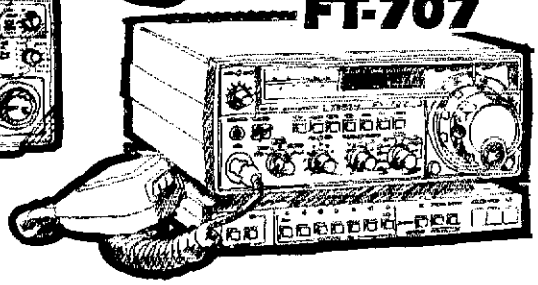
FT-720
RVH/RU



FT-101ZD MARK III



FRG-7700
Shortwave Receiver



FT-707

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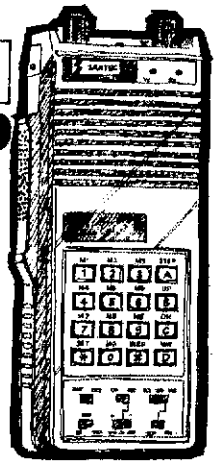
SANTEC
HT-1200



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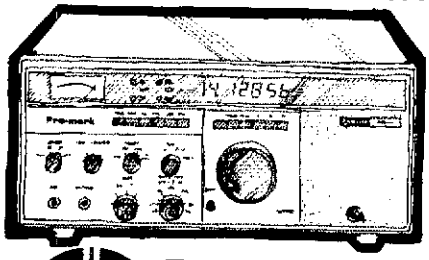

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KWM-380

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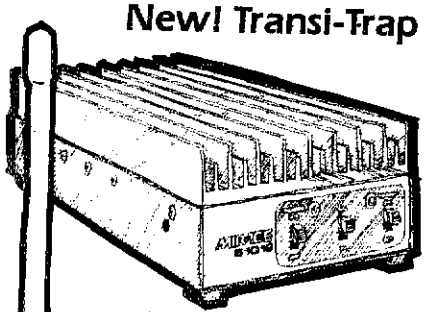
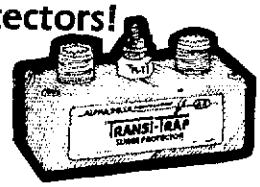
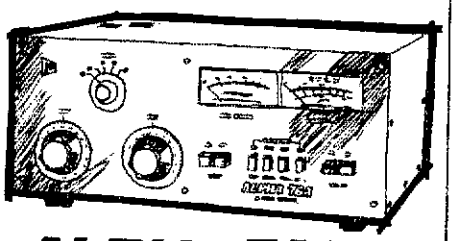
New! Transi-Trap Surge Protectors!

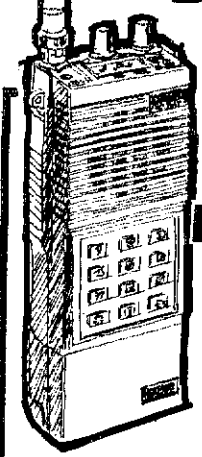




MIRAGE
B1016



ALPHA 76A



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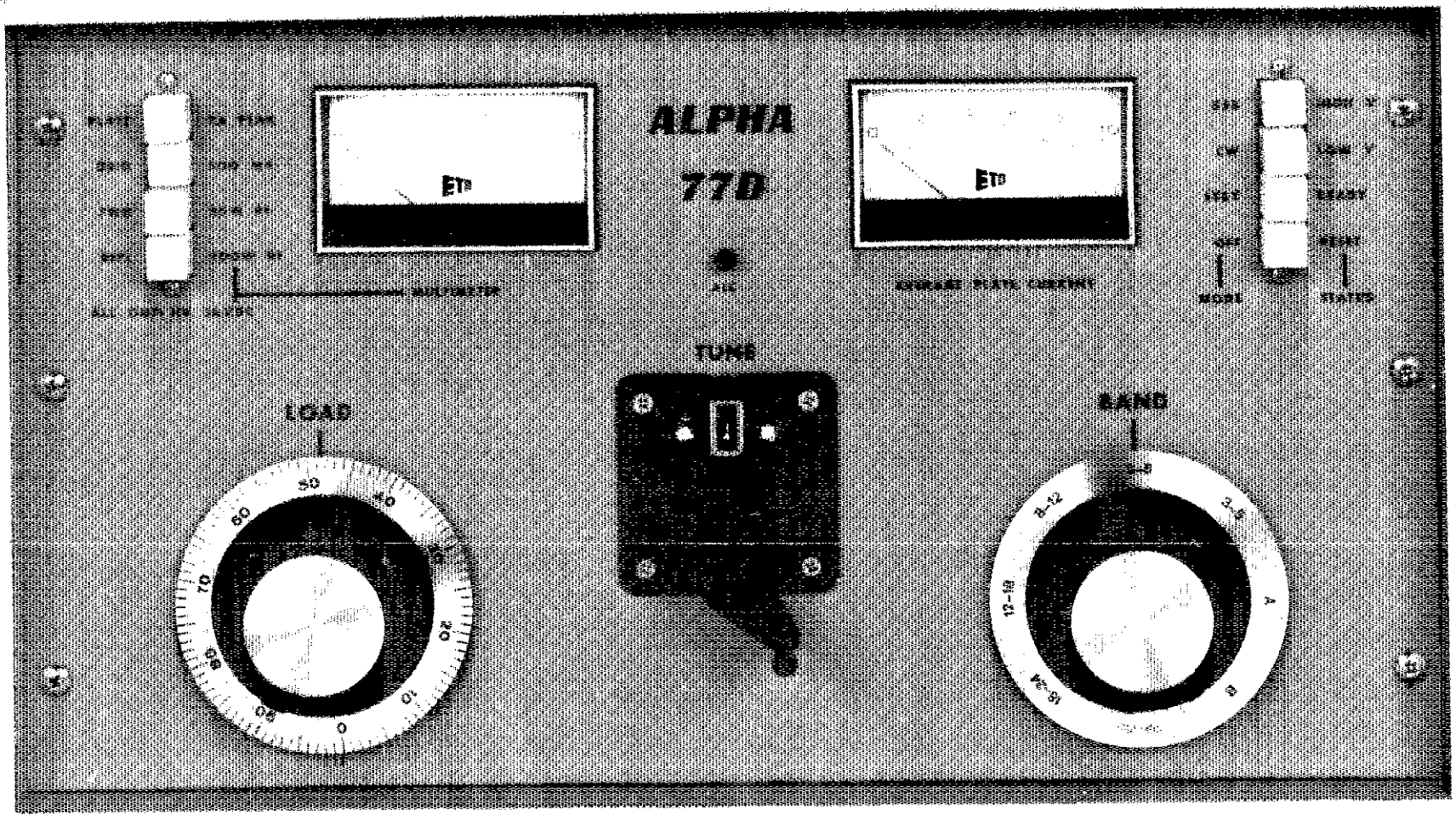

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HW-101 (Owners). Send for your copy of thirteen modifications that can improve your transceiver's overall performance, on both transmit and receive. Send $2 to HW-101-Mods, 6817 Gettysburg Dr., Hudsonville, MI 49426.

KENWOOD TS-120S never used except to check out. Mobile Bracket, MC-35S Microphone, Dentron Jr. Monitor. $630. Will Ship. After 8 P.M., KA2JKF 914-636-4178.

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FAX: WANTED, RJ-4 weather recorder in any condition or parts. N1VC, Vince, 12 Charles St., Plantsville, CT 06479 203-621-5954.

SWAN HF-700S, PSU-3A power supply, extras — $525. Paul, 919-867-5415. KB8VM.

SELL or trade: Solar panel rated at 18 V, 1-5 amps full load, Diode protected commercial panel. Want all-mode 2-meter or synthesized handheld. KO5A, 318-984-7509.

