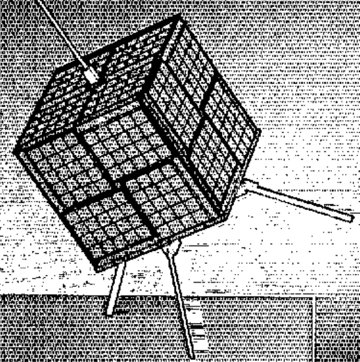
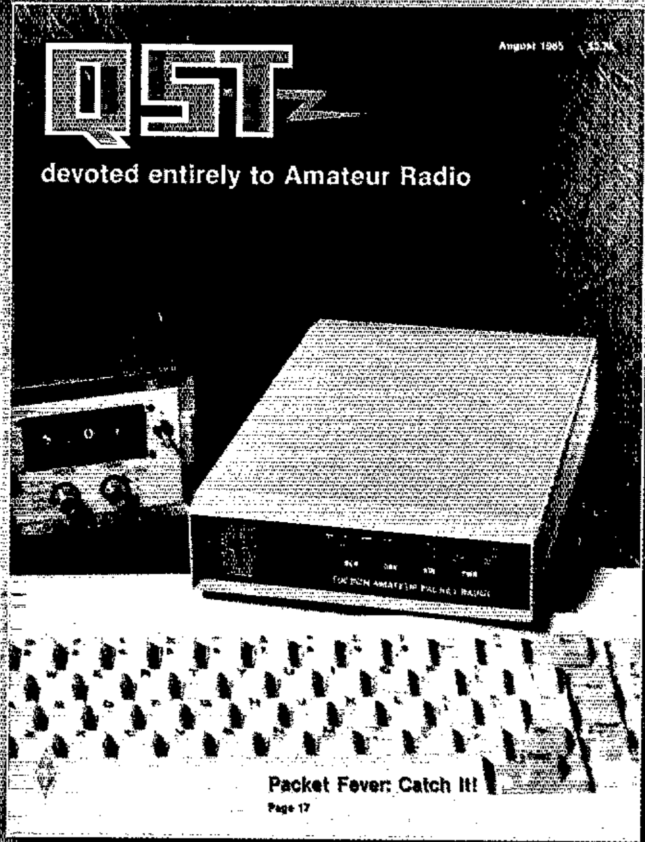
QST

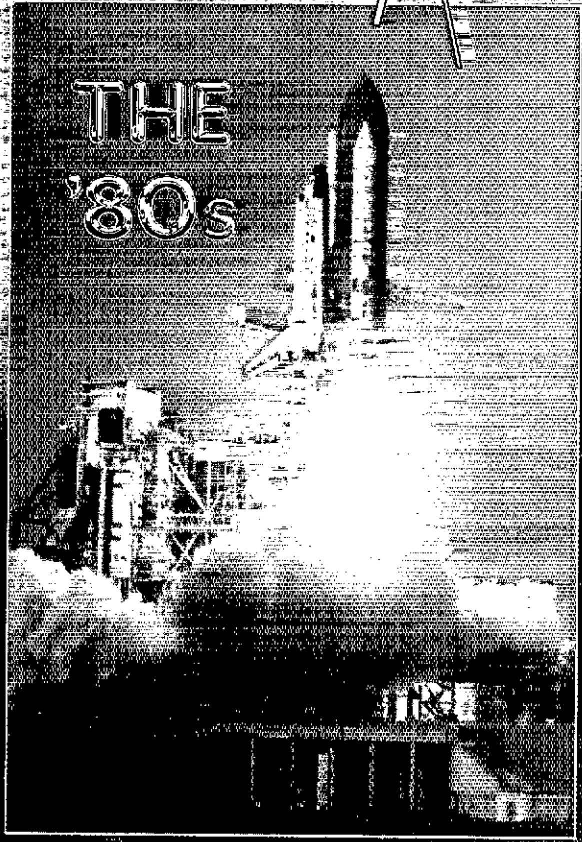
October 1989 $3.00

devoted entirely to Amateur Radio



PRB – 1

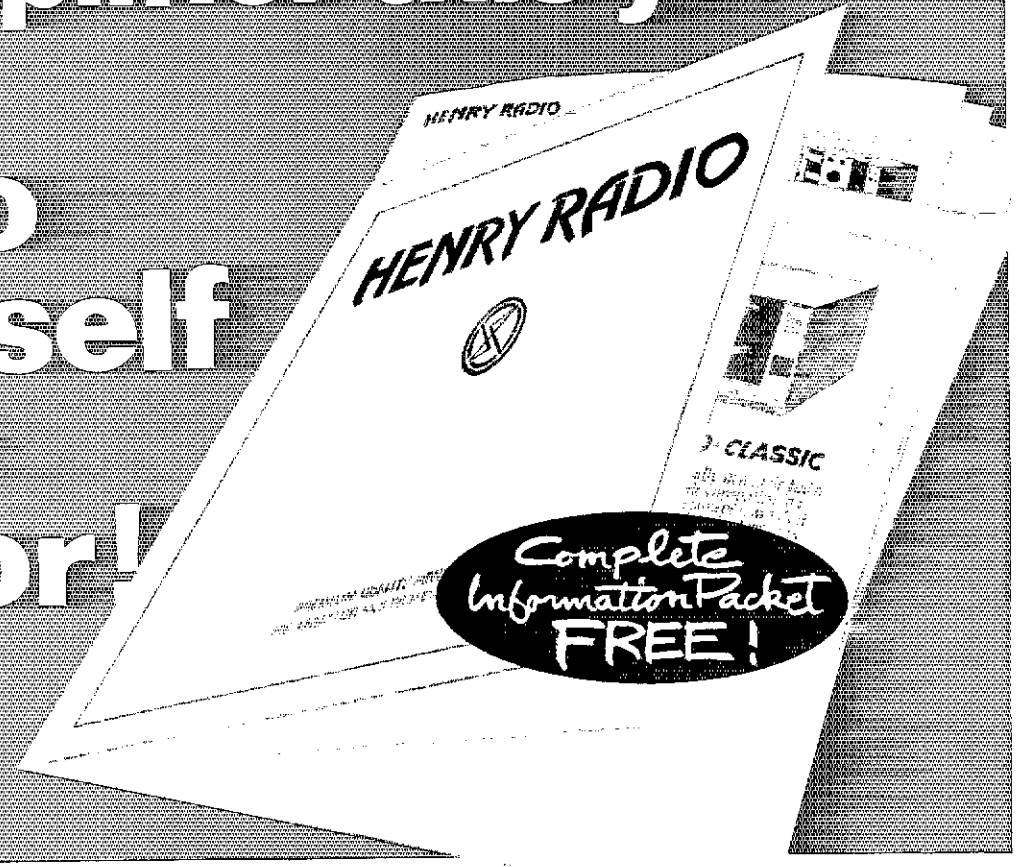




W5LFL and WØORE Operate from Space

If you plan to buy an amplifier this year...

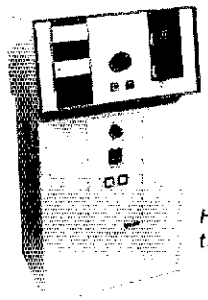
do yourself a favor!



You wouldn't buy a car from a dealer who offers only one model. . .so why buy an amplifier that way?

Henry Radio offers the widest choice of amplifiers in the world. We design and produce amplifiers to fit different needs and different budgets. We feel we offer the best equipment and there are a lot of amateurs who obviously agree. That's why we've sold over 40,000 amplifiers during the last 25 years. If you plan to buy an amplifier, do yourself a big favor. . .call, write, FAX, or come in. But make sure you have our new information packet in your hands before you make a decision. You owe it to yourself. Read it through, compare the specs, compare prices, compare VALUE.

And, of course, when you buy from Henry Radio you're buying factory direct.



Our present HF amplifier line includes the following models:

2KD STANDARD	Single 3-500Z Desk SSB Amp	**3K CLASSIC MKII**	Domestic Console
2KD CLASSIC	Desk Model Linear Amplifier	**3K CLASSIC MKII**	Export Console
2K CLASSIC	Console Amplifier	**3K CLASSIC RF**	RF Deck only
2K CLASSIC X	Domestic Console	**5K CLASSIC**	Export Console
2K CLASSIC X	Export Console	**5K CLASSIC RF**	RF Deck only
2K CLASSIC X RF	RF Deck only	**3K PREMIER**	Console Amp. with 160 meters
3KD CLASSIC	Single 3CX1200A7 Desk Amp	**3KD PREMIER**	Desk Amp. with 160 meters

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All-mode tri-bander!

TS-790A

Satellite Transceiver

The new Kenwood TS-790A VHF/UHF all-mode tri-band transceiver is designed for the VHF/UHF and satellite "power user." The new TS-790A is an all-mode 144/450/1200 MHz transceiver with many special enhancements such as automatic uplink/downlink tracking. Other features include dual receive, automatic mode selection, automatic repeater offset selection for FM repeater use, VFO or quick step channel tuning, direct keyboard frequency entry, 59 memory channels (10 channels for separate receive and transmit frequency storage), multiple scanning and multiple scan stop modes. The Automatic Lock Tuning (ALT) on 1200 MHz eliminates frequency drift. Power output is 45 watts on 144 MHz, 40 watts on 450 MHz, and 10 watts on 1200 MHz. (The 1200 MHz section is an optional module.)

- **High stability VFO.** The dual digital VFOs feature rock-stable TCXO (temperature compensated crystal oscillator) circuitry, with frequency stability of ±3 ppm.
- **Operates on 13.8 VDC.** Perfect for mountain-top DXpeditions!
- **The mode switches confirm USB, LSB, CW, or FM selection with Morse Code.**
- **Dual Watch allows reception of two bands at the same time.**
- **Automatic mode and automatic repeater offset selection.**
- **Direct keyboard frequency entry.**
- **59 multi-function memory channels.** Store frequency, mode, tone information, offset, and quick step function. Ten memory channels for "odd split."
- **CTCSS encoder built-in.** Optional TSU-5 enables sub-tone decode.
- **Memory scroll function.** This feature allows you to check memory contents without changing the VFO frequency.
- **Multiple scanning functions.** Memory channel lock-out is also provided.
- **ALT—Automatic Lock Tuning—on 1200 MHz eliminates drift!**
- **500 Hz CW filter built-in.**
- **Packet radio connector.**
- **Interference reduction controls:** 10 dB RF attenuator on 2m, noise blanker, IF shift, selectable AGC, all mode squelch.
- **Other useful controls:** RF power output control, speech processor, dual muting, frequency lock switch, RIT.
- **Voice synthesizer option.**
- **Computer control option.**

Optional Accessories:
• **PS-31** Power supply • **SP-31** External speaker • **UT-10** 1200 MHz module • **VS-2** Voice synthesizer unit • **TSU-5** Programmable CTCSS decoder • **IF-232C** Computer interface • **MC-60A/MC-80/MC-85** Desk mics • **HS-5/HS-6** Headphones • **MC-43S** Hand mic • **PG-2S** Extra DC cable

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

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ICOM

IC-2400 UHF/VHF Mobile
IC-2500 UHF/1.2GHz Mobile

NOW YOU DON'T HAVE TO DOUBLE UP!

10 watts on 1.2GHz. Both units include selectable low power for working local stations.

Stack today's rapidly expanding VHF/UHF action in your favor with the most advanced design yet easy-to-operate FM dual banders on the road: ICOM's IC-2400 2-meter/440MHz or IC-2500 440MHz/1.2 GHz.

Their overlapping band ranges are great for present use and future expansions, and their wide array of impressive features make your auto a double-mobile winner!

WIDEBAND COVERAGE.

The IC-2400's range of 138-174MHz RX/140-150MHz TX and 440-450MHz RX/TX includes NOAA weather reception plus liberal overlap for MARS/CAP operation. The innovative IC-2500 receives and transmits 440-450MHz and 1240-1300MHz.

HIGH POWER RADIOS!

The IC-2400 delivers 45 watts output on two-meters, 35 watts on 440MHz. The IC-2500 features 35 watts on 440MHz

FULL DUPLEX OPERATION.

Both transceivers transmit on one band while simultaneously receiving on another. Both radios feature independent offsets for each band. It's like having two separate radios in one! Perfect for true telephone-style auto-patching with a modern crossband repeater!

SIMULTANEOUS DUAL BAND RECEPTION.

Monitor both bands on the internal speaker or add external speakers. Each band features separate volume and squelch controls.

40 MEMORIES.

Twenty per band. Store frequencies, PL tones and TX offsets for super-convenient mobiling!

PROGRAMMABLE BAND AND MEMORY SCANNING.

You set the limits and select/lockout preferred memories. ICOM's IC-2400 and IC-2500 monitor the action. A sheer VHF/UHF delight!

Additional features include: **Priority Watch.** Monitor one channel's activity while operating on another frequency. **Two Call Channels.** One on each band for quick, single access to your favorite repeater. A **Repeater Input Monitor Switch** for rapid checks of TX offset and evaluation of direct range. Plus, an **Optional Beeper** silently monitors any selected frequency or repeater for calls with your preselected CTCSS subaudible tone.

Double your bands with ICOM's new IC-2400 or IC-2500 mobiles!

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
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ICOM CANADA, A Division of ICOM America, Inc.,
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First in Communications

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OUR COVER

The 1980s—the digital decade: Microsat, due to be launched later this year, W5LFL and WØORE operated from space, handsome Diamond Jubilee Certificate (earned yours yet?), microwave communications techniques boomed, grass-roots development of packet radio first put Vancouver and then Tucson on the map, and amateur antennas received federal protection in 1985 when PRB-1 took effect.

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October 1989
Volume LXXIII Number 10

TECHNICAL

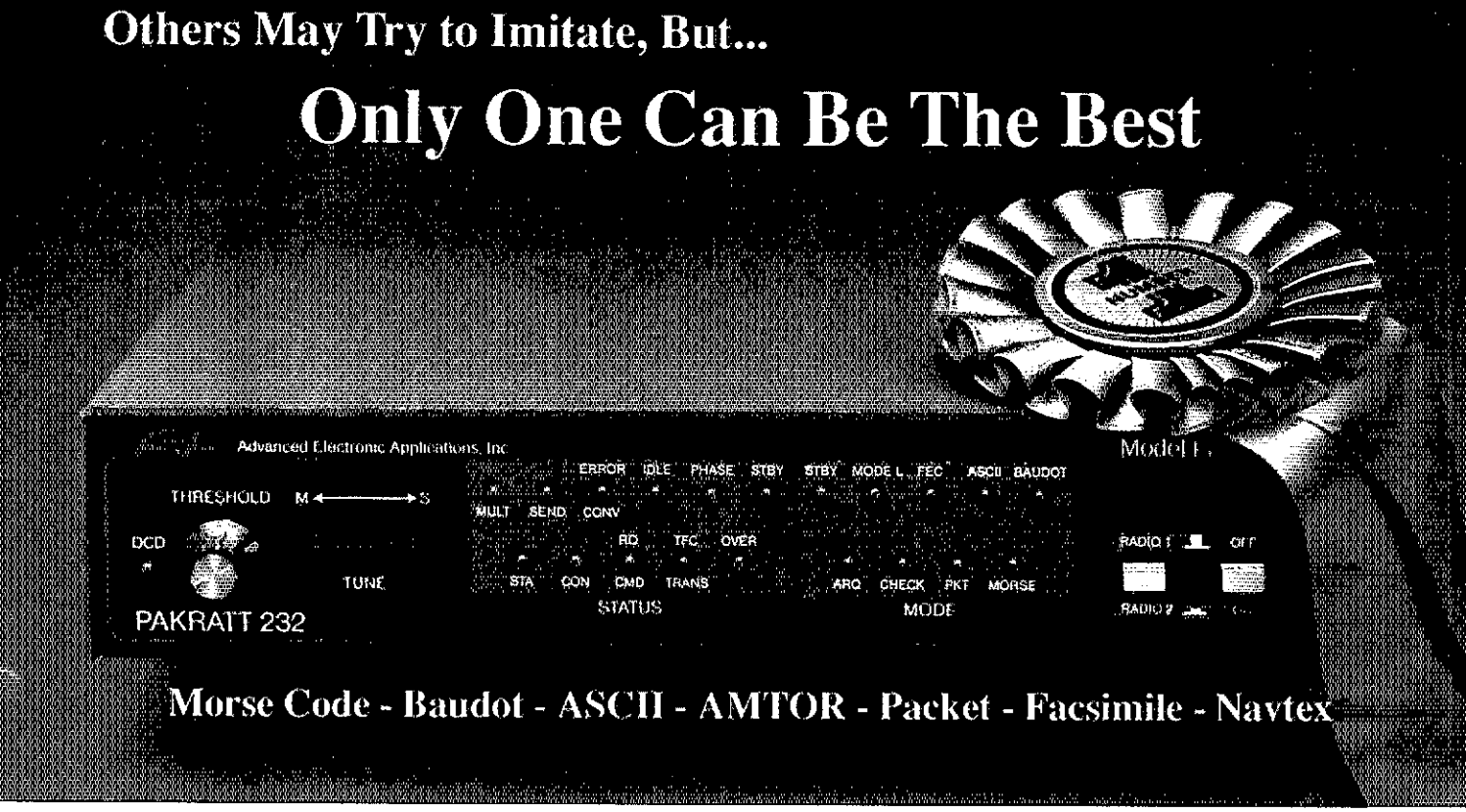
NEWS AND FEATURES

OPERATING

DEPARTMENTS

Others May Try to Imitate, But...