ARGONAUT 509, $235. Terry, KA6IYE, 707-445-9554.

AZDEN OCS-3000 TT Kits asembled and mounted in your mike send $25 to Marty Shapiro, 1138 Boxwood, Jenkintown, PA 19046.

TWO GOOD 7094 tubes needed for free. W7INP.

WANTED: Collins S-line, KWM2A, 30L1, 30S1. W9QYH, 1605 Ridge Rd., Green Bay, WI 54304.

HEATHKIT HR-1680 factory aligned rcvr less tha 20 hrs use good condition $145. Heathkit electronic keyer good condition less than 5 hrs use $45. Call Gary Whidby collect 803-242-3252 before 4:30 P.M. EST. If out, leave a message.

WANTED: Mint Davco DR-30. Jack Shiels, W3OKP, 3212 Chestnut Street, Murrysville, PA 15668, 412-327-3356.

FOR SALE: Kenwood TS-520 SE, brand new, $495., DG-5 Kenwood digital display, brand new, $145. Autek QF-1A audio filter, unused, $45. Antenna noise bridge, brand new, $25. MFJ speech processor, brand new, $35. All plus shipping. Plane, 42 Pennsylvania Ave., Niantic, CT 06357.

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SELL: TS520S. Has 500Hz cw, 2.1 MHz ssb filters. 520S VFO, SP520 spkr, MC-50 Mic. Strictly mint. $650. W4ZWZ, 415 Columbia Ave. NE, Knoxville, TX 37917. 615-546-8312 any time.

WANTED Broken HW-7s WB6OLL.

MICROWAVE TV-Super performing amateur downconverter kit special $55. + $1.50 shipping. Complete kit systems from $144.95 to $194.95. Free catalog. Lab-Tronics, P. O. Box 171HA, Rogers, MN 55374.

ANTIQUE spy radio set. Good condition. RR-6A receiver, RT-6 transmitter. Power supply and converter. Best offer. John Pankow, Box 86, Chiefland FL 32626.

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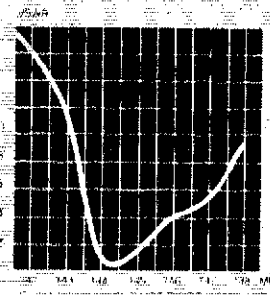


Boomer

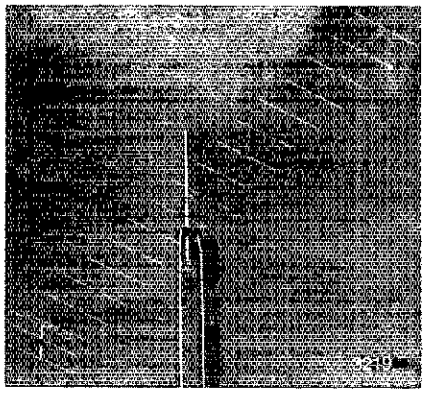
6 and 2 meter High Performance Yagis

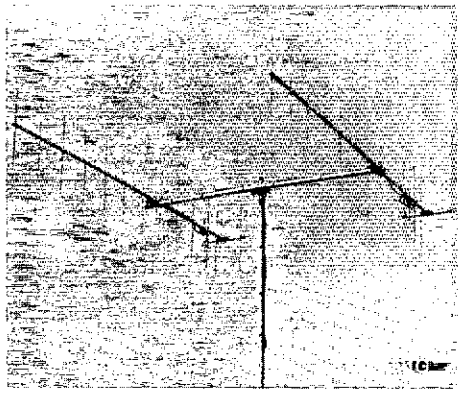
Two Meter Boomers

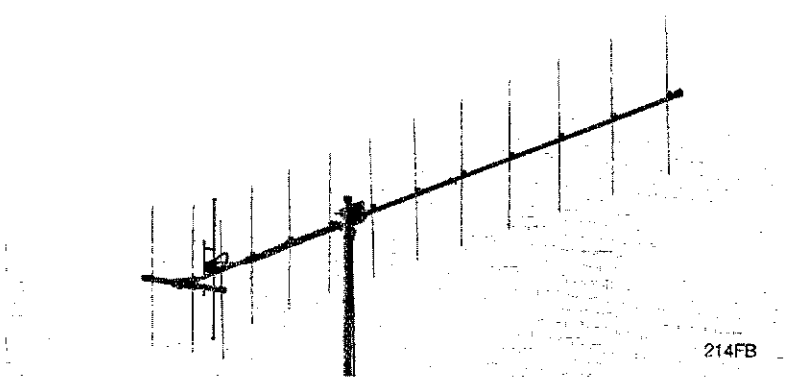
Whether you have the space for the 3.2 λ 32-19 or the compact 2.2 λ models, two meter Boomers are your best choice. They offer the maximum gain available for their boom length (See NBS no. 688). They feature trigon reflectors for additional front-to-back ratio and clearer patterns. All stainless steel hardware and heavy gauge heat treated aluminum are used throughout. Whatever your choice of two meter amateur activity, the Boomer will fill your needs. For FM use the 228FB or 214FB. For CW/SSB on the low end use 32-19 or 214B, in EME, DX or just reliable QSOs Boomer will perform for you.

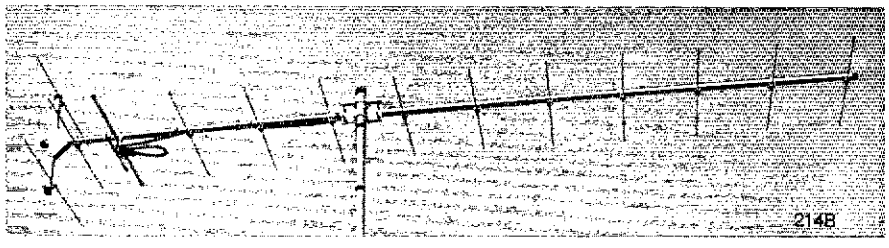
Six Meter Boomer

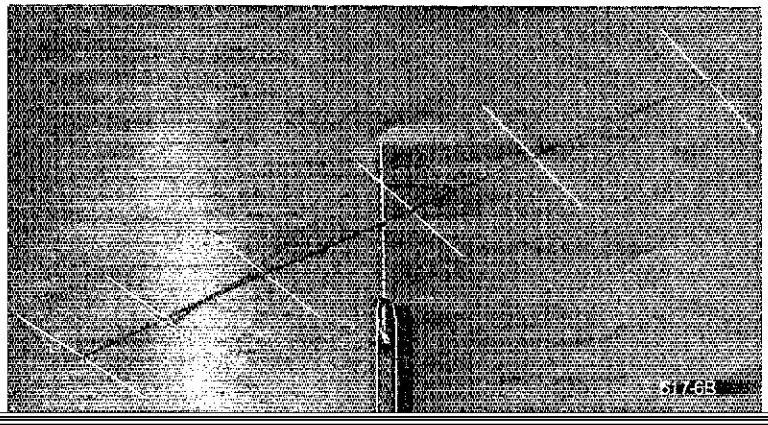
The new six meter Boomer offers more boom and more gain from its new element spacing. The six meter Boomer has Cushcraft's typical attention to detail, including T match feed with balun, and extra heavy duty mechanical construction. The key to this Boomer's super performance and relatively lightweight is special element spacing and boom length.