Only One Can Be The Best

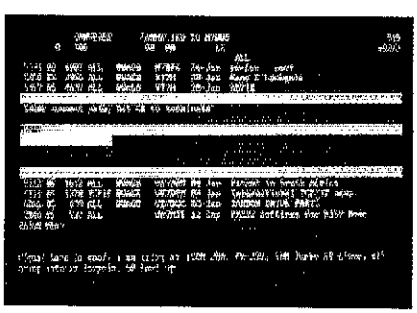


It's a lesson you learn very early in life. Many can be good, some may be better, but only one can be the best. The PK-232 is the best multi-mode data controller you can buy.

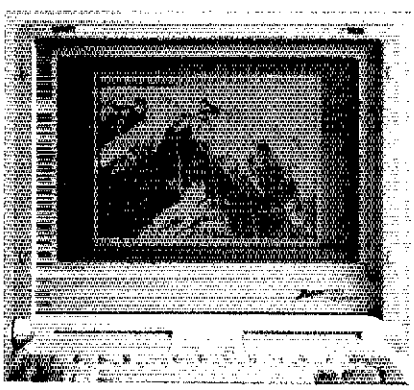
1 Versatility

The PK-232 should be listed in the amateur radio dictionary under the word Versatile. One data controller that can receive seven digital modes, and can be used with almost every computer or data terminal. You can even monitor Navtex, the new marine weather and navigational system. Don't forget two radio ports for both VHF and HF, and a no compromise VHF/HF/CW internal modem with an eight pole bandpass filter followed by a limiter discriminator with automatic threshold control.

The internal decoding program (SIAM[tm]) feature can even identify different types of signals for you, including some simple types of RTTY encryption. The only software your computer needs is a terminal program.



PC Pakratt Packet TX/RX Display



Facsimile Screen Display

2 Software Support

While you can use most modem or communications programs with the PK-232, AEA has two very special packages available exclusively for the PK-232....PC Pakratt with Fax for IBM PC and compatible computers, and Com Pakratt with Fax for the Commodore 64 and 128.

Each package includes a terminal program with split screen display, QSO buffer, disk storage of received data, and printer operation, and a second program for transmission/reception and screen display of facsimile signals. The IBM programs are on 5 1/4" disk and the Commodore programs are plug-in ROM cartridges.

3 Proven Winner

No matter what computer or terminal you plan to use, the PK-232 is the best choice for a multi-mode data controller. Over 20,000 amateurs around the world have on-air tested the PK-232 for you. They, along with most major U.S. amateur magazines, have reviewed the PK-232 and found it to be a good value and excellent addition to the ham station.

No other multi-mode controller offers the features and performance of the PK-232. Don't be fooled by imitations. Ask your friends, or call the local amateur radio store. We're confident the PK-232 reputation will convince you that it's time to order your very own PK-232.

Call an authorized AEA dealer today. You deserve the best you can buy, you deserve the PK- 232.

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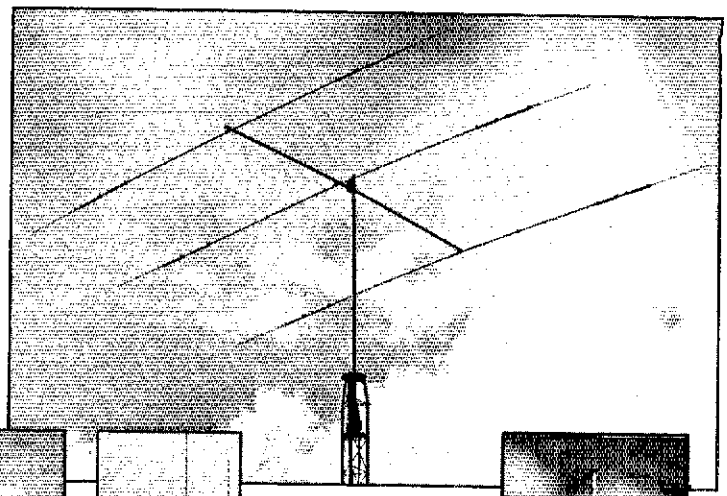
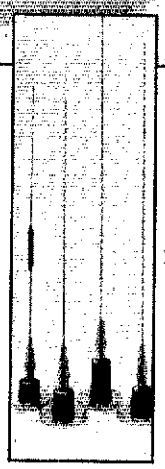
Amateur Net $349.95

Tuned To The New World Of Amateur Radio

From Novice to Extra Class Cushcraft has the antenna you need.



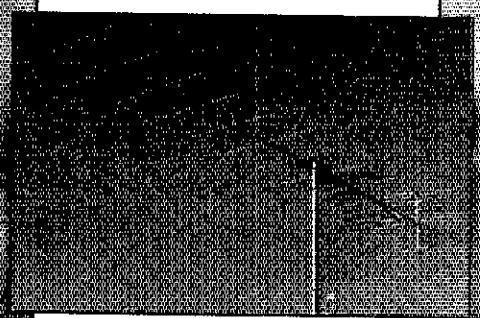
Cushcraft offers high performance antennas to make every phase of your ham radio activity more satisfying. We have been creating innovative and exciting new products for more than 35 years. Call or write for a free copy of our full line antenna and accessory catalog or see your local dealer.



HF TRIBAND BEAM. A3. The most popular compact 10,15, 20 meter beam. ***A4S.*** A high performance 18' long wideband beam with all stainless steel hardware. 40 meter add on kits for each

NEW ***CUSHCRAFT/SIGNALS.*** magnetic mount mobile for 10 meters. An ideal companion to the new 10 meter multi mode rigs. Model CS28M.

AP8 VERTICAL. Covering 10,12, 15, 17, 20, 30, 40, 80 Meters. Great choice for Novice to Extra class.

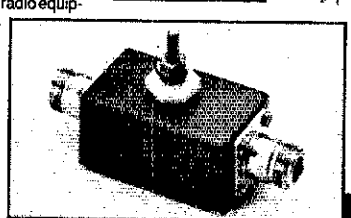


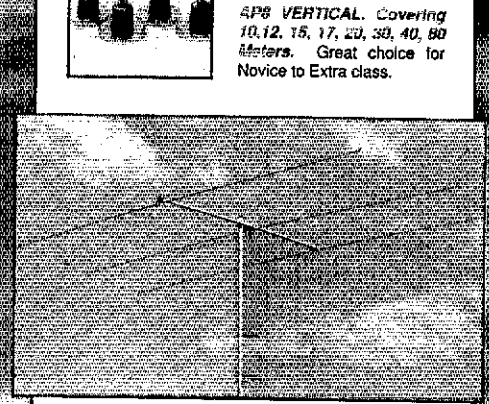
BOOMERS. The contest winners and distance record holders. Computer enhanced design for better gain, pattern and strength. VHF and UHF models for SSB, FM and other activities.

RINGO RANGER II. Still the world's favorite 2 meter, 70 cm or 220 MHz omni antenna, with more gain. A must for your FM or packet station.

FAST ACTION GAS TUBE LIGHTNING ARRESTERS. Protect your valuable radio equipment. High and low power models with SO-239 or N connectors.

NEW ***10, 18, 24 MHz ROTATABLE DIPOLE.*** Mounts easily on the same mast as your tribander or other antennas. Bi-directional pattern gives excellent performance. Model D3W.

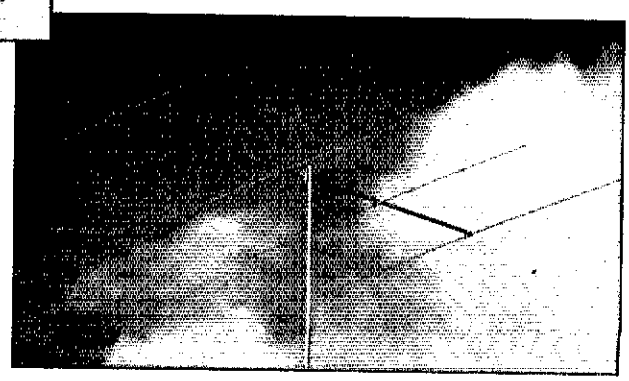




NEW ***NEW 10 METER 3 ELEMENT*** for the novice, technician or any ham who wants more gain with a good front to back ratio. Model TEN-3

NEW ***R5 HALFWAVE 10, 12, 15, 17, 20 METER VERTICAL.*** Amazing DX performance in a small space without ground radials. Includes a solid state broadband impedance matching network. Model R5.

SKYWALKER MONOBAND. 10, 12, 15 and 20 meter Yagis for more contacts, less waiting and a better signal. Preferred by contesters and DX-Peditions.



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AVAILABLE THROUGH DEALERS WORLDWIDE

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All New Dual Bander

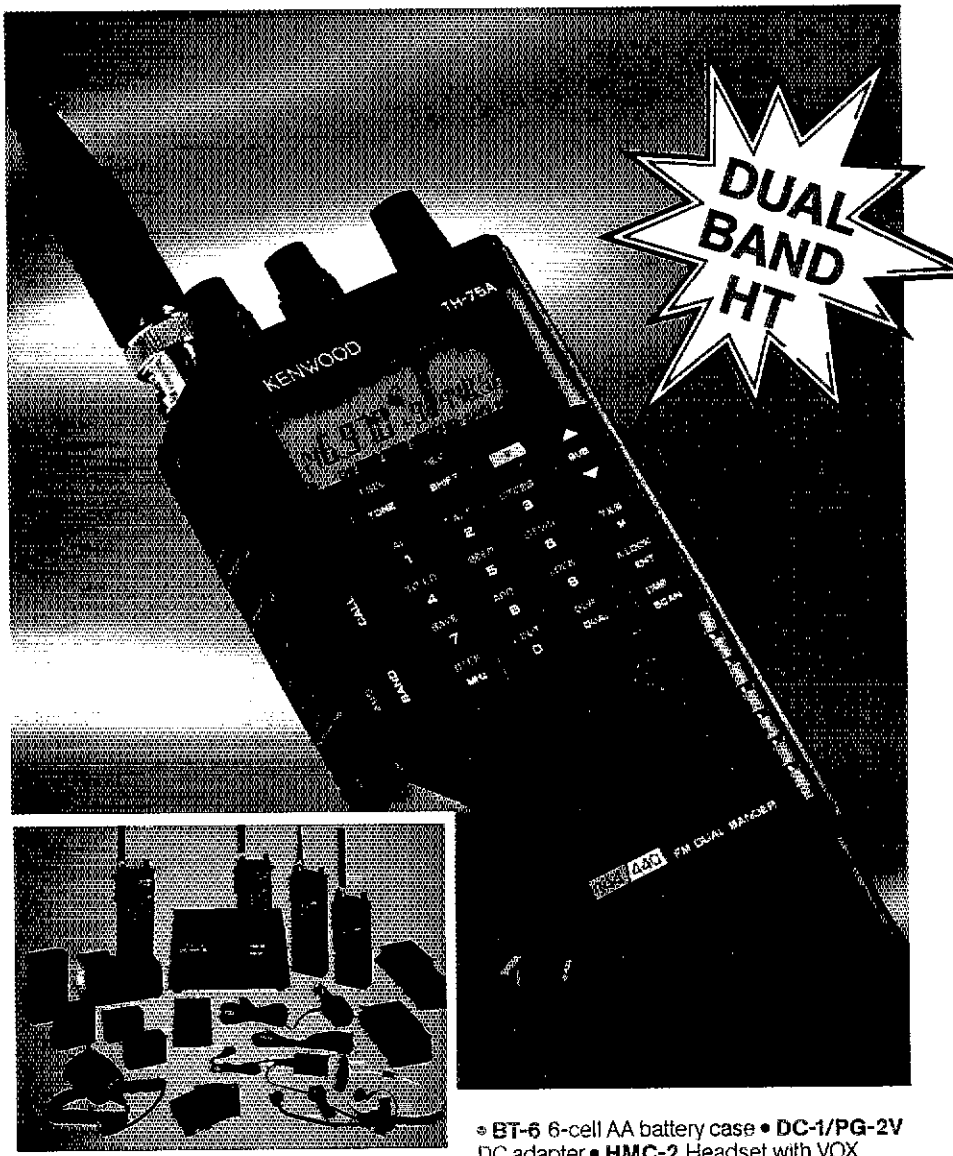
Two in the Hand!

TH-75A

2m/70cm Dual Band HT

The new TH-75A Dual Band HT from Kenwood is here now! Many of the award-winning features in our dual band mobile transceivers are designed into one hand-held package.

- **Dual Watch** function allows you to monitor both bands at the same time.
- **1.5 watts on 2 meters and 70cm: 5 watts when operated on 12 VDC (or PB-8 battery pack).**
- **Large dual multi-function LCD display.**
- **10 memory channels** for each band stores frequency, CTCSS, repeater offset, frequency step information, and reverse. A lithium battery backs up memories. Two memories for "odd split" operation.
- **Selectable full duplex operation.**
- **Extended receiver range:** 141–163.995 and 438–449.995 MHz; transmit on Amateur band only. (Modifiable for MARS and CAP. Permits required. Specifications guaranteed on Amateur bands only.)
- **Uses the same accessories as the TH-25AT (except soft cases).**
- **Volume and balance controls, plus separate squelch controls on top panel.**
- **Super easy-to-use!** For example, to recall memory channel, just push the channel number!
- **CTCSS encode/decode built-in!**
- **Automatic Band Change (ABC).** Automatically switches between main and sub band when signal is present.
- **Automatic offset selection on 2 meters.**
- **Tone alert system for quiet monitoring.** When CTCSS decode is on, the tone alert will function only when a signal with the proper tone is received.
- **Four ways to scan,** including ***dual memory scan,*** with time operated or carrier operated scan stop modes, and priority alert.
- **Automatic battery saver circuit extends battery life.**



- **Supplied accessories:** Dual band rubber-flex antenna, PB-6 battery pack, wall charger, belt hook, wrist strap, water resistant dust caps.

Optional Accessories

- **PB-5** 7.2 V, 200 mAh NiCd pack for 1.5 W output • **PB-6** 7.2 V, 600 mAh NiCd pack • **PB-7** 7.2 V, 1100 mAh NiCd pack • **PB-8** 12 V, 600 mAh NiCd for 5 W output • **PB-9** 7.2 V, 600 mAh NiCd with built-in charger • **BC-10** Compact charger • **BC-11** Rapid charger
- **BT-6** 6-cell AA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-22 and SC-23** Soft case • **SMC-30/31** Speaker mics. • **WR-1** Water resistant bag.

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Complete service manuals are available for all Kenwood transceivers and most accessories

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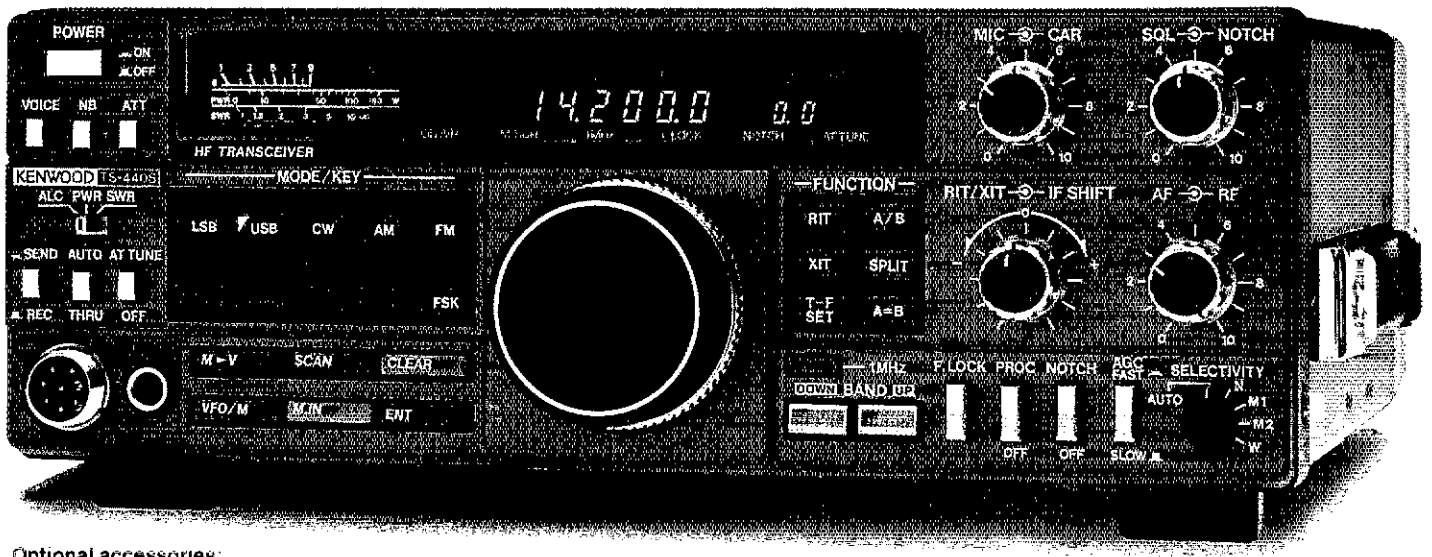
All New Compact HF!