Specifications

Model No.	32-19	214B	214FB	228FB	617-6B
Frequency range (MHz)	144-146	144-146	144.5-148	144.5-148	50.0-51
Forward gain (dBd)					
Front to back ratio(dB)					
E-plane B/width (deg)	2x14	2x17	2x17	2x17	2x19
H-plane B/width (deg)	2x17	2x18	2x18	2x9	NA
Side lobe attenuation (dB)	>80	>60	>60	>60	>60
SWR less than (typ)	1.2:1	1.2:1	1.2:1	1.2:1	1.2:1
Impedance (ohm)	50	50	50	50	50
Recommended stacking distance E-plane (ft) / (m)	14 / 4.27	10 / 3.05	10 / 3.05	10 / 3.05	NA / NA
H-plane (ft) / (m)	12 / 3.66	10 / 3.05	10 / 3.05	10 / 3.05	22.5 / 6.86
Weight (lbs) / (kg)	12 / 5.44	8 / 3.63	8 / 3.63	22 / 9.98	26 / 11.79
Length (ft) / (m)	22 / 6.71	15 / 4.57	15 / 4.57	15 / 4.57	34 / 10.36
Longest element (in) / (cm)	40¾ / 102.5	40¾ / 102	39¾ / 100.3	39¾ / 100.3	113¾ / 289
Turning radius (ft) / (m)	11 / 3.35	7.5 / 2.29	7.5 / 2.29	9.5 / 2.90	17.7 / 5.39
Windload(sq ft) / (sq m)	3.5 / 33	1.7 / 16	1.7 / 16	4.0 / 37	4.8 / 45

Stacking Kits

For stacking two Boomers, use the following coax harness and power divider kits.

32-19 = 32-SK 214B = 22-SK 617-6B = 617-SK

When stacking four Boomers, use the following complete stacking kits. They include H frame, harness, hardware and complete instructions.

32-19 = 324-QK 214B = 224-QK

Specifications, Stacked Boomers

Antenna	2x214-B	2x32-19	2x617-6B	4x214-B	4x32-19
Forward gain (dBd)					
Front to back ratio(dB)					
E/H plane beamwidth (deg) E-plane	34°	28°	35°	17°	12°
H-plane	19°	17°	20°	19°	15°
Stacking dist Vert (ft) / (m)	10 / 3.05	12 / 3.66	34 / 10.36	10 / 3.05	12 / 3.66
Horiz. (ft) / (m)	--- / ---	--- / ---	--- / ---	10 / 3.05	14 / 4.33

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MOBILE 516E-1 and 351D-2 for KWM-2. Best Offer, W2UN 716-394-1815.

SWAN 350C xcvr with ps & spkr. Vry gd cond. $280. Paul, WA8PJK, 1146 East 76th, Cleveland, OH 44103. 216-391-0241. UPS free.

TWO PAGE list of ham & electronic items to sell or trade. Transceivers to transistors. S.a.s.e. appreciated. N4EDX, Box 9684, Birmingham, AL 35215.

NEW CODE cassettes — new beginners code course with two 90-minute cassettes. Order #F1 at $10.95. Many new practice cassettes. Write for new catalog. Order popular QSO tapes similar to FCC exam. #C7 — 25 QSOs at 15 wpm or #C8 — 25 QSOs at 22.5 wpm. All practice cassettes $5.95 each ppd. Computer generated code. 90-minute, high-quality cassettes. MC and Visa welcome. Fast Service! K5SMG, John C. Tarvin, 14480 Shadowlane Ct., Morgan Hill, CA 95037. 408-683-0287.

ELECTROSPACE Systems HP-2 Matching Unit for 160M wanted. Will pay any reasonable price including shipping. W7LJI.

FOR SALE: Henry 2K4 linear. Has less than 30 hours use. One of the last built to include 10 meters. Excellent condition. Price $1000. Firm FOB Emporia Kansas. WDØFDD, 2401 Graphic Arts, Emporia, KS 66801 316-342-1481 days.

HEATHKIT HX1681 HR1680 PS23B excellent cw station $300. HL9RC PSC Box 4336 APO SF CA 96366.

50 QSTs 1930-45 $90. All 1946-67 $85. U-ship. W7AM 503-595-6515.

MINT GALAXY GT-550A station with fan, vox, matching remote VFO, phone patch, cw filter, cables, mike, manuals in original cartons, but prefer you test and pick up. Worked 263 DXCC stations barefoot. $485. W6LOI, 1141 Markham Way, Sacramento, CA 95818. Phone 916-442-8377.

SELL Ten-Tec Argonaut with power supply $200. WD4CIJ 1866 Flintlock Circle, Lansdale PA 19446.

ARTIST: Novice will trade oil painting seascape for station setup of equal value from $500 to $2000. Will send color slides for prior approval. Corriero, KA2MQS, 129 John Street, Ilion, NY 13357.

TEN-TEC TRITON IV for sale. $500. Call Ed AD2X, 301-922-1221.

HEATH HW101, HP23B, SA2040, SM4100, SB634, SB201, HS1661, HD1410. Everything excellent. $800. WD4CQO, 912-244-3185.

HEATH HW-101, cw filter, ac ps, homebrew DC ps, noise blanker, $325/offer, excellent condition w/manuals. Dave Wells, KD6TC, P. O. Box 27373, Oakland, CA 94602.

COLLINS Mechanical filter F455N40 $80. or offer John Maxim Kielbasa 3941 West 66th Place Chicago, IL 60629 K9VQC 312-767-8734.

MOTRAC 450 MHz 2 freq. PL, head, cables, microphone, $295. Carlos, KA9JYO, 219-464-9207.

WANTED: FT243 crystals for 160, 40. Audio choke, Deluxe Vibroplex. W6RNC Box 478, Nevada City, CA 95959

HALLICRAFTERS SX-146 receiver, HT-46 transmitter, D-104 mike, 1-kW TR switch. Like new: $500. or trade for general coverage receiver. Bob Saltzman 505-758-2967.

COLLINS 75S1 with Tubesters $325, 32S1 $275, 516F2 $160. All excellent. Heathkit SB634 $140, SB614 $150, HR1680 $190, SB303 $290, SB650 $130, HM-15 $25. All mint SB220 kit original sealed cartons $490. W4VMM, P.O. Box 1445, Ormond Beach, FL 32074. 904-672-3565.

HEATH SB-102 (filters, p.s., spkr) $385 Atlas 210-X (n.b., mobile mnt.) $450 I'll ship. WB9DVV, 221 Timber Ridge, Barrington, IL 60010 312-382-2162.

CENTURY-21 $190, TR-7400 $180, SX101A $75. KD2I, 94 Unger, Stanhope NJ 07874.

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KENWOOD TS-520S with cw filter $525 DG-5 digital display $100 all excellent condition. Gary Ferdinand W2CS, Sunset Trail, Clinton Corners, NY 12514. 914-266-5398.

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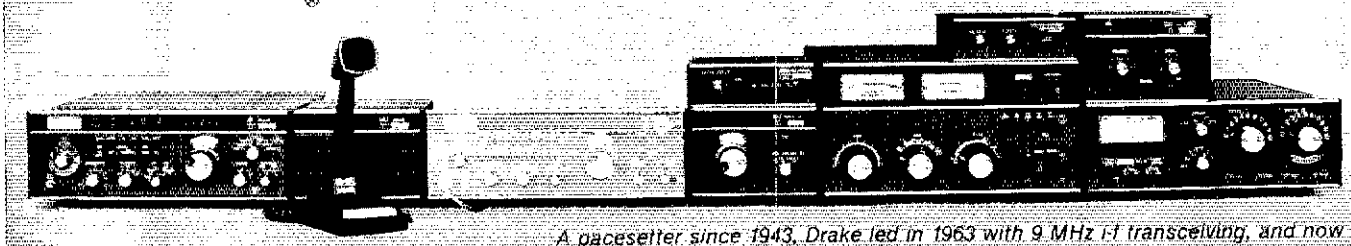