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

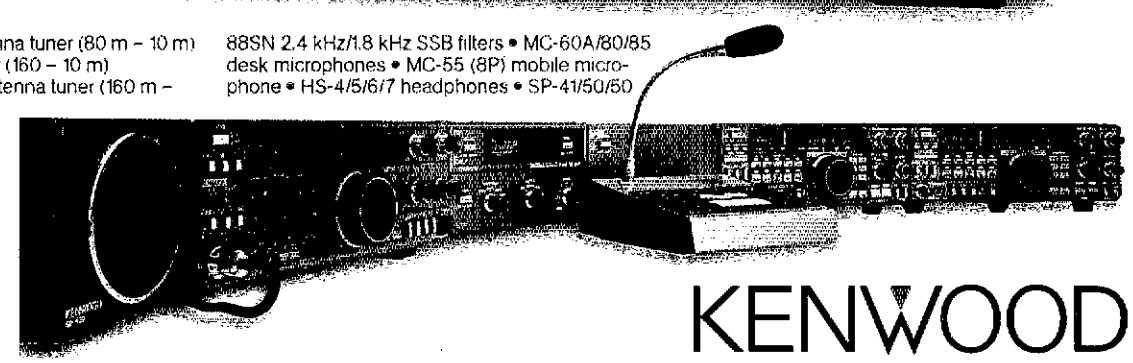
Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)
- **Built-in automatic antenna tuner (optional).** Covers 80—10 meters.
- **5 IF filter functions**
- **VOX, full or semi break-in CW**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **AMTOR compatible**
- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-43S UP/DOWN mic. included**
- **Computer interface port**



Optional accessories:

- AT-440 internal auto. antenna tuner (80 m – 10 m)
- AT-250 external auto. tuner (160 – 10 m)
- AT-130 compact mobile antenna tuner (160 m – 10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S-88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-4/5/6/7 headphones
- SP-41/50/50-mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor (no pan display)
- VS-1 voice synthesizer
- TU-8 CTCSS tone unit
- PG-2C extra DC cable.



Kenwood takes you from HF to OSCAR!

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Vice Director: Wayne Overbeck, N6NB 14021 Howland, Tustin, CA 92680 (714-731-6178)

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Vice Director: Sam C. Sitton, KV5X, 2003 Jamestown Ct, Ardmore, OK 73401

*Executive Committee Member

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Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 15 divisions of the League are further arranged into 69 administrative "sections," each headed by an elected Section Manager. Your SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SM has an appointment available. Check with your SM (below) for further information.

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Southern Florida — Richard D. Hill, WA4PFK, 12380 NW 30 St, Sunrise 33323 (305-572-3172)
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"It Seems to Us . . ."

Bioeffects

This month, we're pleased to have in *QST* an article that we hope will shed some light on a subject of considerable discussion recently: suspicions that there may be a link between exposure to electromagnetic energy (including, but not limited to, radio-frequency energy) and certain effects on human health. With assistance from a number of others who are interested in this subject, Dr Ivan Shulman, WC2S, has worked hard to put the matter into perspective; you can see the results of his labors beginning on page 31.

While no cause-and-effect (causal) relationship between low-level RF exposure and health risks has been established, Dr Shulman makes a number of common-sense recommendations for minimizing exposure that we all should consider. Nearly all amateur operation falls well within existing standards for RF exposure; however, it may be that the present standards do not preclude all harmful effects in all circumstances. We encounter proven health risks every day as we go about our lives, so there is no reason to be especially concerned about data that merely points to the desirability of further research. On the other hand, in the absence of conclusive results and all other things being equal, prudence suggests that we avoid unnecessary exposure. We've been counseling this approach for some time in the League's technical publications.

Media reports of epidemiological and laboratory research often lead people to conclusions about causal relationships that are not supported by the researchers' work. When that happens, it's only natural for anyone who feels threatened by these inaccurate reports to react defensively. Let's remember that in such instances our quarrel is not with the researchers who conduct responsible and dispassionate investigations; they all wear white hats.—*David Sumner, K1ZZ*

The WARC Bands

We're going to let you in on a little secret that some members would rather we kept to ourselves: the new bands at 10, 24, and especially 18 MHz are *terrific*!

This writer is old enough to remember when there was plenty of room in the 40-meter band for CW ragchewing, almost any time of the day or night. It didn't take an amplifier or a big antenna to join in the fun; 100 watts and a dipole put you on a par with just about everyone else. Since those "good old days," increased activity on phone, RTTY, and other data modes has taken its toll on 40-meter CW. Fortunately, the 10-MHz (30-meter) band is a tailor-made alternative for the CW hound and also provides a natural propagation bridge between 7 and 14 MHz for packet networking.

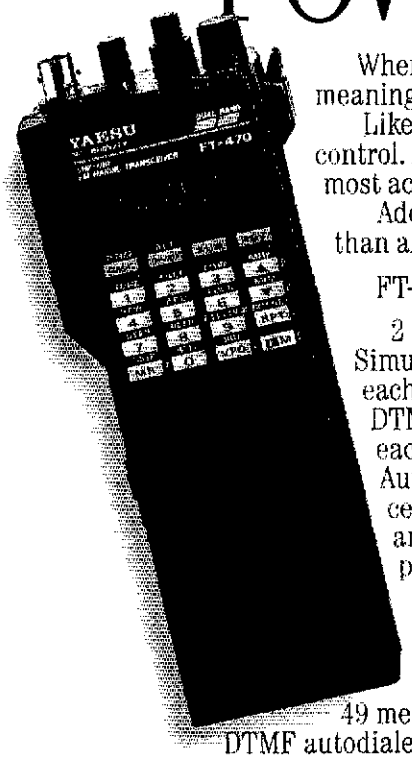
The 24-MHz band became ours in June 1985, when sunspots were but a fond memory; without sporadic-E propagation, the band-warming night would have been a bit of a dud. As conditions improved and 12-meter skyhooks came to grace more antenna farms, the faithful denizens of the band discovered that it was open a *lot* more than our old favorite, 10 meters. Here, rare DX stations are given a respite from the constant pileups and are able to enjoy a relaxing chat—reason enough, perhaps, for 12-meter explorers to keep their discovery under wraps!

Our new 18-MHz band, available to US amateurs only since January 31, has come into its own much more quickly than its two WARC-79 predecessors. Strategically positioned between the overburdened 20-meter band and the exciting, but less reliable 15 meters, in its first few months 17 meters already has proven its worth to thousands of amateurs. As more antennas designed for 18 MHz come into use, it is rapidly becoming a "mainstream" amateur band— but, like the other WARC bands, without the weekend contest activity that some hams would prefer to avoid.

Internationally, the 18- and 24-MHz allocations became exclusively amateur on July 1. Some Fixed Service stations can still be heard operating, and a little patience will be called for as administrations gradually get around to moving these stations to new assignments. As for 10 MHz, we share the band on a secondary basis and must continue to give priority to Fixed Service stations in other countries. In recognition of this secondary status and consistent with IARU Region 2 policy, it has been ARRL policy to not give credit for 10-MHz contacts toward operating awards. Just after this issue goes to the printer, the IARU Region 2 Conference in Orlando will be considering a modest relaxation of this prohibition.

When the new W1AW bulletin transmitters come on line, we expect to make full use of the new WARC bands. The new antenna farm includes two sets of monoband Yagis for the new bands, one for bulletins and one for general operating. If you have trouble hearing W1AW on the traditional bands, take a listen on 10, 18, or 24!—*David Sumner, K1ZZ*

OUR COMPLETE LINE OF PORTABLE POWER TOOLS.



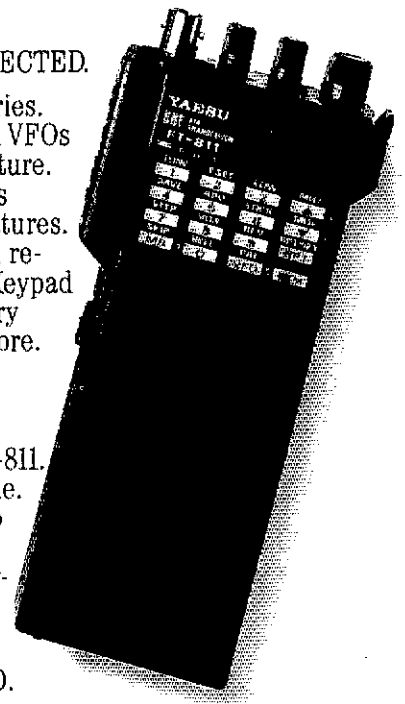
When you're talking Yaesu handhelds, power takes on many meanings.

Like maximum RF output. Sophisticated microprocessor control. Deceptively simple operation. Even cost savings—as most accessories are interchangeable throughout the line.

Added up, it's no wonder amateurs choose Yaesu HTs more than any others.

FT-470. DUAL-BAND OPERATION PERFECTED.

2 meter and 430-450 MHz. 42 memories. Simultaneous receive of both bands. Dual VFOs each band. PL encode/decode. Paging feature. DTMF autodialer (10 memories, 15 digits each). Auto repeater shift. Scanning features. Auto power-off. Battery saver. Extended receive. Audible command verification. Keypad and rotary-dial frequency entry. Battery packs available from 2.3 to 5 watts. More.



FT-411 SERIES. MAXIMUM SINGLEBAND PERFORMANCE.

2-meter FT-411 and 440-MHz FT-811. 49 memories. Dual VFOs. PL encode/decode. DTMF autodialer (10 memories, 15 digits each). Auto repeater shift. Scanning features. Auto power-off. Battery saver. Extended receive. Audible command verification. Keypad and rotary-dial frequency entry. Many battery packs available, from 2.3 to 5 watts. More.

FT-23R SERIES. SMALL, SMART, RUGGED.

2-meter FT-23R, 220-MHz FT-33R, and 440-MHz FT-73R. 10 memories (7 store odd splits). Memory scan at 2 frequencies per second. High/low power switch. LCD power output and "S"-meter display. Many PL features. Auto-battery saver. Aluminum-alloy case. Water-resistant seals. Many battery packs available, from 2 to 5 watts. More.

Want more information? Call **(800) 999-2070** toll-free. Or ask your dealer about Yaesu's FT-470, FT-411 and FT-23R Series handhelds. The power in handheld performance.

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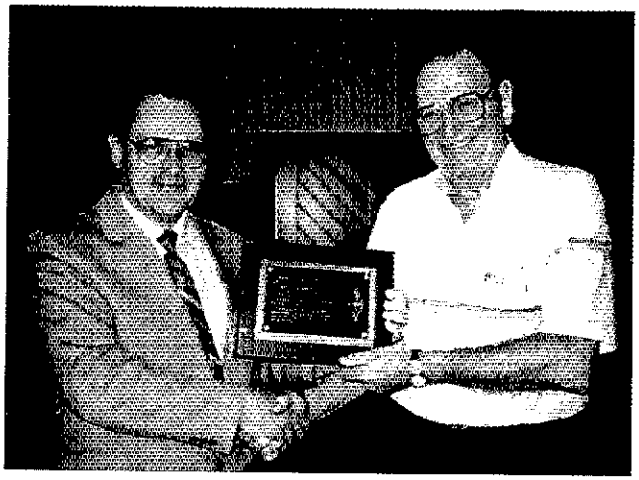
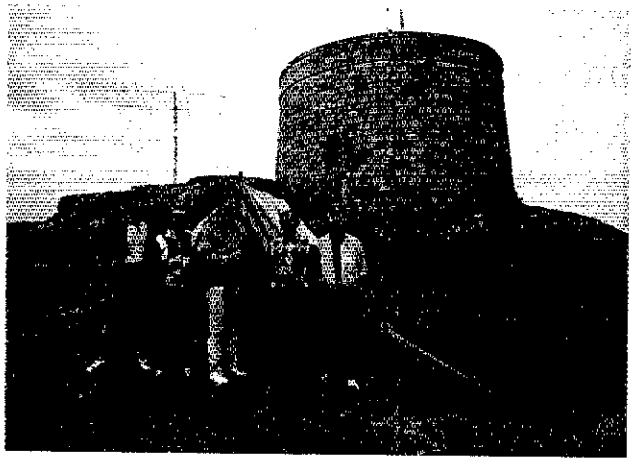
UP FRONT in QST

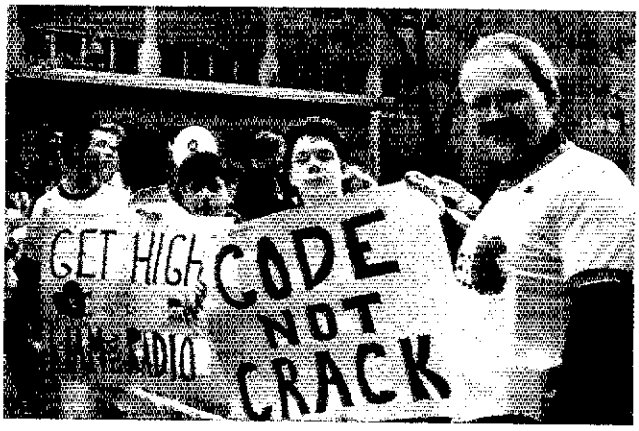


W4FRU honored: John Parrott, W4FRU (r), past chairman of the ARRL DX Advisory Committee, was presented with this appreciation award for his outstanding service to Amateur Radio, the League and the DX community. Roanoke Division Director John Kanode, N4MM, made the presentation at the Raleigh Amateur Radio Society's North Carolina hamfest.

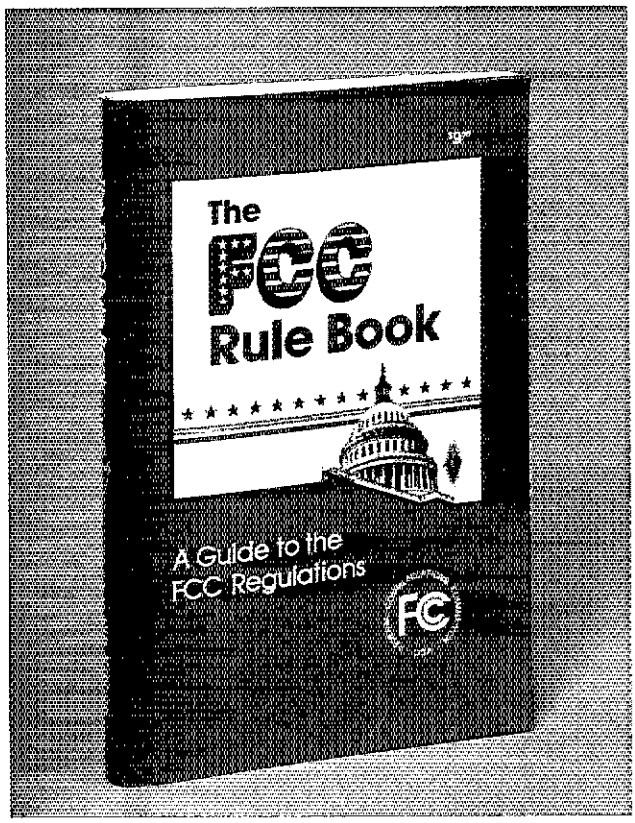
Pass it on: Thirteen-year-old Adam Vernia, WUØY, has a good friend, Jim Jones, N9DIX. Jim had a debt he desired to repay. When he heard that Adam had to share radio time and equipment with his father, NTØG, Jim saw the opportunity to put his Drake Twins to work. Jim had an Elmer who gave him a complete station, but only if he promised to return the favor someday. Tim Barton, KAØWOW, who sent in the info, is confident Adam will continue the tradition. *(photo NTØG)*



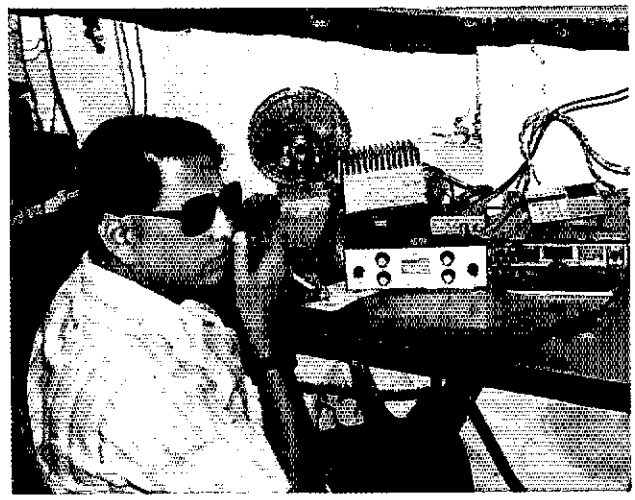
Irish towers: Here's the scene from the operation of EJ1D from Dalkey Island, near Dublin, during the IARU HF World Championship in July. The multiop team netted over 2200 contacts. The stone tower is one of a series of Martello Towers that were built in the UK and Ireland in preparation for an invasion by Napoleon. The group reports that nowadays the towers make very convenient antenna supports. Pictured are (l-r) EI2GB, EI7CC, EI2CA, EI6EW and EI6COB. The EJ prefix is the only alternative to EI in Ireland and is reserved solely for use on offshore islands. *(photo EI5DI)*



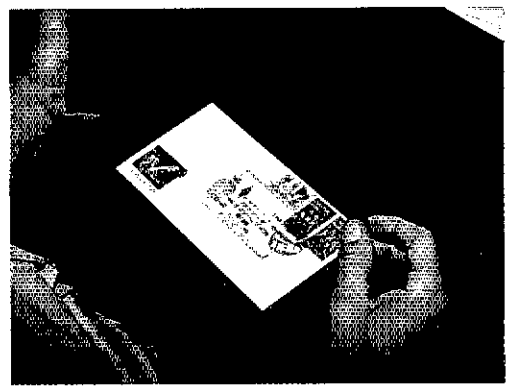
Code, not crack was the theme for the 1200 members of the Radio Club of Junior High School 22. They joined with a coalition of 29 other community groups and corporate sponsors all working in support of the Drug Alcohol Rehabilitation Education (DARE) program's annual march through Manhattan's Greenwich Village. Joe Fairclough, WB2JKJ (r), said keeping youngsters busy planning for the antidrug parade, plus the club's regular ham radio activities, leaves very little time for the lure of drugs. Joe reports that the message of the march was best summed by 14-year-old Ralph Vasquez, KB2HVR: "Anybody who's got a microphone at their mouth doesn't have time to be sticking a needle in their arm." *(photo Steve Revco)*



Team efforts: Here's the new 288-page *FCC Rule Book*, the culmination of work done by the ARRL Board's Part 97 committee and a team of editors headed by Rick Palm, K1CE. Other *new* editions along the licensing front are *Tune in the World with Ham Radio* and separate *Technician* and *General Class License Manuals*. Coming in November: *The 1990 ARRL Handbook*. For more information, see the ARRL Bookshelf listing elsewhere in this issue.



Chak's shack: Blind ham R. Chakravarthy, VU2TTC, of Paithambadi, India, is an avid DXer and award hunter. He has DXCC, with over 260 countries confirmed, Worked All Zones, Worked the Equator and five-band WAC awards. Besides award hunting, Chak is host to many hams visiting India. Presently, his target is 30,000 QSOs per year. Chak would like to acknowledge JJ1TZK and DJ1US for getting him on five bands with the FT-7; his QSL manager, W8XM; and YB5BEE and YB5BEH for help with his antenna experimentation.



Special cancellation: The morning of the W1AW rededication ceremony, stamped envelopes bearing a 15-cent Progress in Electronics and two 5-cent Amateur Radio stamps were hand canceled by the US Postal Service with a special League 75th anniversary cancellation. This memento is available for $3.00 postpaid from HQ; order "Special W1AW postal cancellation." *(photo AA2Z)*

Studio code: Loraine McCarthy, N6CIO (l), narrates the new *Tune in the World with Ham Radio* code tapes at D & K Sound Services. An IBM® PC provided keying signals to drive a code-generation circuit designed by ARRL Lab Engineer Ed Hare, KA1CV. On the right is D & K Sound Services Recording Engineer Dan Kritwitsky. Read more about N6CIO in the *QST* Profile elsewhere in this issue.

League Lines

FCC has reaffirmed its ***reallocation decision of 220-222 MHz*** in General Docket 87-14. In so doing, FCC denied 700 petitions for reconsideration. See the Happenings column of this issue for more information.

Alfred Sikes, Sherrie Marshall and Andrew Barrett were confirmed by the Senate on August 4 as FCC Commissioners. Sikes was sworn in as Chairman of the FCC on August 8 for the term expiring June 30, 1993. Marshall was sworn in on August 21 for the term expiring June 30, 1992. Barrett is expected to be sworn in September 15, and his term will expire June 30, 1990. See the September Happenings column for more information on the new Commissioners.

According to United States Postal Inspector Martin T. Biegelman of Hicksville, New York, a Federal Grand Jury in the Eastern District of New York indicted Michael D. Harrison, WB2PTI, of Oceanside, New York charging 50 counts of mail fraud. According to the indictment, Harrison, also known as "John McNamara," and "Mike Hanson," "did knowingly and willfully devise and intend to devise a scheme...to defraud and to obtain money by means of fraudulent pretenses...and for the purpose...did use the mails." It is stated that Harrison took out advertisements in several magazines under the name of Atlas Radio, Inc, and offered for sale Uniden products. The money for the orders was received, but the merchandise was never shipped, according to the indictment.

The next ***ARRL open house*** will be held Saturday, November 4 from 10 AM to 4 PM. Come and tour HQ and the newly renovated W1AW.

Don't forget that the ***Jamboree-on-the-Air (JOTA)*** will be held the weekend of October 21-22. Call your local Girl or Boy Scout councils (See the White pages of the phone book) to invite Scouts to your station. For details on how you can involve youth in our great hobby through the JOTA, see this month's Contest Corral and contact the Educational Activities Branch at HQ.

From the FCC comes word that a complaint of harmful interference to the Amateur Radio Service has been lodged by the Commission with the Ministry of Posts and Telecommunications, Beijing, China. A station in the vicinity of Hangzhou operating on 14,188.5 kHz has been causing interference throughout much of the 20-meter band. The complaint was prompted by reports from ARRL Interference Reporting System (AIRS) volunteers.

During the first half of 1989, the ***ARRL QSL Bureau*** sorted and mailed approximately 1.7 million cards (weighing over 5½ tons) to overseas QSL bureaus.

Attention contesters: The Contest Branch at ARRL HQ can now accept entries on floppy disk for the ARRL November Sweepstakes and other ARRL sponsored contests. The disk must be an MS DOS formatted disk, either 5¼ or 3½ inch, and the log information must be in true ASCII format. The summary sheet must also be in true ASCII format, although paper summary sheets are preferred. The log file should take on the same layout as the official forms and must contain the band, date, time on/off, time in UTC, exchange sent and received, multipliers and points. Each contest in which you participate must be submitted on a separate disk.

If you are planning a trip to a foreign country (other than Canada) and you are interested in the possibility of operating your ham rig there, you must apply for a permit even if that country holds a reciprocal operating agreement with the US. Remember that many countries require at least a 4-6 week lead time for processing permit requests and you will be required, in most cases, to pay a licensing fee. Some countries do offer walk-in processing. You may obtain permit requirements and other information for the country you are visiting from the Regulatory Information Department at HQ. An SASE with two units of first-class postage is required for each country requested.

US amateurs visiting Canada should remember that the US shares an automatic reciprocal agreement with Canada, and this makes your FCC license valid in Canada as long as the original license is carried. Should you have difficulty getting your equipment through customs, tell the customs officer to refer to Memoranda D2-1-1 (page 7) and D19-4-2 (page 4). This will remind him or her that you can take your equipment into the country as a part of your personal baggage. You will also need to declare your equipment by completing US Customs Form 4457 so that you won't have to pay a duty tax when entering the US.

Nagesh Upadhaya is seeking ***detailed reports of a communications blackout*** that took place between 0100 and 0500 UTC on August 16. Please send reports of your observations to him at: Tech Physics, ISAC, Bangalore-17, India.

David Chase, KY7B, has submitted his application for the very first VUCC award above 300 GHz. David used laser emissions on a frequency of 678 GHz (442 nanometers), and earns a plaque for this accomplishment. Plaques are offered to the first five qualifiers for laser VUCC.

US-Soviet Radio Relations Thaw in the Arctic

The inspiring story of the first joint US-Soviet Amateur Radio operation.

By Wallace Kaufman, KC4EBX
Rte 5, Box 118
Pittsboro, NC 27312

Officially, our purpose was to commemorate the 1934 rescue of the crew of the freighter *Cheluskin*, ice bound in the Soviet arctic near Ayon Island. Through the efforts of the famous Soviet radio operator Ernst Krenkl (RAEM), aided by American fliers, mechanics and radio operators, the crew was saved.

When we met on Ayon Island 55 years later, Soviets and Americans together hoisted a toast to the man whose vision had sparked our trip: Jacob Makhinson, N6NWP. Although the original idea of the expedition had come from Valery Shinevsky, UAØKK, we all knew it would have been impossible without Jacob—the "Ø" in our call sign.

Jacob Makhinson is a native of Latvia, a once-independent state annexed by Stalin. He left the Soviet Union as a refugee in the late 1970s, before the beginning of glasnost and perestroika. After eight months of planning and negotiation, we Americans became his return by proxy.

It may have suggested a "Soviet propaganda coup" to Cable News Network, but it was a perestroika party for us.[1] And for thousands of radio amateurs around the world last April, it meant exchanging greetings with USØSU, the first joint US-Soviet operating activity from the USSR.

For five Americans,[2] the central question was just how much freedom would we really have? Could we, in a country known to Americans for its secrecy and its restrictions on speech and movement, do and say what we pleased? Could we get on the radio and tell anyone—anywhere in the world—what we saw and how we felt?

A toast offered our first night in Moscow, by Sergei Bartyashevich, UAØIA, showed us that we were on more than an ordinary DXpedition: "For many years," Sergei said with his glass held out to us, "Russian radio operators have waited and dreamed of getting together with Americans. For all that time you have been only voices on our radios. Now we can sit at the table with you and talk face to face."

A well-insulated Wallace Kaufman coils coaxial cable as the station is taken down in −40 degree weather *(photo W6MKB)*

Valery, UAØKK, runs them on CW at USØSU. The proficient Soviet operators handled the bulk of the CW operating. *(photo W6MKB)*

Tangled Up in Reams

As do almost all visitors to the Soviet Union, we arrived first in Moscow. We immediately encountered the first of

Expedition members leaving Ayon Island by Aeroflot helicopter with reindeer antlers presented by villagers as souvenirs. *(photo KC4EBX)*

[1]Notes appear on page 16.

Expedition members at the end of the operation with the official flag. *(photo W6MKB)*

many paper hurdles—about tickets, about vehicles, about passenger lists, about bringing in and taking out equipment. The customs bureaucracy had not heard of us and didn't know of any letter authorizing us to bring in radio equipment. There we stood at the customs counter with two huge carts of bags, boxes and trunks, including two amplifiers and three transceivers. (The antennas hadn't made the London transfer, and we were instructed to come back tomorrow and look for them in the Aeroflot lost-and-found rooms.)

Fortunately, we were greeted at customs by a half dozen Soviet hams. They jawboned a series of customs officers and visited a few offices. The letter of authorization never appeared, but irate citizens prevailed over the bureaucracy as they would time and time again during our stay. Whatever glasnost has achieved, the USSR still is burdened by habits demanding a record of everything citizens and visitors do and say. It fell to our hosts and sponsors to budge the bureaucracy. The Iron Curtain has parted faster than the paper curtain.

So, while officialdom seemed to be trying to tell us our mission was impossible, our hosts acted as if the whole country was at our command. We had become part of glasnost.

Moscow was so lavish in hospitality—long nights of eating and drinking toasts—we looked forward to a more Spartan existence in Pevek, our stopping-off point before Ayon Island. But Pevek, a town of 15,000 people located some 4000 miles east of Moscow, was primed to host not only the first Americans ever granted permission to operate on Soviet soil, but the first Americans to come to town!

A bright red and blue banner foretold what was to come: "Welcome Dear American Guests."

Local dignitaries ensured a full schedule of engagements—and dinners—for us.[3] Valery, UAØKK, along with DOSAAF officials, had arranged any number of sumptuous meals—salmon, squid, reindeer meat, sour cream, chocolate, champagne, cognac and vodka.

Luckily for our waistlines, life soon filled with radio. HF operating from the arctic took some getting used to—many mornings following another spectacular aurora borealis display, a haggard night shift would greet the morning relief team saying, "Neechyevo, nothing, bad propagation."

Fortunately, opening day featured good conditions, as on April 3 we inaugurated USØSU from Ayon Island and USØSU/1 from the village of Apepelguino near Pevek.

Send It Back to Rewrite

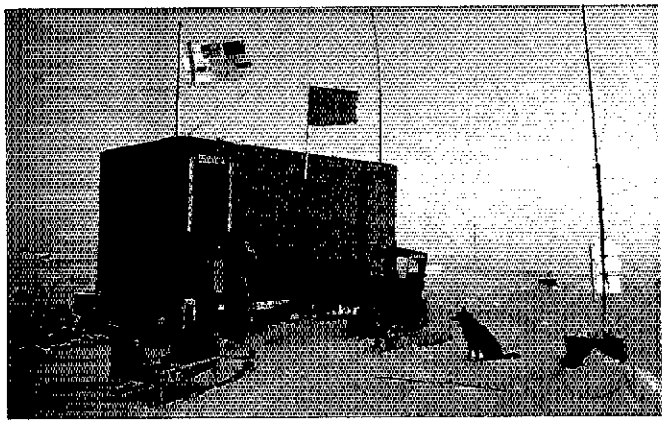
A few days before we went on the air, local party officials had handed me an opening statement to read. As a writer (and an American), my defenses went up. I rewrote the speech, removing the florid passages implying that US-Soviet differences paled beside "glorious and heroic pages" of cooperative efforts. In the end, the Russian statement also turned out to be mine. Someone forgot to bring the original Russian to the ceremony; their translator borrowed my version and read it in Russian.

A few days later, when John Ritter and I and a few Soviets flew out to work USØSU, our three-man advance team already had soaked up most of the social celebration and fulfilled whatever propaganda functions we might serve out there next to a village of 200 reindeer herders and fishermen. Thus we were free to do our duty, keeping three transmitters on the air around the clock. In the end, from the two stations we made over 15,000 contacts in more than 130 countries.

But more important than the contacts with such DX delicacies as Papua, Australia, Norway, Fiji and the States, was the contact between team members. For six Soviets and five Americans, life in our four room apartment became a continuous perestroika and glasnost party fueled by great plates of salmon and reindeer.

We talked prices, television, living standards, socialism, capitalism, freedom of the press, science, women's liber-

Team members in Red Square, Moscow, still 4000 miles from their arctic destination. (l-r) Terry Dubson, W6MKB; John Ritter, W4MQB; Sergei Bartyashevich, UAØIA, Ron Oates, AA4VK; and the author. Not shown is Tony Loeb, AB6Q. *(photo W6MKB)*



The sled-shack at US0SU. *(photo W6MKB)*

Installing a beam in frigid arctic air is a true team effort. *(photo W6MKB)*

ation, Nicaragua, Cuba, Afghanistan and Stalin. We talked homes and families.

Most of the time we communicated without translators (only one Soviet and one American, Tony Loeb, AB6Q, were fully bilingual). The language barrier inspired us to work harder in other ways, in many cooperative efforts. At the end of the expedition, in a debriefing summary in Pevek, UAØKK noted that "We put up antennas under conditions that are unusual even for people here who are used to the weather."

Working successfully at −40 °C in driving snow is possible only among people who respect each other and who want to cooperate. We knew we were committed to something greater than keeping a few sticks of metal horizontal in the arctic sky.

One day on Ayon Island I had walked out on the frozen East Siberian Sea and looked back on the village of Ayon, perched at the very edge of the Soviet Union. It wasn't much—a few rectangular apartment buildings, a weather station, some ramshackle houses, and on the outskirts of the village a few skin teepees with fresh hides strung up to dry outside.

Terry, W6MKB, tries out UAØKK's homebrew rig at Pevek club station UZØKWI. *(photo W6MKB)*

But Ayon was proof that human beings are social animals. We get together. In this place everyone had the chance to be alone in the vast white wilderness, but they chose to live as a community.

And I thought of Jacob Makhinson, the object of so many of our toasts. He had gotten together with Valery Shinevsky, a man he didn't know, and the two of them had put us five Americans together with strangers who quickly became good friends. I looked at our little white island and thought of the words of John Donne, "No man is an island."

Then I looked at the little blue shack with the American and Soviet flags, where Americans and Soviets sat talking to people all over the world. I turned southeast, tipped my borrowed fur hat toward California—and Jacob Makhinson—and said, "No country can be an island."

Editor's note: For more information on the US0SU and other joint US-Soviet operations, see "Tune in to Glasnost" elsewhere in this issue.

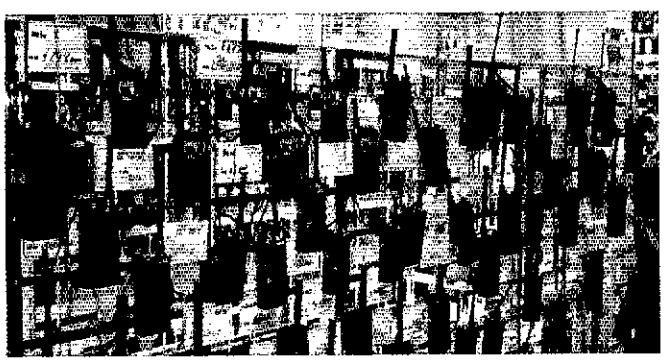
Notes

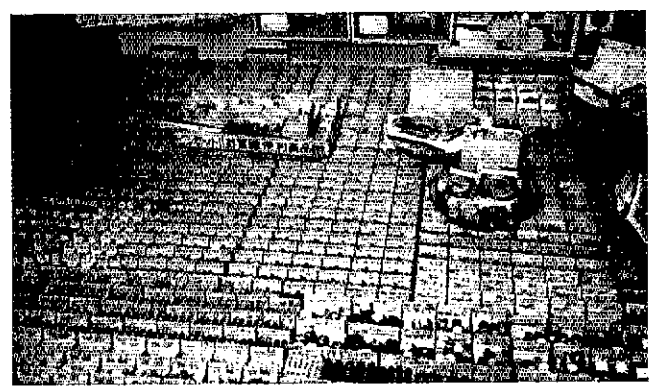
[1]Just before our departure CNN ran a brief story on the trip, featuring Tony Loeb, AB6Q, in his ham shack.

[2]Our American team included a locomotive engineer from Tampa; a Hewlett Packard engineer and a computer marketing manager from California; a nuclear power plant engineer; and the writer.