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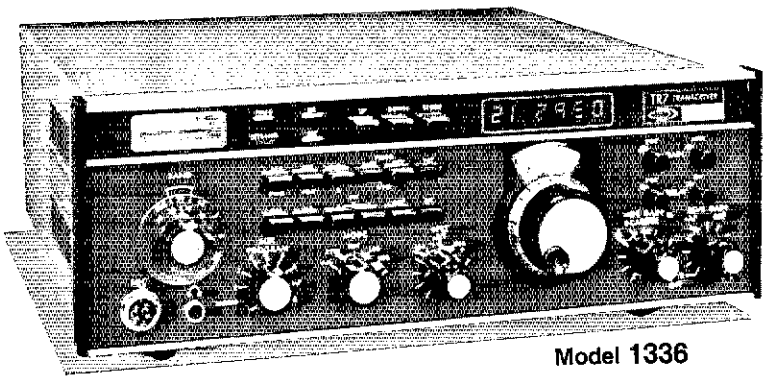

Model 1336

TR7

solid state continuous coverage synthesized hf system

Continuous Frequency Coverage—The TR7 provides continuous coverage in receive from 1.5 to 30 MHz. Transmit coverage is provided for all amateur bands from 160 through 10 meters. The optional AUX7 Range Program Board allows out-of-band transmit coverage for MARS, Embassy, Government and Commercial services as well as future band expansions in the 1.8 through 30 MHz range.* The AUX7 Board also provides 0 through 1.5 MHz receive coverage and crystal-controlled fixed-channel operation for Government, Amateur or Commercial applications anywhere in the 1.8 to 30 MHz range.

Synthesized/PTO Frequency Control—A Drake exclusive: carefully engineered high-performance synthesizer, combined with the famous Drake PTO, provides smooth, linear tuning with 1 kHz dial and 100 Hz digital readout resolution. 500 kHz up/down range switching is pushbutton controlled.

Advanced, High-Performance Receiver Design—The receiver section of the Drake TR7 is an advanced, up-conversion design. The first intermediate frequency of 48.05 MHz places the image frequency well outside the receiver input passband, and provides for true general coverage operation without i-f gaps or crossovers. In addition, the receiver section features a high-level double balanced mixer in the front end for superior spurious and dynamic range performance.

True Passband Tuning—The TR7 employs the famous Drake full passband tuning instead of the limited range "i-f shift" found in some other units. The Drake system allows the receiver passband to be varied from the top edge of one sideband, through center, to the bottom edge of the opposite sideband. In fact, the range is even wider to accommodate RTTY. This system greatly improves receiving performance in heavy QRM by allowing the operator to move interfering signals out of the passband, and it is so flexible that you can even transmit on one sideband and listen on the other.

Unique Independent Receiver Selectivity—Space is provided in the TR7 for up to 3 optional crystal filters. These filters are selected, along with the standard 2.3 kHz filter, by front panel pushbutton control, independent of the mode control. This permits the receive response to be optimized for various operating conditions in any operational situation. Optional filter bandwidths include 6 kHz for a-m, 1.8 kHz for narrow ssb or RTTY, and 500 Hz and 300 Hz for cw.

Broadband, Solid State Design—100% solid state throughout. All circuits are broadbanded, eliminating the need for tuning adjustments of any kind. Merely select the correct band, dial up the desired frequency, and you're ready to operate.

Rugged, Solid State Power Amplifier—The power amplifier is internally mounted, with nothing outboard subject to physical damage. A Drake designed custom heat sink makes this possible. The unique air ducting design of this heat sink allows an optional rear-mounted fan, the FA7, to provide continuous, full power transmit on SSTV/RTTY. The fan is not required for ssb/cw operation, since normal convection cooling allows continuous transmit in these modes.

Effective Noise Blanker—The optional NB7 Noise Blanker plugs into the TR7 to provide true impulse-type noise blanking performance. This unit is carefully designed to maximize both blanking and dynamic range in order to preserve the excellent strong-signal handling characteristics of the TR7.

* NOTE: Transmitter coverage for MARS, Government, and future WARC bands is available only in ranges authorized by the FCC, Military, or other government agency for a specific service. Proof of license for that service must be submitted to the R. L. Drake Company, including the 500 kHz range to be covered. Upon approval, and at the discretion of the R. L. Drake Company, a special range IC will be supplied for use with the Aux7 Range Program Board. Prices quoted from the factory. See Operator's Manual for details. (Not available for services requiring type acceptance.)

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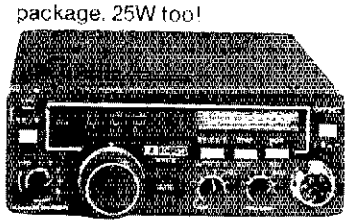

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Measures 2 (H)x5½ (W)x7"(D). Dual VFO's with band scan and memory scan with automatic resume after preset delay or carrier drop. Encoding microphone also included. 5 memories with priority channel. Tuning rates 5KHz (A VFO) or 15KHz (B VFO).

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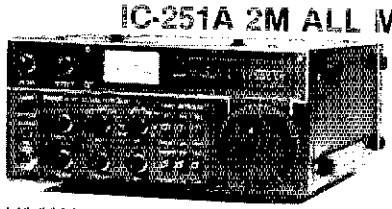

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143.8000 - 148.1999 MHz, 10W,SSB,FM,CW. Dual VFO's with 3 memories. Dual all mode scanning system. AC supply self-contained.

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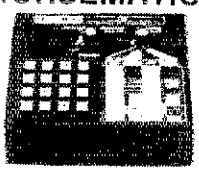

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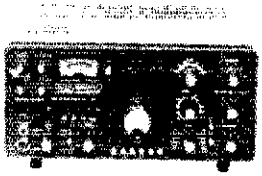

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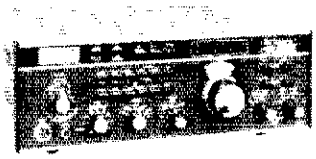

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PARTS, meters, socket punches, variables, precision resistors, wire wound pots, List s.a.s.e. Kirchhuber, 31 Sulphur Creek, Elkmont, AL 35620

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KENWOOD PS-8 power supply, new, $85. W5KFX, 6527 Kenwood, Dallas, TX 75214. 214-826-7693.

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HEATHKIT HW-101 with HP-23B power supply and cw filter, $350. WD6EMD, Scott 209-268-8827.

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COLLINS 32S-1, 75S-1, a/c-supply, console, cables, manuals. Excellent operating condition, one owner. $650.00, 213-541-2200. WA6MSO.

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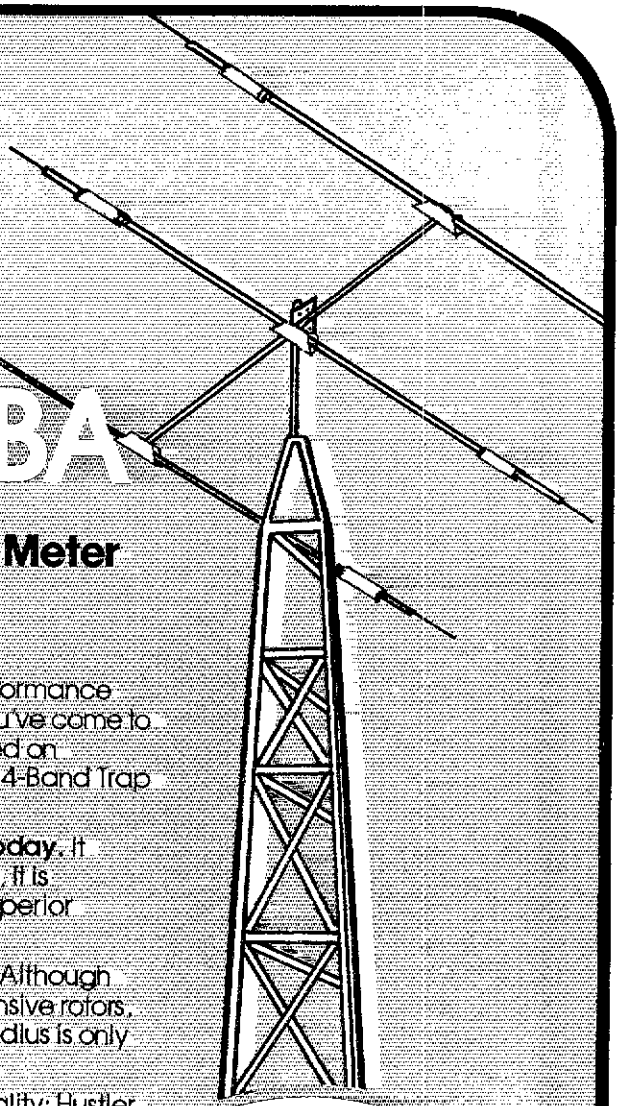