[3]Every visitor to the USSR seems to come home fatter than he left. Pessimists would attribute this to propaganda; optimists to the Soviets' desire to please.—*Ed.*

Strays





Everyday hamfest: Bill Clemow, KE7CX, writes to say that he found Akihabara, Tokyo's electronic district, a fascinating place to look for ham equipment and components. Bill said he doubts the selection is better anywhere. He has some recommendations from his visit: First, leave your business and nonham associates behind, you'll easily want to spend most of the day; second, get a map and a Japanese ham friend to show you around; third, bring plenty of money. The photographs above show a four-sided hand-held display and one of the many parts bins. *(photos KE7CX)*

"This is not a Drill!"

Ham help is crucial in Sioux City crash.

By Mike Nickolaus, NFØN†;
Doug Potts, KAØVHV;
and Alan Pedersen, KAØVNM

When United Airlines Flight 232 ripped apart literally in our backyards on July 19, 1989, our Amateur Radio emergency team commenced five days of nonstop work. In the process we discovered that planning and practice had prepared us for the nature of the disaster, but not necessarily its magnitude.

Iowa's Sioux Gateway Airport hosts aircraft the size of the DC-10 only in extraordinary circumstances. When United 232 declared an in-flight emergency and set down there, we were among many groups facing a crisis of unknown proportions.

In 1987 we simulated an airliner crash involving 87 people, and 12 Amateur Radio operators took part. Our core group and volunteer base—as well as the new City Wide Disaster Planning Committee—were in place for the real thing, should it occur.

†Correspondence may be sent to 316 East 32nd St, South Sioux City, NE 68776.

Mark Stephenson, NØIUJ, (l) and Bryan Struble, NØHTZ, handle direct communications to Red Cross Headquarters, the flight line and the Emergency Operations Center. (*photo courtesy KAØVHV*)

"We're Coming In"

Flight 232 broke up on impact just before 4 PM that muggy July afternoon. Of 296 passengers and crew, 112 ultimately died.

First word of an impending crash had come around 3:30. A fire department "Alert 2" indicated a flight crew had declared an emergency and sent fire and rescue units into action. On its heels an "Alert 3" signaled the worst—crash imminent. It occurred at 3:55 PM.

Amateurs were summoned less than an hour later. At the request of the Sioux City Communication Center, Amateur Radio Emergency Service (ARES) volunteers were solicited by repeater. Little did we know that the 12 ham volunteers budgeted at our 1987 drill would grow to more than 60 in this real life situation.

John Bylin, KØAAR, and NFØN quickly received Red Cross identification and reported to the disaster site. They brought a motor home now loaded with communications equipment and ARES communications supplies. The entire airport area already had been secured.

Other amateurs were assigned to the American Red Cross chapter office, hospital emergency rooms, and the airport control tower, as well as to the Emergency Operations Center and at Briar Cliff College, where survivors would be billited. We established net control at KAØVHV's home.

Later, amateurs also were dispatched to the flight line at the airport and to the temporary morgue on the Iowa Air National Guard grounds.

NFØN and KAØVHV were chosen to take charge and make major decisions, primarily because of their knowledge of each volunteer's skills. They conducted a loose net operation, allowing communications to bypass net control as necessary.

Radiolocation

Amateur Radio was hugely successful in this situation because we were able to react quickly to the needs of many agencies and groups. With Red Cross facilities scattered over a wide area and other agencies at several different sites, finding people became a shell game. Rather than telephone half a dozen sites in search of an important official, those in need looked to ARES. One call on the radio touched every important site.

Some outposts, such as the Red Cross emergency van, had no telephone at all, and in other locations two or more groups vied for one phone.

Often an amateur on foot, manning a hand-held, was needed to track someone down.

Since the crash site was seven miles from the repeater, hand-helds on high power strained our ability to keep them charged. Consequently, a portable repeater was set up at the airport to ameliorate the battery problem.

Additional volunteers surfaced when it

Alan Pedersen, KAØVNM, stationed at the Iowa Air Guard building where a temporary morgue was set up. (*photo courtesy KAØVHV*)

The tail section of the DC-10 was on a runway 200 yards from the main body of the airplane. (*photo courtesy NFØN*)

became apparent that all posts would require manpower 24 hours a day for the first two days. As many as five amateurs manned each post for the next five days.

Although packet stations were prepared to handle health and welfare traffic, United Airlines assumed this task. None the less, we were ready if needed with two BBS within range.

As the enormity of the situation became clear, offers of assistance poured in from up to 200 miles away—from Sioux Falls, South Dakota; from Lincoln and Omaha, Nebraska; and from Des Moines, Denison, and Council Bluffs, Iowa. Several amateurs from the Omaha-Council Bluffs area came with American Red Cross vans and joined us.

Many Were Served

Because of the great loss of life, communications and volunteers for the American Red Cross were especially important. We established stations at their food preparation site, at the Red Cross chapter house, and with survivors of the crash at Briar Cliff College.

Not only did amateurs locate a department store willing to provide clothing for the survivors, they delivered it to the College.

ARES also passed traffic for the Sioux City Police and Fire Departments, Woodbury County EOC, the 185th Air National Guard, Sioux Gateway Airport, the Salvation Army, the National Transportation Safety Board. Also, for St Lukes Hospital, the Marian Health Center, ambulance services, medical personnel, morticians and private individuals.

A local company loaned a dozen cellular telephone sets to police, fire, and civil preparedness personnel. While not as versatile as our amateur gear, the phones did provide some additional communication. It was decided that in any future emergency ARES would be in charge of maintenance and distribution of cellular phones.

In only one special case did we set up a dedicated simplex channel: between the temporary morgue and the crash site, where the state medical examiner was identifying victims.

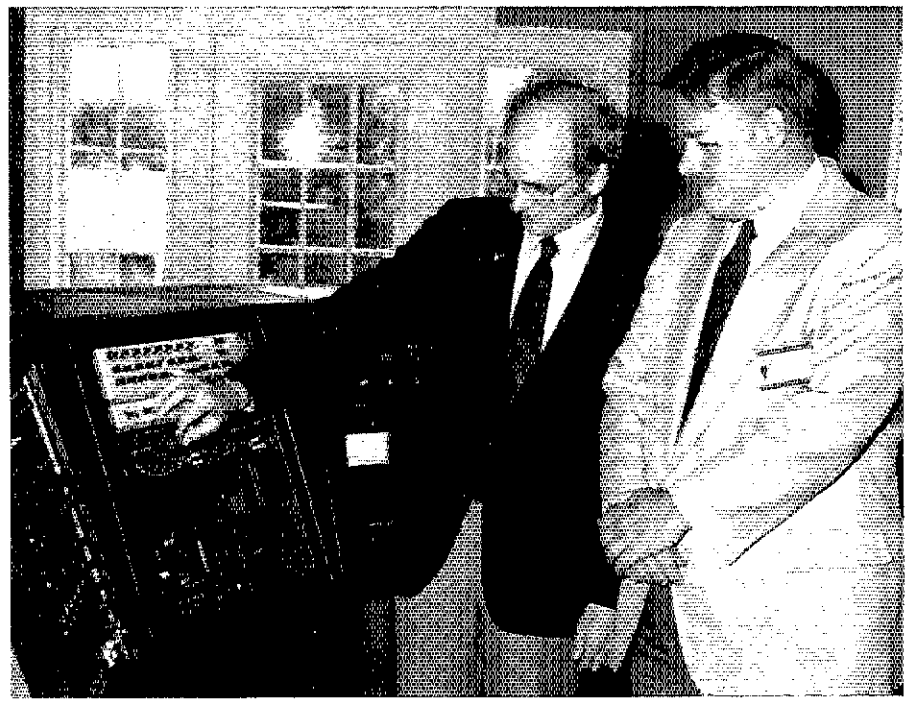
More than 60 amateurs responded to this tragedy, contributing over 1150 hours of assistance. Words cannot adequately express the gratitude felt for everyone who worked so professionally throughout this ordeal.

Here is a brief summary of the lessons we learned:

- Centralize control and decision making.
- Plan for the worst.
- Extend hand-held range with a portable repeater.
- Have packet capabilities.
- Tape record all repeater communications.
- Document each potential volunteer's skills.
- Maintain regular contact with service agencies.
- Meet regularly to discuss disaster preparedness.

Mike Nickolaus, NFØN, is Emergency Coordinator for Dakota County, Nebraska. Doug Potts, KAØVHV, is Assistant Emergency Coordinator for Woodbury County, Iowa. Alan Pederson, KAØVNM, is Assistant Emergency Coordinator for Dakota County, Nebraska.

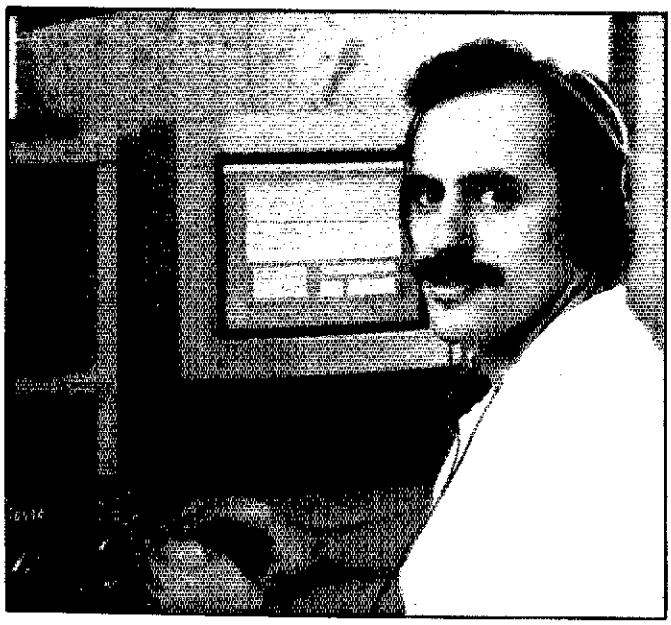
Strays



ARRL UHF/VHF Advisory Committee Chairman Tom Kirby, W1EJ (r), stopped by HQ recently to drop off a check for $1000: a contribution from his employer, GTE Government Systems Corporation. The grant was made to the organization of Tom's choice as part of the GTE's Volunteers Initiative Program in recognition of the hundreds of hours of volunteer work Tom has done on behalf of the League. Tom designated the W1AW renovation fund as the recipient, which rated a special preview tour of the newly renovated facility by Executive Vice President Dave Sumner, K1ZZ. Here they're inspecting the main audio console for the new bulletin transmitters. (*photo KC1MP*)

A Computer-Controlled Digitized-Speech System for SSB Contesting

In addition to providing contact logging, duplicate call-sign checking and automatic time entry, you can make your computer *speak* for you!



By Bryan P. Bergeron, NU1N
30 Gardner Road, Apt 1G
Brookline, MA 02146

Radio contesting is enjoyable, but demanding in terms of equipment and human endurance. Over the years, many ways and means for making contesting successful and enjoyable have evolved. These approaches range from using a desk microphone (instead of a hand-held one) to avoid arm fatigue, to that of keeping a small refrigerator loaded with provisions next to the operating position. Hardware and software aids have also evolved to support the contester's habits. For example, many serious contesters use real-time computerized logging, complete with duplicate-call-sign checking. Similarly, CW contesters would be at a disadvantage without a stand-alone or computer-based keyer programmed with calling sequences, reports, and the like. In this article, I'll describe the SSB equivalent of a contest keyer. Instead of generating Morse code, this Macintosh®-based system produces *speech* that is indistinguishable from your own.

Introduction

Well over 95% of my HF activity is on CW, partly because I prefer this mode to SSB and RTTY, and partly because I can operate at any time without disturbing my family (as long as I use headphones). The "silent" nature of CW is especially important in contests, where one can expect to be operating well into the early morning hours.

With the approach of the March 1989 CQ World Wide Prefix (WPX) Contest, however, I looked for a way to enter the fray on SSB (perhaps picking up a few new DXCC countries in the process!) without disturbing my family. Experience had shown me that, in our small apartment, even working with a boom microphone and speech processor proved unsatisfactory: Whispering loudly doesn't cut through a pile-up very effectively. What I needed was a way to produce specific speech sequences quickly and easily. My first attempt at a solution—a system based on a cassette-tape player plugged into the mike jack of my transceiver—was quickly abandoned because of the inherent constraints of linear data access. I had to fast-forward or reverse the tape to a specific location in preparation for each transmission. My requirement to quickly access specific speech sequences suggested that I needed a computer for any realistic solution to my problem.

After some thought, a little high-level-language programming, and a bit of soldering, I finally developed a workable system for silent and efficient SSB contesting. The technique takes advantage of the sound-generating capabilities of the Apple® Macintosh computer, or Mac. In addition to producing easily customized speech sequences to drive my ICOM IC-751A transceiver, this approach also provides computerized logging and includes duplicate-call-sign checking and automatic time entry.

System Overview

The main screen of the computer program is shown in Fig 1. In the top panel are *buttons* for calling CQ, for transmitting reports, the station call sign, and for generating a few standard replies and inquiries used in contesting. Selecting one of these buttons with the mouse (the standard pointing device for the Mac), causes the computer to produce the corresponding speech sounds. For example, selecting the **Report** button in Fig 1 results in sending: *You are five by nine, number two nine one, QSL?* The computer-generated audio signal, connected to the mike input of the transceiver, serves as the basis for SSB modulation. Because I use VOX, toggling between transmit and receive modes is automatic.

The middle panel in Fig 1 provides a text field (the **TAB** key, as well as the mouse, can be used to move the cursor from field to field) in which the other station's call sign can be entered, a sequential contact number assigned, and includes buttons for recording the band used and the other station's signal report. The buttons that indicate the band and the signal reports recorded I call *radio buttons*, because only one button in a group can be selected at a time (just like the buttons used to select frequencies on many car radios). The sequential contact number (**Their Number** in Fig 1) is automatically incremented by one each time a log entry is made. Selecting the **Call** or **Their Number** button causes the contents of the corresponding fields to be translated into speech. For example, selecting the **Call** button with CR6DTH (wishful thinking!) in the call-sign field results in the computer saying: *Charlie Romeo Six Delta Tango Hotel*. Selecting the **Their Number** button with 291 in the number field produces: *Two Nine One, QSL?*

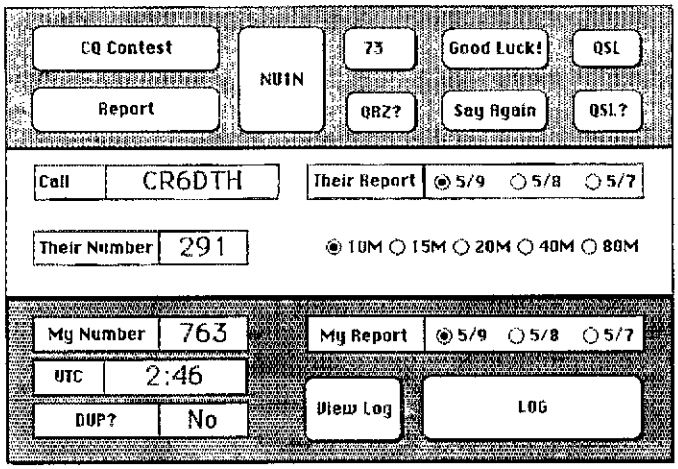


Fig 1—The main computer screen of the digitized speech contesting system. Buttons—selected with the mouse-directed cursor—control the generation of predefined or dynamic speech sequences. Similarly, the band used and the signal reports are recorded by selecting the appropriate radio buttons. Contact logging and dupe checking is also automated. Selecting the **View Log** button brings the contact log into view (see Fig 2).

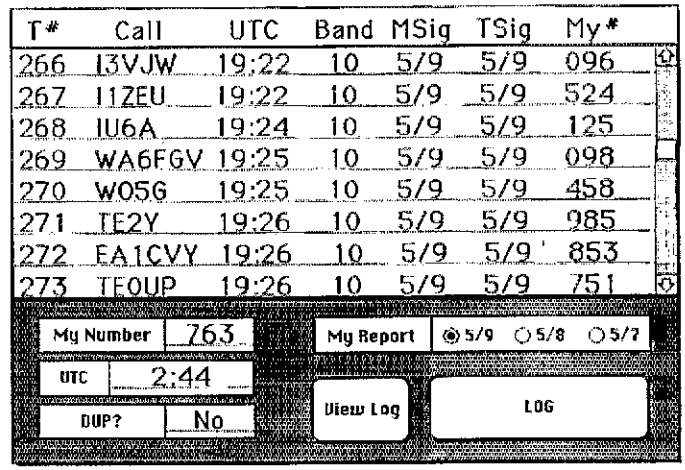


Fig 2—The contact log, a scrollable text field overlaid on the main screen of the system (see Fig 1). From left to right are: their contact number (**T#**); call sign (**Call**); time (**UTC**); the band on which the contact was made (**Band**); my signal report (**MSig**); their signal report (**TSig**); and my contact number (**My#**). The slider bar along the right border of the text field is used to move forward and backward within the log. Clicking in the center of the text field with the mouse hides the data log from view, and returns the system to its original appearance (see Fig 1).

The lower panel in Fig 1 provides an area to record the sequential contact number given to you; the UTC time (based on the Mac's internal clock); feedback on whether or not the call sign entered in the middle panel exists in the computer-based logbook; buttons to record your signal report; a button (**View Log**) to access the logbook (see Fig 2); and a button (**LOG**) to save the information currently on the screen in the logbook.

When accessed via the **View Log** button, the logbook entries (see Fig 2) appear in a field of scrollable text. That is, contact data is accessed by moving the slider, located along the right border of the text field. Using the mouse to move the slider up brings earlier records into view; moving the slider down shows more-recent entries. Data stored in the logbook for each contact includes the sequential contact numbers and the signal reports of both stations, the call sign of the other station, and the band used.

For example, the top entry in Fig 2 shows that my 266th contact in the contest—with I3VJW—was at 1922Z on 10 meters. We gave each other 5/9 signal reports, and I was I3VJW's 96th contact. Moving the mouse-directed cursor over the logbook data and clicking the mouse button hides the log data from view, and returns the program to the state shown in Fig 1.

During the WPX contest, I normally listened for a station calling "CQ Contest," and entered the station's call sign in the **Call** field. If the duplicate-call-sign search was negative, I selected the **NU1N** button when appropriate, generating the corresponding phonetic speech sequence. When called by a station, I altered their signal report if necessary (normally I used the default 5/9 report) and then selected the **Report** button. The station's report was then generated, in my voice, including the station's sequence number. Normally, the station operator responded with *QSL*, and I responded in turn with *QSL* by selecting the **QSL** button.

In heavy QRM, operators sometimes request a repeat of their entire report, their signal report, their sequence number, or a letter in my call sign. In the first three cases, the requested data is generated by selecting the **Report, Their Report,** and **Their Number** buttons, respectively. In the last case, the call-sign area is used. For example, to repeat the last letter of my call, N, I type *N* into the call-sign field and then select the **Call** button one or more times, followed by the **QSL?** button. The resulting speech generated is *November...November... November, QSL?*

Even in complex exceptions to normal operation, only a few keystrokes and mouse selections are required to operate this system. Furthermore, the keystrokes and mouse selections are buffered. That is, you can quickly select three or four buttons, and the routines associated with each button are executed in turn. This provision for type-ahead makes it possible to momentarily ignore the computer screen and jot down notes or perform other chores.

Implementation

To get this system up and running, three basic steps are required: capturing a variety of phrases and words with an audio digitizer; designing the software to reproduce the digitized sounds and provide for automated logging of contest information; and interfacing the sound output of the computer to the microphone input of the HF transceiver. Although this discussion assumes a particular computer hardware and software platform, the techniques are transferable to any computer system that supports analog-to-digital (A/D) conversion, including the IBM®, Tandy®, and Commodore computers.

Audio Digitizers

In order to provide this system with a personal, human-sounding voice, the analog speech waveform must be converted into a digital format that can be manipulated by a computer. A variety of A/D converters or digitizers are available, including inexpensive ($150 or less) units for the Apple Macintosh, Tandy, and IBM PC computers.[1,2] If you prefer the home-brew approach, you can build an audio digitizer for about $35.[3] The audio digitizer used for this project, MacRecorder ($150), has a built-in microphone, as well as a mike jack. (Although I found the internal mike to be more than adequate for my use, you can use your favorite mike, if you like.) The MacRecorder digitizer, about the size of the base plate on a set of Bencher paddles, comes complete with an impressive array of software tools, including those for selective audio filtering (see Fig 3), spectral analysis, and audio compression.

A major limitation of computer-based speech generation is that a large quantity of data must be stored in order to reproduce speech with sufficient fidelity. Regardless of the make of the digitizer used, you will have to keep three factors in mind: the sampling frequency of the digitizer, quantizing noise, and the dynamic range of your digitizer. The basic trade-off is simple: distortion can be avoided at the

[1]Notes appear on page 24.

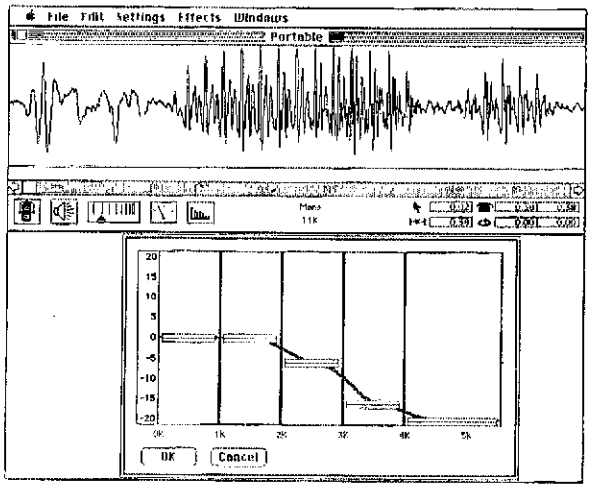


Fig 3—The program interface to MacRecorder, the audio digitizer used to capture and digitize speech on the Macintosh. In the top window is the audio tracing for the spoken word *portable*, digitized at a sampling rate of 11 kHz. The bottom window shows the frequency-selective audio filter, one of the many software tools provided with MacRecorder. In this example, the filter is set to attenuate the audio frequencies above the range useful for SSB communications.

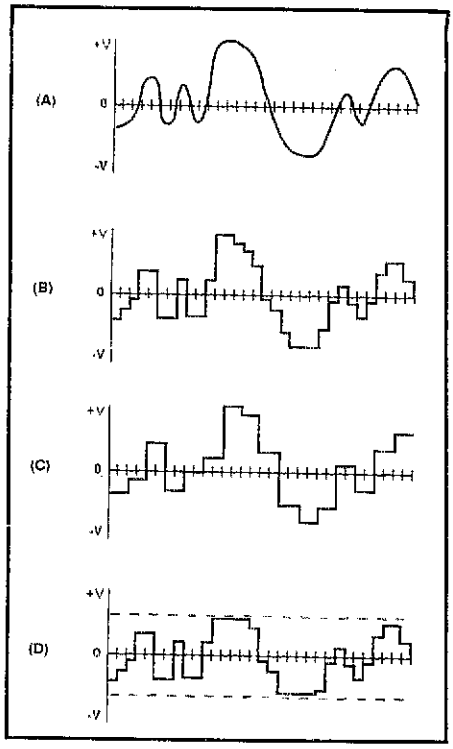


Fig 4—Amplitude (Y axis) versus time (X axis) tracings that illustrate the trade-offs associated with audio A/D conversion. At A, the original analog speech signal. Note the smooth transitions in signal amplitude. At B, a digitized version of the original analog signal, with a sampling rate of one arbitrary time unit. Note the abrupt changes in amplitude with time. At C, the digitized waveform with a sample rate of two time units. Note that this waveform bears little resemblance to the original analog signal, especially when the higher frequencies are compared. At D, the digitized waveform illustrating the effects of clipping. In this example, the dynamic range of the original analog signal exceeds that of the digitizer (the dynamic range of the digitizer is indicated by the dotted lines). Note the distortion caused by clipping, even though the original waveform was digitized at a sampling rate of one arbitrary time unit.

expense of increased memory requirements.

Sampling Frequency

The shape of the sound wave lends tonal qualities to a sound: ie, a sine wave is sweet, whereas a square wave is harsh. The smoother the wave, the cleaner it sounds. A typical analog speech waveform changes smoothly in amplitude, frequency, and shape over time (see Fig 4A).

To store sound waves in a computer, a digitizer is used to take samples of the analog waveform at evenly spaced intervals (see Fig 4B); these amplitude values are stored in memory. If a sufficient number of samples is taken, the original waveform can be reconstructed with a digital-to-analog (D/A) converter. If an insufficient number of samples is taken (see Fig 4C), it is impossible to faithfully reconstruct the original analog signal. Here's why.

The Nyquist theorem states that the minimum sampling rate must be at least twice that of the sampled-signal frequency.[4] Because the average voice occupies a bandwidth of about 4 kHz, the minimum sampling rate for speech is 2 × 4 kHz or 8 kHz. The Nyquist theorem assumes a perfect system. In reality, the sampling rate should be three or four times the highest frequency to be digitized (see referent of note 3).

When the sampling rate is less than twice the signal frequency, the reconstructed signal is of a lower frequency than the original. The higher frequencies in the original signal appear as lower frequencies in the reconstructed signal—a phenomenon known as *aliasing*. Aliasing is a significant source of noise in A/D conversion.

Aliasing can be minimized by sampling the audio signal at a high rate. Sampling at high rates, however, requires larger amounts of RAM and disk-storage space compared to sampling at low rates. In this system, for example, at a sampling rate of 11 kHz, only 11 kbytes of memory are needed. By comparison, at a sampling rate of 22 kHz, 22 kbytes of RAM or disk space are used *for every second* of recorded sound.

Another way to avoid aliasing is to use a low-pass filter that blocks frequencies greater than half of the sampling rate. The MacRecorder provides such filtering.

Quantizing Noise

Most of the inexpensive audio digitizers convert analog data to an 8-bit digital representation. That is, the sound amplitude is restricted to a range of integers from 0 to 255. In an 8-bit system, a sine wave might be represented by the sequence: 128, 150, 255, 150, 128, 106, 0, 106, 128. Most microcomputers—including the Mac—store sound in an 8-bit format. Smooth waves, even when digitized at high sampling rates, become jagged (see Fig 4B). The effect is to introduce *quantizing noise*, or background hiss, in the digitized waveform. Quantizing noise sounds like the high-frequency hiss in a cassette deck without Dolby® or another form of noise reduction. It is possible to minimize quantizing noise by using a 12- or 16-bit digitizer, coupled with modifications in the computer system's hardware and software. A much simpler approach, however, is to filter the high-frequency hiss from the audio signal after it is reconstructed by the D/A converter in the computer.

Dynamic Range

Restricting the representation of the amplitude of an analog waveform to integers between 0 and 255 also limits the dynamic range (the difference between the loudest and softest sounds that can be recorded) of the digitized sound. With an 8-bit system, the dynamic range can be no greater than 48 dB. Sounds that fall outside the dynamic range of a digitizer are simply clipped (see Fig 4D), resulting in a harsh sound. Clipping can be avoided by restricting the dynamic range of the analog signal fed to the digitizer.

Digitizing Speech

The MacRecorder allows you to select one of four sampling rates: 5, 7, 11, or 22 kHz. I found that the 11-kHz sampling rate is a good compromise between audio fidelity and required memory space. The entire program—including the digitized sound files—requires less than 300 kbytes of disk space, leaving 500 kbytes available for log data (on a 3½ inch, 800-kbyte disk).

Using the built-in microphone provided with MacRecorder, I first digitized the alphabet, the numbers from 0 to 9, and the word *portable*. Each of the 37 digitized sound records was stored separately on disk as a file with a name corresponding to its content—ie, the disk files named A, B, and C contain *Alfa*, *Bravo*, and *Charlie*. When

you record the phonetic alphabet, pay particular attention to your intonation and rate of speech. You shouldn't speak in a dull monotone, but keep in mind that a letter could appear as the first, middle, or last character in a call sign, and it should sound natural there. Keeping your rate of speech constant (thereby avoiding choppy-sounding speech) adds to the illusion of reality.

The next step was to record a few canned phrases, including:

CQ CQ Contest from November Uniform One November
QSL
QSL? (this is a question, so watch your intonation)
Say Again
73
Good Luck!
Number
You are (as in *You are five by nine*)
by (as in *You are five by nine*)

Each digitized speech segment was saved under a short, but appropriate, file name. The entire recording session took less than five minutes. The most difficult and time-consuming part of the process was deciding which speech sequences to digitize!

Table 1
Examples of HyperTalk Scripts Associated with the Buttons Shown in Fig 1

```
on MouseUp  -- linked to the "CQ Contest" button
     Play "CQContest"  -- say "CQ CQ Contest from NU1N"
end  MouseUp


on MouseUp  -- linked to the "Report" button
     GiveSignal  -- e.g., say "you are 5 by 9"
     Wait 65  -- pause 65 60ths of a second
     GiveNumber  -- e.g., say "number 0 7 8"
     Play "QSL?"  -- ask "QSL?"
end  MouseUp


on GiveTheirCall  -- linked to the "Call" button
     put length of card field TheirCall into NCount
     Repeat with Count = 1 to NCount
          get character Count of card field TheirCall
          put it into Temp
          if Temp = "/" then
               play  "portable"
          else
          play Temp  -- e.g., if Temp = N then play "November"
          end if
     end  Repeat
end  GiveTheirCall


on Idle  -- update the time when there is no user activity
     put The Time into background field "Time"
end  Idle
```

The top routine is linked to the **CQ Contest** button. Similar routines are linked to the **73, QSL?** and other predefined speech buttons. The second routine from the top is linked with the **Report** button. The third routine from the top, linked to the **Call** button, generates speech corresponding to the call currently in the call-sign field, eg, CR6DTH as in Fig 1. The bottom routine provides for the real-time UTC clock.

The Software

Like most digitized-speech systems, this one generates its audio output by reversing the A/D conversion process. Luckily, many microcomputers, including those produced by Apple, Atari®, Commodore, Tandy, and IBM, either have built-in D/A converters, or are designed to accommodate them as options. The Macintosh computer line includes a built-in, 8-bit D/A converter. Sound records residing on disk, represented by a series of values from 0 to and 255, inclusive ($2^8 = 256$), are first moved to a buffer in RAM and then on to a D/A converter chip.[5] After the digitized signal is converted to an analog signal, it is amplified and sent to an internal speaker. The analog signal is also available for external use at a standard 3.5-mm jack mounted to the rear panel of the Mac.

The D/A converter chip and associated circuitry in the Mac can be accessed by a variety of software languages. Although assembler or FORTH (my favorite language) can be used to work with the hardware on a very low level, such a degree of control is hardly necessary for a project of this nature. High-level languages, such as BASIC or Pascal, provide all the necessary access to the sound-producing hardware. However, even working with BASIC on the Mac can be a challenge, especially if you want to provide all of the standard Mac interface features, including mouse support, windows, buttons, and scrolling text fields. On the Mac, the software tool that provides the best compromise between ease of use, support for the standard user interface, and speed of execution is HyperCard®. This tool provides the basis for the SSB Contesting System.

HyperCard

Apple Computer, Inc, promotes HyperCard as a personal tool kit for accessing and manipulating text, graphics, video, music, voice, and animation.[6,7] HyperCard is based on the concept of *card files*, in which *cards*, containing the basic information, are in turn organized into units called *stacks*. These cards and stacks can be linked, manipulated, and organized in a variety of ways. A high-level programming language, HyperTalk,™ allows you to easily extend the capabilities of HyperCard. HyperTalk, somewhere between English and BASIC in structure, is not only compact, but is easy to learn and use. Over 95% of the HyperTalk code used in my program is shown in Tables 1-3.

HyperCard should be familiar to Macintosh users, because it is included free with the purchase of the computer. The availability of numerous third-party software add-ons and books has helped to popularize HyperCard as the programming environment of choice for nonprogrammers. On-line retrieval services, such as CompuServe,™ are filled with libraries of useful HyperCard shareware, including stacks developed expressly for radio amateurs.

You can program HyperCard easily. Creating buttons, text fields, and graphics requires only a few mouse-directed menu selections. Programming time for a simple application is minimal. For example, the

Table 2

HyperTalk Scripts Associated with the Log Button

```
on LogData -- make an entry into the contest log
    global TheBand  -- e.g., 10, 20, 40, or 80 meters
    global TheirReport  -- e.g., 5/9
    global MyReport  -- e.g., 5/9
    -- first get the data
    put item 1 of card field TheirNumber into TheirNumber
    put item 1 of card field TheirCall into CallSign
    put item 1 of card field MyNumber into TheCount
    -- now format it with spaces
    put Return & TheirNumber & Space & CallSign & Space into Temp1
    put The Time & Space & TheBand & Space & TheirReport into Temp2
    put Space & MyReport & Space & theCount into Temp3
    -- now save it in the field LogData
    put Temp1 & Temp2 & Temp3 after last word of card field LogData
end LogData

on UpdateCardFields  -- clear the callsign and increment contact counter
    get item 1 of card field TheirNumber
    add 1 to it  -- increment the contact number by 1
    if it < 99 then  -- not necessary, but easier to understand in QRM
        put "0" & it into it
    end if
    put it into card field TheirNumber  -- show the incremented number
    put " " into card field TheirCall  -- clear the current call sign
end UpdateCardFields

on MouseUp  -- linked to the "LOG" button
    LogData  -- make an entry into the contest log
    UpdateCardfields  -- clear the call and increment contact counter
end MouseUp
```

Selecting the **Log** button with the mouse first makes an entry into the contest log (top), and then updates the contact counter and prepares the screen for the next contact (middle). These two subroutines are called by the HyperTalk script (bottom) that is linked directly with the **Log** button.

Table 3

HyperTalk Script To Perform Duplicate Call Checking and Notification

```
On ReturnInField  -- linked to the "Call" button
    -- activated when the user hits the Return key
    put item 1 of card field TheirCall into CallSign
    -- get the call sign
    if CallSign is in card field LogData then
    -- see if it's in the contest log
        put "Yes" into card field Dup
    else
        put "No" into card field Dup
    end if
End ReturnInField
```

This script is activated when the user hits the RETURN key, after entering the call sign in the appropriate field (in Fig 1, the call sign field contains CR6DTH). The result of the duplicate search appears in the Dup field (shown in the bottom left-hand corner of Fig 1 with **No**).

user interfaces displayed in Figs 1 and 2 took about 10 minutes to set up. After defining the appearance of a HyperCard program, the next step is to associate subroutines (written in HyperTalk) with each button, text field, or other object in the interface. Total programming time for this project was about an hour. A more experienced HyperTalk programmer could likely create a much more elaborate program in less than half that time.