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This exciting new tribander sets the pace for dependable performance with its two in one trap design — and the solid construction you've come to expect from Hustler. In fact, its durable design is partially based on concepts used in the time-tested and world-renowned Hustler 4-Band Trap Vertical.

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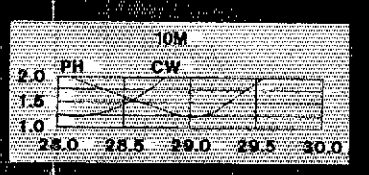
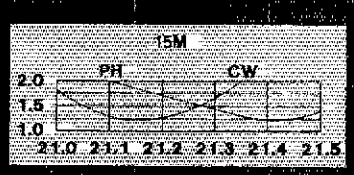
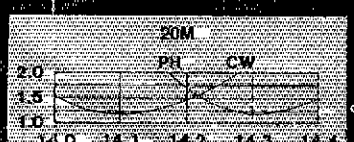
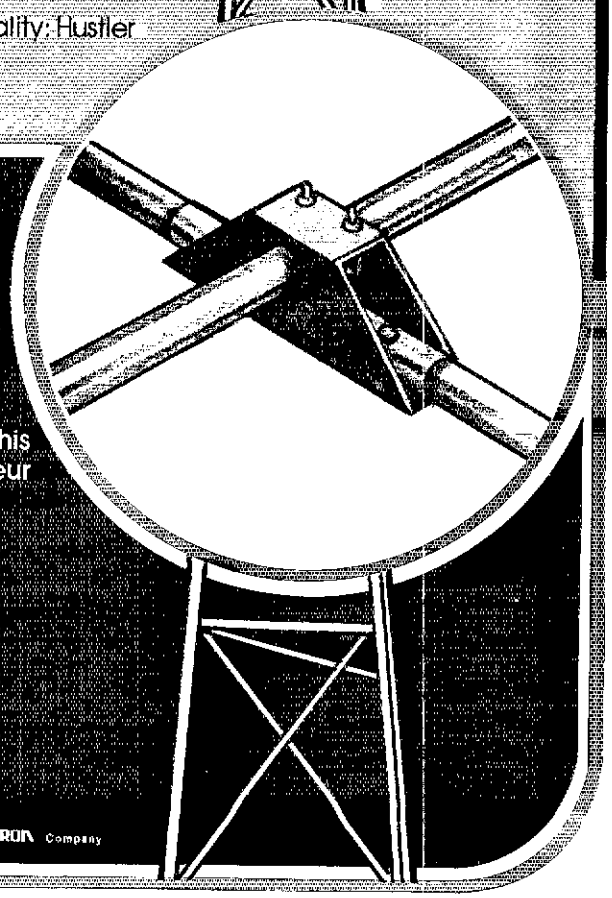
All in all, you can't surpass the Hustler 3-TBA for top triband quality. Hustler — still the standard of performance.









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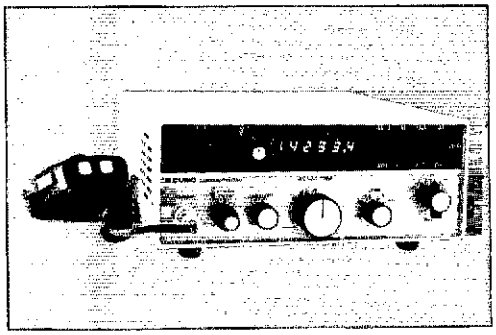

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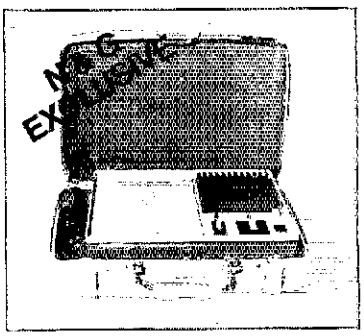

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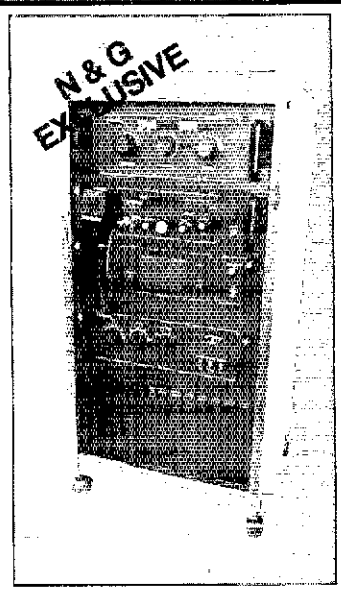

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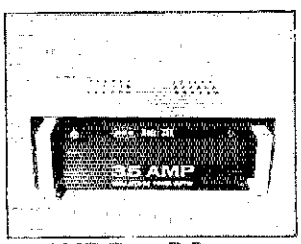

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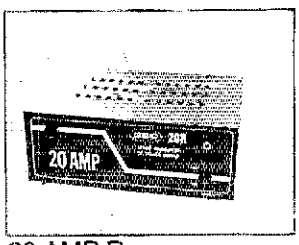

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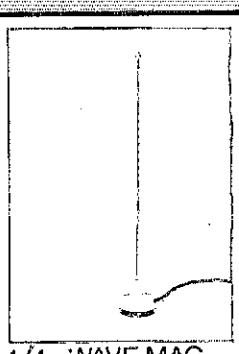

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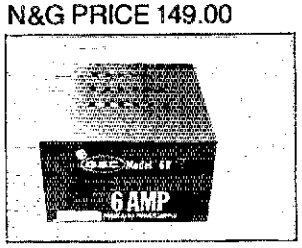

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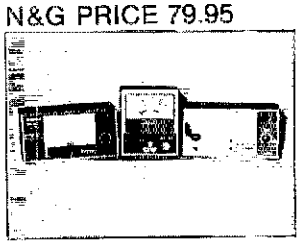

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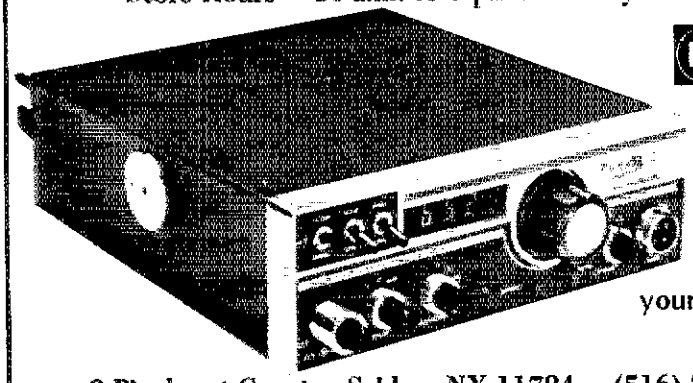

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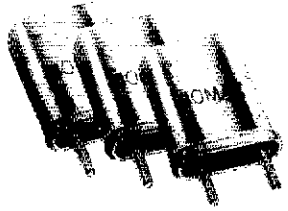

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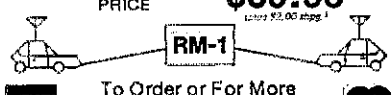

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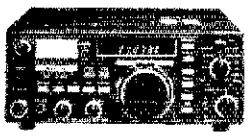

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See you next month!

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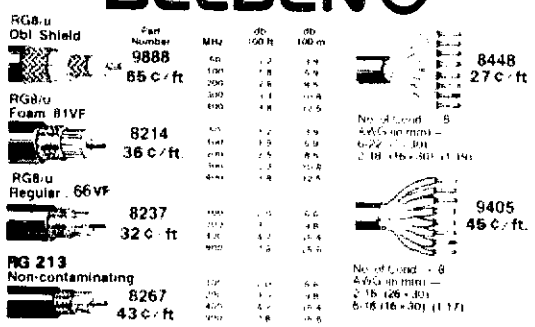

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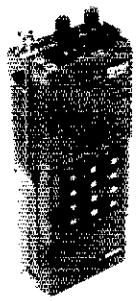

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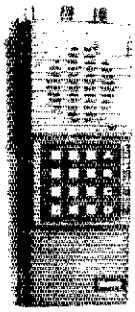

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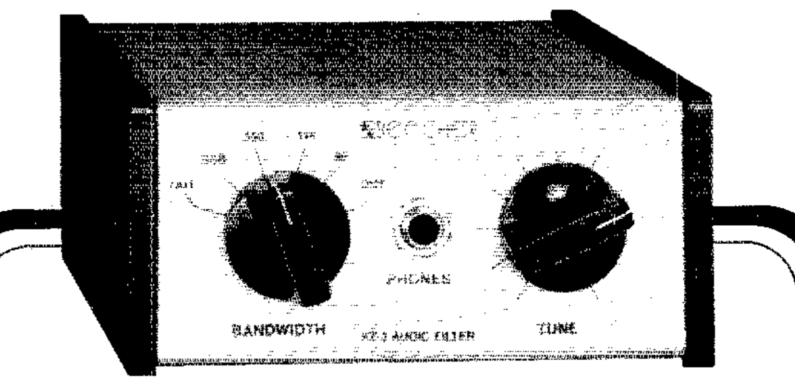

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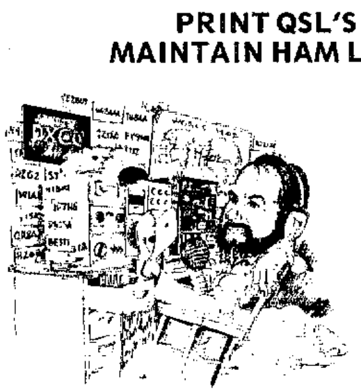

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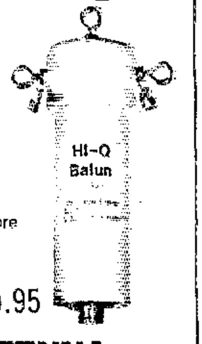

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- 1:1 impedance ratio
- For full legal power and more
- Helps eliminate TVI
- With SO 239 connector

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Replaces center insulator
Handles full legal power and more
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May be used for
- Guy wire strain insulators
- End or center insulators for antennas
- Construction of antenna loading coils or multiband traps

Patent No 4,091,350

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DIPOLES

MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
Dipoles				
D-80	80/75	130	$[illegible]	$24.95
D-40	40/15	66	[illegible]	[illegible]
D-20	20	33	24.95	[illegible]
D-15	15	22	[illegible]	19.95
D-10	10	16	22.95	18.95
Shortened dipoles				
SD-80	80/75	90	31.95	27.95
SD-40	40	45	28.95	24.95
Parallel dipoles				
PD-8010	80/40/20/10/15	130	39.95	[illegible]
PD-4010	40/20/10/15	66	[illegible]	29.95
PD-8040	80/40/15	130	[illegible]	31.95
PD-4020	40/20/15	[illegible]	[illegible]	[illegible]
Dipole shorteners - only, same as included in SD models				
S-80	80/75		$11.95 pr	
S-40	40		$10.95 pr	

All antennas are complete with a Hi-Q Balun or Hi-Q Antenna Center Insulator, No. 14 antenna wire, ceramic insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V and may also be used by MARS or SWLs.

Antenna accessories – available with antenna orders

Nylon guy rope, 450# test, 100 feet	$4.49
Ceramic (dogbone type) antenna insulators	[illegible] pr
SO-239 coax connectors	[illegible]

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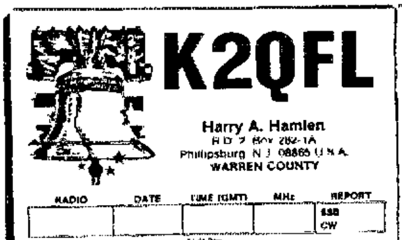

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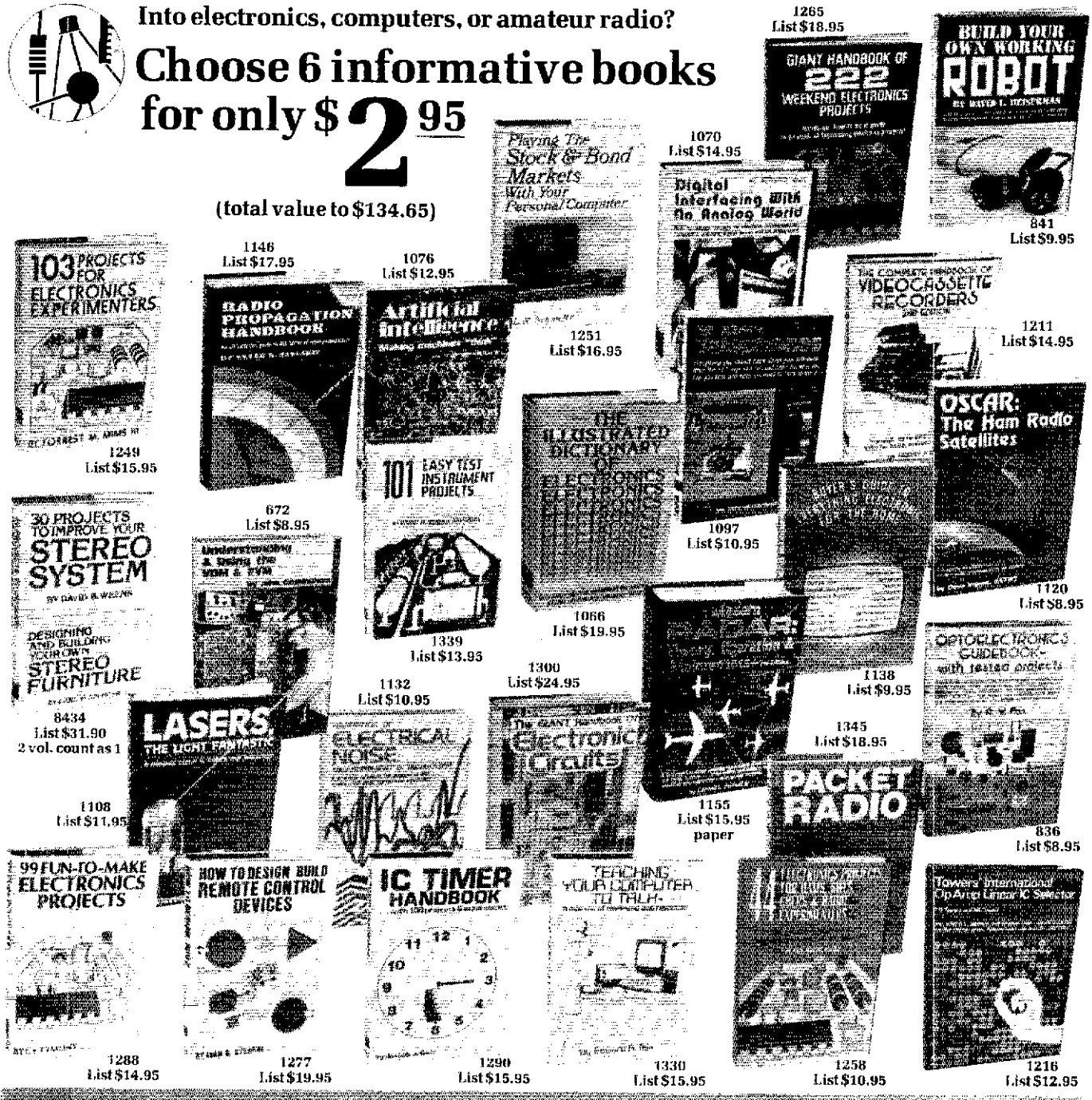