The HyperTalk code associated with the **CQ Contest** button shown in Fig 1 appears at the top of Table 1. Note the brevity of the HyperTalk commands. The majority of the listings are comments (following the double hyphen [--] symbols). Like most of the routines linked to HyperCard buttons, this code is activated when you release the mouse button over the HyperCard button. (In normal operation, you position the cursor over the desired button with the mouse, then click on the mouse button to select the HyperCard button.) The HyperTalk command **Play** expects the name of file of digitized audio as a parameter. The **Play** routine opens the file, converts the data to an analog signal and sends the signal to the sound port on the Mac. The other canned speech routines are no more difficult to implement.

Chaining canned speech fragments into sentences is only a bit more difficult than playing single files. The second routine from the top in Table 1 shows the HyperTalk code linked to the **Report** button shown in Fig 1. After you release the mouse button over the **Report** button (resulting in a Mouse-Up event), the **GiveSignal** subroutine is called, followed by a short delay. The **GiveReport** subroutine is then called, and then the canned speech *QSL?* is played.

Perhaps the most difficult routine in the program is the **GiveTheirCall** routine in Table 1. When the **Call** button is activated, the length of the call sign in the corresponding field is computed, ie, for CR6DTH the length is 6. Then, starting with the first character or number and ending with the last, the appropriate digital records are played. The D/A conversion process is fast enough that there is no noticeable delay between the spoken characters.

Not directly related to the digitized speech system—but important in contesting—is the provision for the UTC display (Table 1, bottom). **The Time** is a global variable accessible from within the HyperCard environment, updated every 60th of a second. Whenever there is no user activity, such as between keystrokes, this HyperTalk routine displays the current time in the previously created Time field. The Mac's internal clock can be set to provide time in either a 12- or 24-hour format.

Table 2 shows the HyperTalk code required to implement the program's automatic logging features. Selecting the **LOG** button causes the contact data to be entered in the logbook and prepares the program

for the next contact. The **LogData** routine (Table 2, top) first collects the contents of the text fields and the global variables that indicate band used and signal reports. The next step is to format the data in the proper order, and finally, append the data to the end of the LogData file. The **UpdateCardFields** routine increments the contact counter and clears the call sign and contact-count fields.

The HyperTalk code in Table 3 shows all that is required to perform duplicate call-sign checking in the program. Hitting the **RETURN** key, after entering the call sign in the appropriate card field (see the location of CR6DTH in Fig 1), activates this duplicate checking routine. If the call sign is in the LogData, this routine will put **Yes** in the Dup field and beep three times to attract the operator's attention. Otherwise, the routine will put **No** in the field.

Transceiver Interface

Like the HyperCard software, the hardware required for this project is sheer simplicity. The main requirement is a means of coupling the low-impedance audio output of the Mac to the high-impedance microphone input of the transceiver.

Fig 5 shows the schematic of the circuit that I found optimum for use with my '751A. Impedance matching is handled by the audio transformer (T1). Because the Mac sound port is capable of easily driving a set of low-impedance headphones or a small speaker, R1 (a 10-kΩ, ¼-W resistor), is necessary to prevent overdriving the microphone input. C1, a 0.01-μF bypass capacitor, is included to prevent RF entering the microphone circuit. C2 (a 2.2-μF, nonpolarized, electrolytic capacitor), is used to eliminate the high-frequency hiss or quantization noise associated with the A/D and D/A conversion process. C2 also eliminates possible false triggering of the VOX circuitry by minimizing the high-frequency, computer-generated noises that sometimes accompany keyboard activity and disk-drive accesses.

Through trial and error, I found that the optimum settings for my '751A are: VOX on; VOX delay on, but minimal; compression off; and microphone gain set to 1/8th of maximum. Although it helps to enlist the aid of another amateur in determining these settings, you can use a second receiver to monitor the audio quality of the modulation. If you do use a local receiver, turn your transceiver's RF power output to minimum.

Summary

This digitized-speech system is not only enjoyable to use, but is an efficient means of working in a chaotic SSB contest environment. My family appreciates the lack of interruptions to their sleep, and my throat isn't the least bit sore after a full night of "voice" contesting. If you would like a copy of the HyperCard stack, please send me a business-size SASE together with a formatted Mac disk.

Bryan Bergeron, NU1N, has been an active ham for over 20 years, starting at age 11. (He previously held the calls WB5HQQ and K5HQ.) Operating HF CW is Bryan's main interest; he also enjoys building equipment and chasing DX. Weight training, long-distance biking and swimming are among Bryan's other hobbies.

Bryan is a physician and Instructor in Medicine at the Harvard Medical School. His postgraduate work in computer science and medical informatics was done at Harvard. He has performed undergraduate work in electrical engineering at Louisiana State University and in neurobiology at the Marine Biology Laboratory, Woods Hole, Massachusetts.

A certified developer for the Apple Macintosh computer, Bryan has written three commercial software packages for the Mac. His writing experience includes about a dozen articles on various aspects of Amateur Radio and three dozen articles on computer applications in medicine. He's also a contributing editor for M.D. Computing, *a medical journal.*

Notes

[1]MacRecorder Audio Digitizer, Farallon Computing, Inc, 2150 Kittredge St, Berkeley, CA 94704, tel 415-849-2331.

[2]Audio Digitizers for Tandy and IBM computers, Covox Inc, 575-D Conger St, Eugene, OR 97402, tel 503-342-1271.

[3]S. Ciarcia, "Talk To Me!," *Ciarcia's Circuit Cellar*, (Peterborough, NH: BYTE Books, 1979), pp 77-87.

[4]From R. Kellejian, *Applied Electronic Communication*, (Chicago: Science Research Associates, Inc, 1980), pp 402-403: "A pioneer in the development of PCM (pulse-code modulation), Claude Shannon of Bell Telephone Laboratories developed the theoretical relationship between baud rate, signal-to-noise ratio. . . and bandwidth for reliable dc-level data communications. . ." On p 418: "Incidentally, Shannon based his PCM development work in the 1940's on principles advanced by Harry Nyquist in the 1920's. Nyquist advanced a theorem that a given bandwidth can carry pulse signals of half its high-frequency cutoff. Nyquists' relationship was actually the inverse of Shannon's sampling theorem, but in engineering practice the term *Nyquist rate* is often used to specify Shannon's *sampling rate*."—*Ed.* For more information, see H. Nyquist, "Certain Factors Affecting Telegraph Speed," *The Bell System Technical Journal*, Vol III, No. 2, Apr 1924, pp 324-346; R. Schellenbach and F. Noble, "Switched-Capacitor Filters—An Emerging Technology for Amateur Radio Use," *QST*, Mar 1984, pp 19-23; R. Nelson, "The RePlay Digital Voice Message System," *QST* Jun 1988, pp 31-37; B. Hale, ed, *The 1989 ARRL Handbook*, pp 8-21 to 8-22.

[5]C. Rose, *Inside Macintosh, Volumes I, II, and III* (Menlo Park, CA: Addison Wesley, 1985).

[6]D. Goodman, *The Complete HyperCard Handbook* (New York: Bantam Books, 1987).

[7]HyperCard-like programs were recently introduced for MS/PC-DOS computers by other vendors.

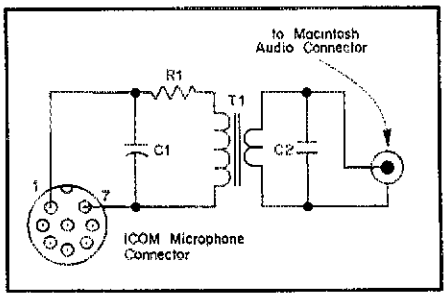


Fig 5—The hardware interface between the IC-751A transceiver microphone jack (an 8-pin DIN connector, left) and the sound output port of the Macintosh computer (a 3.5-mm monaural jack, right). T1 is a small audio transformer with an 8-Ω primary and a 1000-Ω secondary. R1, a 10-kΩ, ¼-W resistor limits the audio input to the microphone jack. C1, a 0.01-μF disc-ceramic capacitor, is used to bypass stray RF energy at the microphone input. C2, a 2.2-μF, nonpolarized-electrolytic capacitor, serves to eliminate the unwanted high frequency noise generated by the Mac's sound system.

Strays

I would like to get in touch with...

☐ hams who have undergone heart transplant surgery. Joe Pearlstein, NU3Y, 7210 Bradford St, Philadelphia, PA 19149, or on packet@ K3PGB.

☐ any hams who operate from nursing homes, or any hams who would just like to exchange correspondence. Harry Burton, K1SV, Brewster Manor Nursing Home, Drawer QQ, Room 220 B, Brewster, MA 02631.

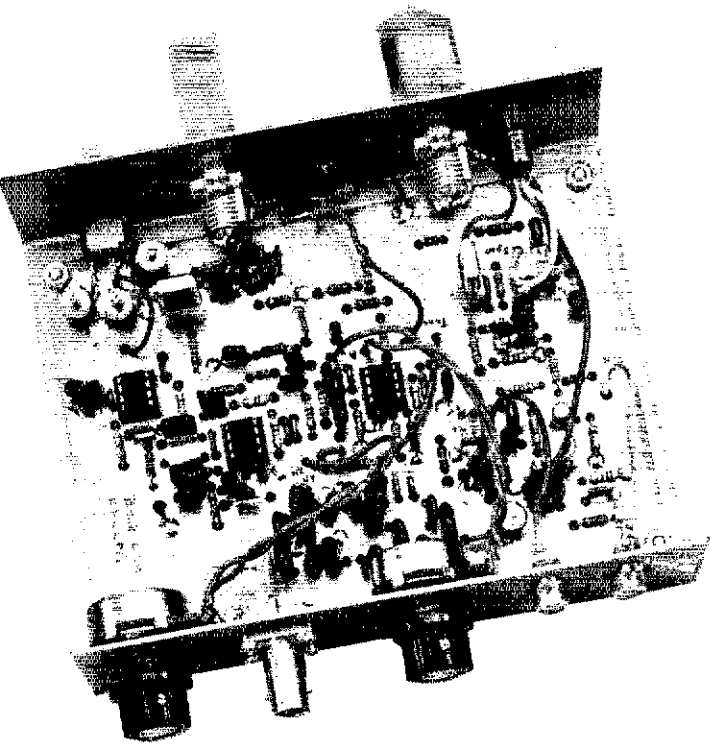
☐ any hams or clubs in the the coastal area of Maine. I am planning to move there and would like to correspond with other amateurs in the area. Mark A. Cobbeldick, KB4CVN, Rte 6 Box 289, Fort Payne, AL 35967.

☐ anyone who works or did work for a TV antenna manufacturer. Al Tobia, KB6KAX, 7603 Linden Ct, Newark, CA 94560.

☐ anyone who has 35 mm transparencies of TV station IDs or test patterns. The British Amateur Television Club, an organization of ATVers and TV professionals, is producing its second educational video tape and is in need of North American TV slides. Andy Emmerson, G8PTH, 71 Falcutt Way, Northhampton, NN2 8PH, United Kingdom.

QST congratulates...

☐ Maria Evans, KT5Y, of Columbia, Missouri, on being selected as the 1989 recipient of the American Medical Association Education and Research Foundation Jerry L. Pettis Memorial Scholarship. Maria was net manager of the Missouri Single Sideband Net, has held section appointments as public information officer and affiliated club coordinator, and has contributed to *QST* and The ARRL *Operating Manual*. She is presently a senior at the University School of Medicine.



The QRP Three-Bander

This low-power, direct-conversion CW transceiver covers 18, 21 and 24 MHz, and includes sidetone, spotting and relay-less full break-in—all on one circuit board!

By Zack Lau, KH6CP
ARRL Laboratory Engineer

With this solar cycle's activity nearing its peak, the time for high-band QRP operation is *now*. This low-power CW transceiver is capable of exploiting these conditions. It's easy to use, sensitive enough to receive weak QRP stations, and includes audio limiting to protect your ears from loud local stations. Moving from band to band with this rig is easy: Just change crystals and re-peak its receiver input. Key down, the QRP Three-Bander produces its own sidetone—and RF, too: 1.25 to 4 watts, depending on the band, the dc supply voltage and the particular transistors used in the transmitter. And you can build the QRP Three-Bander *your* way: A complete kit of parts is available, or you can assemble your version using ground-plane construction.[1,2]

Circuit Description

Fig 1 shows the transceiver circuit. U1, an NE602N doubly balanced mixer IC, operates as a direct-conversion (D-C) product detector, converting the incoming signal directly to audio by mixing it with energy from Q2, a bipolar-junction-transistor (BJT) variable crystal oscillator (VXO). Although the NE602 achieves its conversion gain and low noise figure at the expense of dynamic range, it rejects AM-broadcast-band signals well when a capacitor is present across its differential output (pins 4 and 5).

To help prevent hum pickup, the NE602's audio output is amplified by a differential amplifier (U2A, half of an NE5532 low-noise, audio-op-amp IC), which feeds a moderate-gain filter stage (U2B). The final audio-amplifier stage (U3A, half of another NE5532) drives low-impedance stereo headphones at a comfortable level. Q1, a 2N5486 junction-field-effect-transistor (JFET) used as a switch, breaks the connection between U2B and U3A in transmit to keep keying clicks and thumps out of the headphones.

The QRP Three-Bander uses audio amplitude limiting instead of automatic gain control (AGC): Diodes in the filter and final-audio-amplifier stages (D1-D2, and D3-D4, respectively), and R18 (between the final audio amplifier and J2), provide ear and headphone protection by clipping the transceiver's audio output on strong signals.

Transmitter RF is generated by Q3, an MPS918 (or 2N5179) BJT operating as a VXO. Q3's output signal drives a buffer amplifier consisting of two BJTs: Q5, a 2N2222, and Q6, a 2N5109 (or selected 2N2222A). The buffer circuit is based on a design by Lewallen;[3] this version is re-biased for higher power output to make it more suitable for transmitters. The transmitter power amplifier, Q8, is an MRF237 BJT running class C. A seven-element low-pass filter (L1 through L3, and C37 through C40) reduces the harmonic content of the transmitted signal. Because this filter's cutoff frequency is high enough to pass the transceiver's 24-MHz output with little loss and yet is low enough to reduce harmonics of the rig's 18-MHz signal to a legal level, it requires no adjustment for band changes. Fig 2 shows the output spectrum of the Three-Bander's transmitter.

Full-break-in, relay-less TR switching is one of the QRP Three-Bander's finer points. The TR switch is a wide-bandwidth version of the switch used by Lewallen in his Optimized QRP Transceiver.[4] If you model this switch or measure its characteristics, you'll notice lots of passband ripple: The filter (C36, C41, C42, L4, L5 and L6) has steep skirts and three peaks corresponding to the bands covered by the transceiver. Although the calculated safe maximum-power-handling capability of this switch is just 1.4 W at 24.9 MHz, it seems to handle the transceiver output just fine. (A PIN-diode switch with appropriate biasing could handle more power, but PIN diodes are more difficult to find than ordinary switching diodes.)

The Three-Bander's transmitter section uses *differential keying*—a method of time-sequencing the keying of multiple transmitter stages to achieve a desired effect. As implemented in this circuit, differential keying helps eliminate chirp by turning on the transmit oscillator (Q3) before the buffer amplifier (Q5-Q6) comes on. This sequence is reversed at key up: The buffer amplifier turns off before the oscillator stops. Turning the oscillator on before the buffer gives the oscillator time to stabilize before the transmitter puts out RF; keeping the oscillator on after the buffer turns off assures that frequency changes by the turning-off oscillator won't be present in the transmitted signal.