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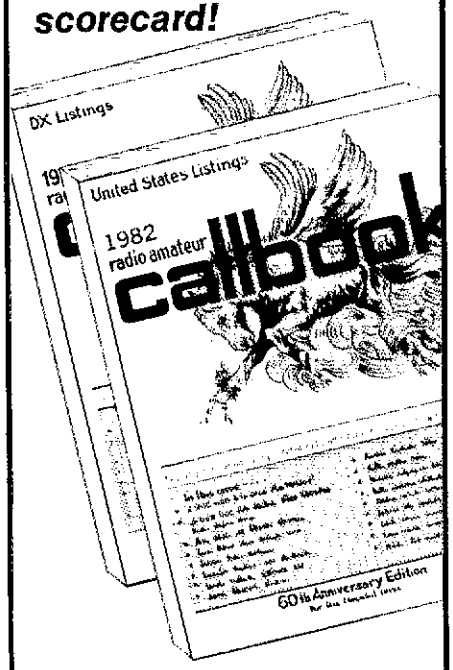

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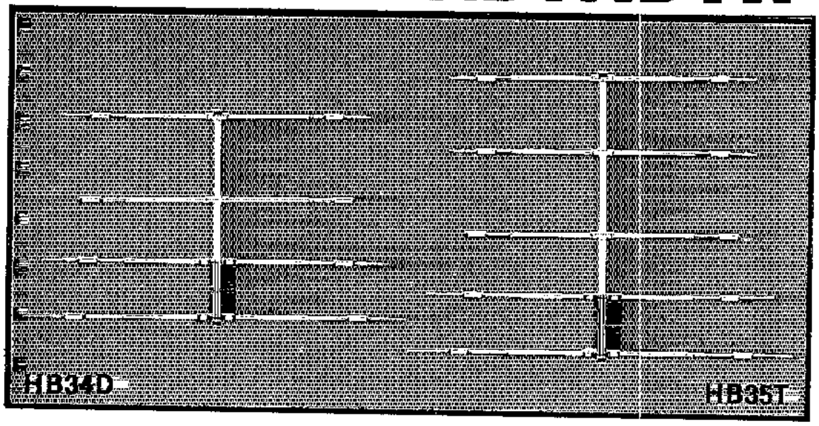

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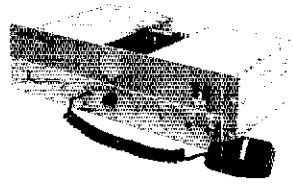

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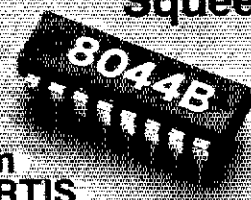

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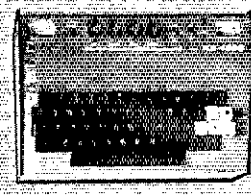

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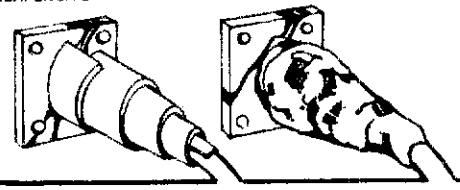

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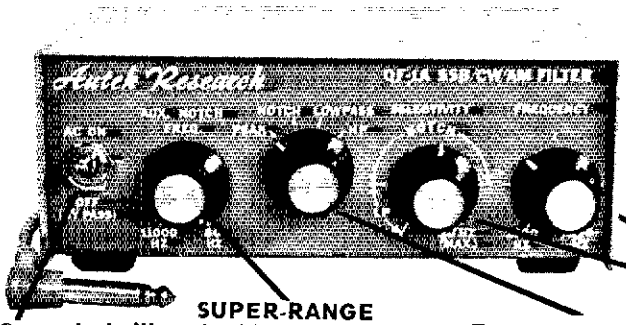

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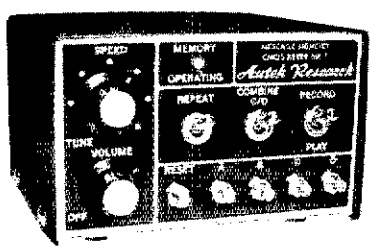

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FLASH! An MK-1 breaks its old world CW record! A single operator worked well over 4000 DX QSO's in 48 hours. And heard the weak ones through a QF-1. Second-place wasn't even close. Get the choice of champions — AUTEK!

ORDER BLANK (Or Use Separate Sheet of Paper)

Please Rush ppd. via Speedy UPS

- ☐ QF-1A Filter at $73.00
- ☐ MK-1 Keyer at $104.50
- ☐ ME-1 Expander for MK-1 at $35 (factory installed)
- ☐ ME-1 Owner installed at $25 (save $10)

Add 4% tax in Fla. Add $3 each to Canada, Hawaii and Alaska. $3 for UPS air. Add $18 each elsewhere (shipped air).

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PRICING: Autek is an innovator, so we're heavily copied. Yet, the "copies" cost you much more. We also give you a free AC supply and pay US shipping. How do we do it? Volume. And because WE SELL ONLY FACTORY DIRECT. No 25% to 50% middlemen markups.

DELIVERY: For 9 years we've shipped over 95% of orders from stock. Some companies have regular long delays. Not us. Order with confidence.

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Box 302E ODESSA, FL 33556

Full Duplex Oscar Transverter

YAESU FTV-901R

Tired of compromise in your VHF/UHF operating? Does your "compact" multimode rig leave something to be desired in the selectivity department? With the Yaesu FTV-901R VHF/UHF Transverter, the superb capabilities of your FT-901/902DM or FT-101ZD can be extended to the 50, 144 or 430 MHz bands!

Multiband Design Philosophy
The FTV-901R comes equipped for operation on the 144 MHz band, with 50 MHz and 430-440 MHz modules available as options. Power input is 20 watts on all three bands.

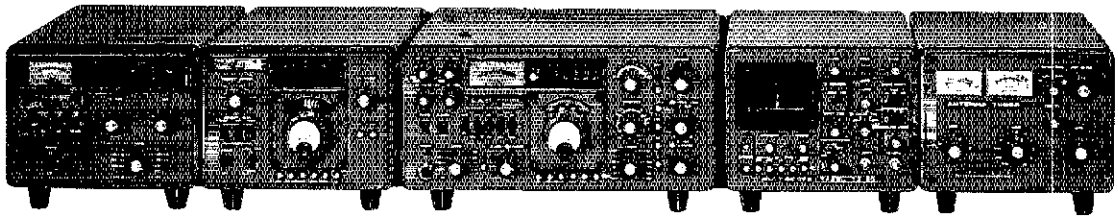
Duplex Satellite Operation
For satellite operators, three satellite bands are provided, allowing full duplex operation through the transverter for downlink monitoring. You can transmit on 2 meters while receiving on 10 meters or 70 cm, or transmit on 70 cm while listening on 2 meters. An external receiver is required (in addition to your FT-901/902DM or FT-101ZD) for duplex operation.

Rugged, Dependable Construction
The FTV-901R is a futuristic blend of FET, bipolar, and stripline techniques, providing high reliability, consistent power output, good noise figure, and outstanding rejection of spurious responses. And there's attention to the details, like the Type N connector for 430 MHz operation.

Worldwide Power Capability
Equipped for operation from supply voltages of 100/110/117/200/220/234 VAC, the FTV-901R won't become obsolete if you move to another country. The transmit drive requirement of 3V RMS at 28-30 MHz makes the FTV-901R compatible with many older Yaesu transmitters.

Repeater Split Capability
The FTV-901R comes equipped for repeater operation on the 6 and 2 meter bands. For 6 meters, 1 MHz split is provided, while 600 kHz split is provided on 2 meters. Take full advantage of the FM capability on your FT-901/902DM or FM-equipped FT-101ZD Mk III.

FT-901/902 Line of Accessories
Other high-performance accessories for your FT-901/902DM station include: the FV-901DM Synthesized Scanning VFO; YO-901P Multiscope with Panadapter; and the FC-902 160-10 Meter Antenna Tuner. See your dealer also for details of the YR-901 Code Reader and SP-901P Speaker/Patch.



For top performance on 1.8 through 450 MHz, Yaesu has the most complete line of transceivers, receivers, and accessories in the Amateur industry. Yaesu products are backed by a nationwide dealer network and two factory service centers for your long-term service needs. So when it's time to upgrade your station equipment, join the thousands of hams that are tired of compromise—join them by investing in Yaesu!

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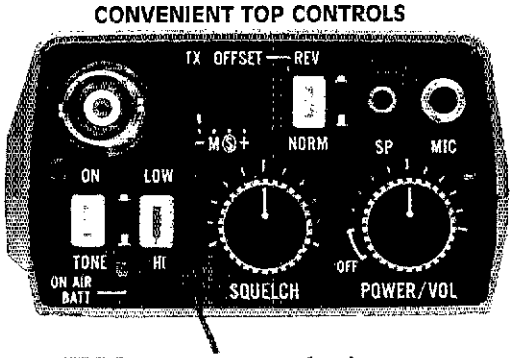
TR-2500

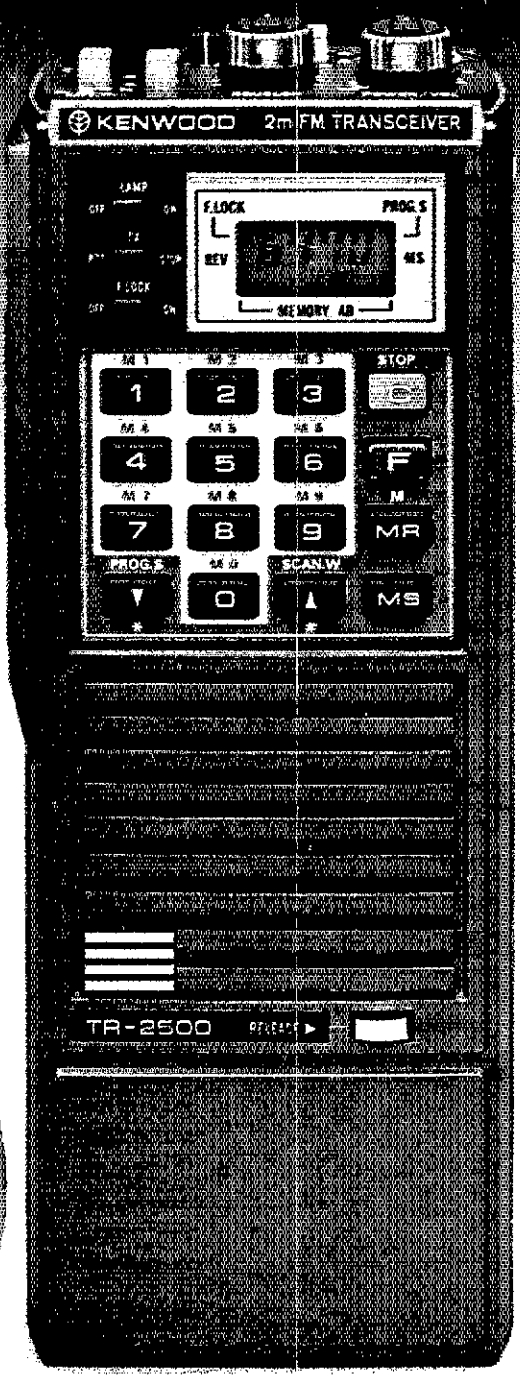
The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.

- **Extremely compact size and light weight**
  Measures 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches). Weighs 540 grams (1.2 lbs) with Ni-Cd pack. (Photo shown, actual size).
- **LCD digital frequency readout**
  Easy to read in direct sunlight or dark (with lamp switch). Low current drain. Shows frequencies and memory channels, plus four "Arrow" mode indicators.
- **Ten channel memory**
  Nine memories for simplex or ±600 KHz offset. "M0" memory for non-standard split frequency repeaters.
- **Lithium battery memory back-up**
  Built-in Lithium battery (estimated 5 year life) maintains memory when Ni-Cd pack is fully discharged or removed.

CONVENIENT TOP CONTROLS



- **HI/LO power output selection**
  Allows operation at 2.5 watts or 300 mw RF output.



Actual size

- **Programmable automatic band scan**
  Upper and lower frequency limits and scan steps of 5 KHz and larger (5, 10, 15, 20, 30 KHz, etc.) may be programmed. Scan locks on busy channel, resumes approximately 2 seconds after signal ceases.
- **UP/DOWN manual scan**
  Up/Down manual scan in 5 KHz steps.
- **Built-in tuneable sub-tone encoder**
  Sub-tone encoder, with activate switch, tuneable (variable resistor) to desired CTCSS tone. Optional TU-1 programmable (DIP switch) encoder accessory available.
- **Built-in 16 key autopatch encoder**
  16 keys provide telephone dual tone modulation.
- **"SLIDE-LOC" battery pack**
  Slides into position, locks into place.
- **Reverse operation**
  Shifts receiver to transmit frequency, and transmitter to receive frequency.
- **Keyboard frequency selection**
  Sets operation frequency across full range.
- **Extended frequency coverage**
  Covers 143.900 to 148.995 MHz in 5 KHz steps.
- **Optional power source**
  Using optional MS-1 mobile or ST-2 A charger/power supply, radio may be operated while charging. (Automatic drop-in connections.)
- **High impact plastic case**
  Provides extra strength to resist dama
- **Battery status indicator**
  Flashes to indicate low battery charge level.
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.

Standard accessories included:

- Flexible rubberized antenna with BNC connector
- 400 mAH heavy-duty Ni-Cd battery pa
- AC charger
- Plugs for external microphone and speaker

More information on the TR-2500 is available from all authorized dealers Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

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Optional accessories:

- ST-2 Base station power supply and quick charger (approx. 1 hr)
- MS-1 Mobile stand/charger/supply
- TU-1 Programmable sub-tone (CTCSS) encoder
- SMC-25 Speaker microphone
- LH-2 Deluxe top grain cowhide leather case
- PB-25 Extra Ni-Cd battery pack, 400 mAH, heavy duty
- BH-2 Belt hook
- WS-1 Wrist strap
- EP-1 Earphone
- _____ RF power amplifier (To be announced later.)

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