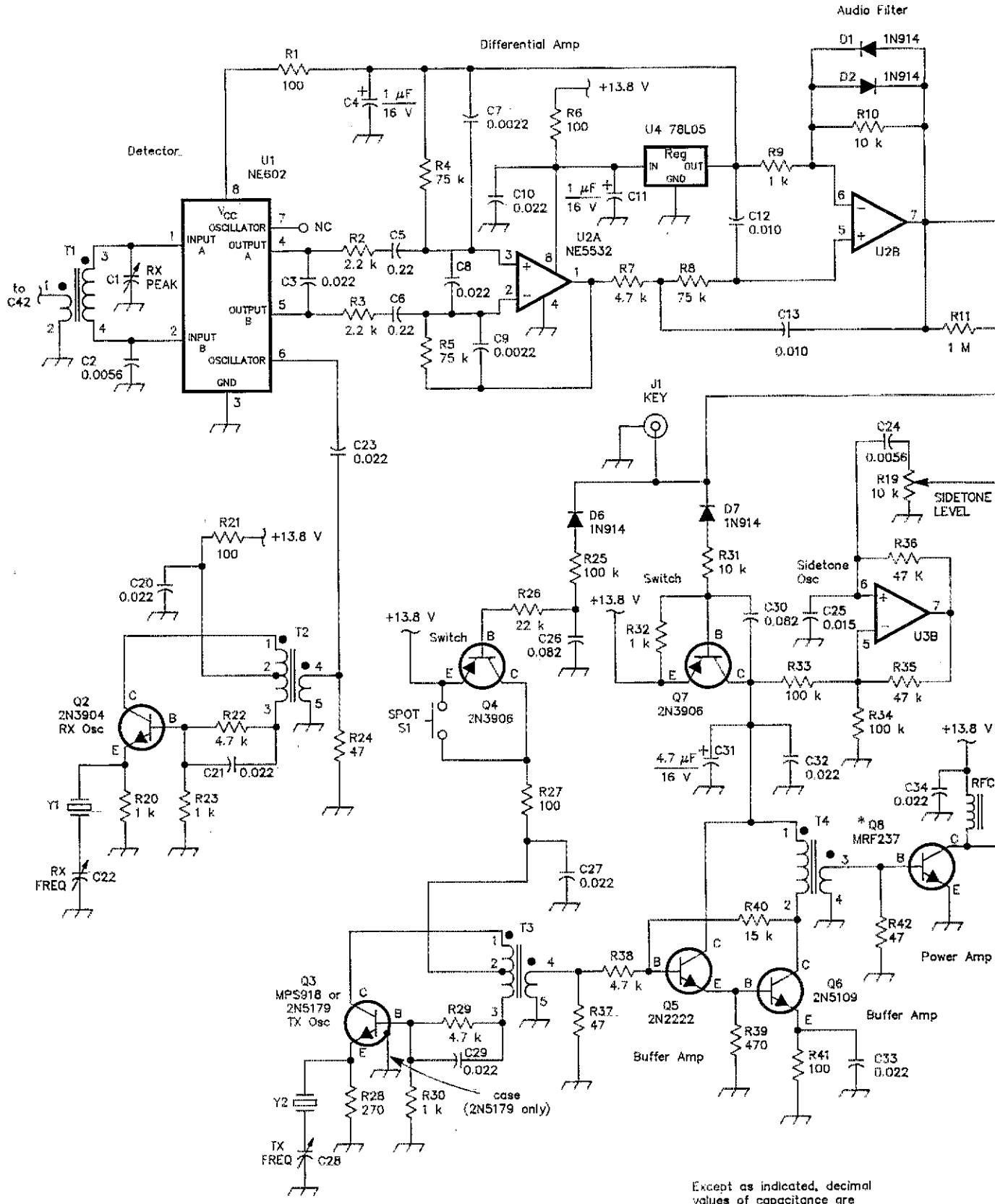
To avoid key clicks—which would make the Three-Bander's signal wider than necessary for effective CW communication—the waveform of the transmitted signal is shaped in the buffer amplifier. Even though the transmitter power amplifier is nonlinear and tends to shorten the rise and fall times of its driving signal, the Three-Bander's transceiver's RF-output waveform is well-shaped, as shown in Fig 3. The open-circuit voltage at the **KEY** jack is positive, and about 0.5 V less than the transceiver's dc supply voltage; 1.3 mA flows in the keying circuit line when the **KEY** jack is shorted.

Getting the Parts

The tough part of building has nothing to do with soldering or making holes in metal: It's finding the parts! Fortunately, all the parts used in this project are sold by a number of suppliers—or you can buy a complete kit of parts from RADIOKIT, as detailed at Note 1.

Parts availability is one thing; parts cost is another. Aside from the crystals, variable capacitors C1 (**RX PEAK**), C22 (**RX FREQ**)

[1]Notes appear on p 30.



Except as indicated, decimal values of capacitance are in microfarads (µF); others are in picofarads (pF); resistances are in ohms; k=1,000, M=1,000,000

*Heat sink required; see text
● = phasing
SM = silver mica

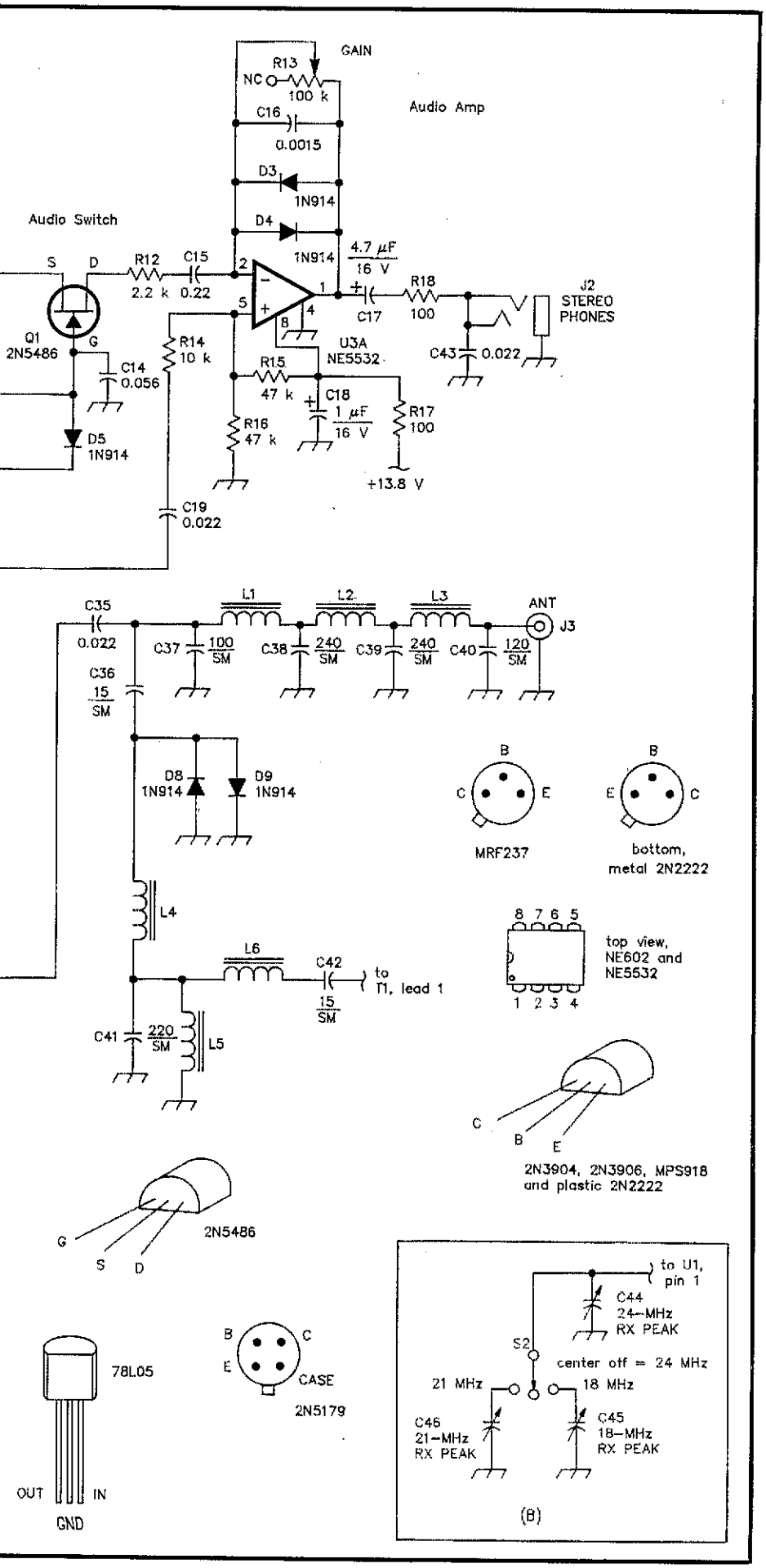


Fig 1—Schematic of the QRP Three-Bander. All resistors are ¼ W, carbon film. The inset, B, shows how to replace C1 with a switch (S2) and three trimmer capacitors (C44-C46); if you use this variation, peak C44 at 24 MHz *before* adjusting C45 and C46 for maximum received-signal strength at 21 and 18 MHz.

C1—50 pF, air dielectric, variable (Millen 21050 7- to 45-pF ceramic trimmers, used in ground-plane version, and switch and trimmers [S2 and C44-C46, Fig 1B] have been used successfully). See text.
C2, C24—0.0056 µF, ceramic.
C3, C8, C10, C19-C21, C23, C27, C29, C32-C35, C43—0.022 µF, ceramic.
C4, C11, C18—1-µF, 35-V tantalum electrolytic.
C5, C6, C15—0.22 µF, metal film.
C7, C9—0.0022 µF, metal film (Bessel AF filtering). Use 0.0027 µF for tighter, Chebyshev filtering.
C12, C13—0.010 µF, metal film (Bessel AF filtering). Use 0.012 µF for tighter, Chebyshev filter.
C14—0.056 µF, metal film.
C16—0.0015 µF, polypropylene.
C17, C31—4.7-µF, 35-V, tantalum electrolytic.
C22, C28—14 pF, air dielectric, variable. (Millen 21015 capacitors and Johnson 189-series trimmers have been used successfully. Several months of on-air-use caused severe wear in the RX FREQ Johnson 189-series capacitor, however; use a tuning, not trimmer, capacitor at RX FREQ for longest capacitor life.) See text.
C25—0.015 µF, metal film.
C26, C30—0.082 µF, metal film.
C36, C42—15 pF, silver mica.
C37—100 pF, silver mica.
C38, C39—240 pF, silver mica.
C40—120 pF, silver mica.
C41—220 pF, silver mica.
C44-C46—30-pF plastic trimmer (optional). Used in conjunction with S2, these capacitors replace C1. See text.
D1-D9—1N914 or 1N4148 silicon switching diode.
J1—Phono jack.
J2—1/8-inch stereo phone jack.
J3—BNC jack. See text.
L1, L3—Toroidal inductor,12 turns of no. 26 enam wire on a T-25-6 powered-iron core (0.46 µH).
L2—Toroidal inductor, 13 turns of no. 26 enam wire on a T-25-6 powdered-iron core (0.52 µH).
L4, L6—Toroidal inductor, 26 turns of no. 24 enam wire on a T-44-2 powdered-iron core (3.8 µH).
L5—Toroidal inductor, 9 turns of no. 24 enam wire on a T-25-6 powdered-iron core (0.26 µH).
Q1—2N5486 JFET. A 2N4416, 2N5485, 2N5484 or MPF102 should also work.
Q2—2N3904 BJT.
Q3—BJT, MPS918 or 2N5179 recommended. A 2N3904 will work, but may exhibit faster keying rise and fall times at 24 MHz than those shown in Fig 3, and the transceiver's RF power output may be suboptimal.
Q4, Q7—2N3906 BJT.
Q5—2N2222 BJT. A 2N3904 will also work.
Q6—2N5109 RF-power BJT. A selected metal-cased (TO-18) 2N2222A will work; some 2N2222As may not have enough gain for optimum power output at 24 MHz. See text.
Q8—Motorola MRF237 RF-power BJT.
R1, R6, R17, R18, R21, R27, R41—100 Ω.
R2, R3, R12—2.2-kΩ (Bessel AF filtering).

Use 3.3-kΩ for tighter, Chebyshev filtering.
R4, R5—75 kΩ.
R7, R22, R29, R38—4.7 kΩ.
R8—75 kΩ (Bessel AF filtering). Use 56-kΩ for tighter, Chebyshev filtering.
R9, R20, R23, R30, R32—1 kΩ.
R10, R14, R31—10 kΩ.
R11—1 MΩ.
R13—100-kΩ, audio-taper potentiometer.
R15, R16, R35, R36—47 kΩ.
R19—10-kΩ, audio-taper potentiometer.
R24, R37, R42—47 Ω.
R25, R33, R34—100 kΩ.
R26—22 kΩ.
R28—270 Ω.
R39—470 Ω.
R40—15 kΩ.
RFC1—Toroidal RF choke. Use 6 turns of no. 26 enam wire on an FT-37-43 ferrite toroid (10 μH).
S1—Normally open, momentary push-button.
S2—SPDT, center-off toggle (optional). Use only if C1 is replaced with C44, C45 and C46. See text.
T1—Narrow-band transformer, 10.5:1 turns ratio; 21 turns of no. 26 enam wire on a T-30-6 powdered-iron toroid (primary, 1.75 μH). Secondary has 2 turns of no. 24 or 26 enam wire over primary winding.
T2—Broadband transformer, 10:1 turns ratio; 20 turns of no. 26 enam wire on an FT-37-43 ferrite toroid (primary). Tap is 13 turns from the collector. Secondary has 2 turns of no. 24 or 26 enam wire over primary winding.
T3—Broadband transformer, 5:1 turns ratio; 20 turns of no. 26 enam wire on an FT-37-43 ferrite toroid (primary); tap at 13 turns from the collector end. Secondary has 4 turns of no. 24 or 26 enam wire over primary winding.
T4—Broadband transformer, 3:1 turns ratio; 9 turns of no. 26 enam wire on an FT-37-43 ferrite toroid (primary). Secondary has 4 turns of no 24 or 26 enam wire over primary winding.
U1—NE602 mixer IC.
U2, U3—NE5532 dual low-noise op-amp IC.
U4—78L05 5-V regulator IC.
Y1, Y2—Fundamental crystal, HC-25/U holder, parallel resonance, 20- or 32-pF load capacitance. See text for discussion of frequency choice. Available from International Crystal Mfg Co, 701 W Sheridan, PO Box 26330, Oklahoma City, OK 73126-0330, tel 405-236-3741; JAN Crystals, 2341 Crystal Dr, Ft Myers, FL 33906-6017, tel 800-237-3063; and other sources.

The title photo version of the QRP Three-Bander uses the switch-and-capacitors scheme shown at Fig 1B instead of C1, and Johnson air-dielectric trimmers for RX FREQ (C22) and TX FREQ (C28). Acrylic blocks machined to take set screws and the trimmers' 3/16-inch-diameter shafts serve as tuning knobs. The board is 4 × 5-3/8 inches in size.

and C28 (**TX FREQ**) are probably the most expensive components in this project. You can save money by purchasing these capacitors from a surplus outlet or flea market, although they are still available new. In this application, the voltage rating and physical size of C1, C22 and C28 are relatively unimportant; these capacitors need only cover the necessary capacitance range. C1 must cover the range from 15 to 45 pF. VXO capacitors C22 and C28 should have a maximum capacitance of 10 to 50 pF (10 to 15 pF is optimum) and have a minimum capacitance of just a few picofarads—the lower the minimum capacitance, the better.[5] If you can't find air-dielectric variables at an affordable price, you can replace a given variable capacitor with a switch and several trimmer capacitors, as shown in Fig 1B for C1, **RX PEAK**; the transceiver shown in the title photo uses this arrangement. You may prefer the Fig 1B solution to C1 because flipping a switch is easier than peaking a tuning control; on the other hand, a front-panel peaking control can help you minimize interference from strong shortwave broadcasters, as discussed later in "Using the Radio on the Air." This switch-and-trimmers idea can also be applied to the transceiver VXOs; you can readjust the trimmers if your preset frequencies are occupied.

The crystal frequencies you choose depend somewhat on the particular VXO tuning capacitors you use. A VXO with a maximum tuning capacitance of many tens or even hundreds of picofarads (so much capacitance that the crystal is essentially shorted to ground with the tuning capacitance at maximum) may oscillate as much as 10 kHz below the frequency marked on the crystal. If, however, you use capacitors with maximum capacitances in the range I've specified, your VXOs should oscillate within a few kilohertz of the crystal frequency.

If you want to get your transceiver working on all three of its bands with minimal experimentation, use a 2N5109 at Q6 to ensure adequate drive to the final amplifier at 24 MHz. A *metal-cased* (TO-18) 2N2222A may work if you're willing to try several transistors at Q6 before settling on one. (I was able to use metal-cased 2N2222As in two out of the three QRP Three-Banders I've built.) If you're interested in using your Three-Bander only at 18 and 21 MHz, *any* TO-18 2N2222A will probably work at Q6.

One of home-brewing's benefits is that you can use connectors of your choice. I like to use BNC connectors as antenna jacks on HF gear. Although I don't necessarily agree with others' choices, I've seen UHF, N, and even phono connectors used for antenna connections at MF and HF. This transceiver uses phono jacks for power and keying connections. (Beware of using

The QRP Three-Bander: Vital Statistics

The performance of the QRP Three-Bander varies with band, dc supply voltage and the particular active devices used. Two versions of the Three-Bander exhibit a receive sensitivity (minimum discernible signal, or MDS) between −124 and −128 dBm, and 3rd-order-IMD dynamic ranges between 71 and 74 dB. A third Three-Bander exhibits an MDS between −112 and −120 dBm, and a 3rd-order-IMD dynamic range between 67 and 69 dB. Operated at 13.8 V and using an MPS918 at Q3, two QRP Three-Banders produce 2.6 and 4.0 W at 18 MHz, 2.6 and 3.4 W at 21 MHz, and 1.7 and 2.5 W at 24 MHz. A third Three-Bander (with a hand-picked 2N3904 at Q3) produces 3.8 W at 18 MHz, 3.1 W at 21 MHz and 2.4 W at 24 MHz when operating at 13.8 V. Operating the Three-Bander at 13.8 V provides 3 to 70% more transmitter output power than that available with a 13.0-V supply.

Although the Three-Bander's receiver isn't unduly sensitive or crunch-proof, it's adequate for routine amateur communication. I had no difficulty in making 3rd-order-IMD dynamic-range measurements on the Three-Bander's receiver at the ARRL lab's standard 20-kHz spacing.

The frequency swing afforded by the Three-Bander's VXOs varies with the band, stray capacitances and the particular crystals and VXO tuning capacitors used. The crystals I used allowed swings of 8.9 to 16.2 kHz at 18 MHz, 8.4 to 17.6 kHz at 21 MHz, and 14.1 to 23.4 kHz at 24 MHz.—*KH6CP*

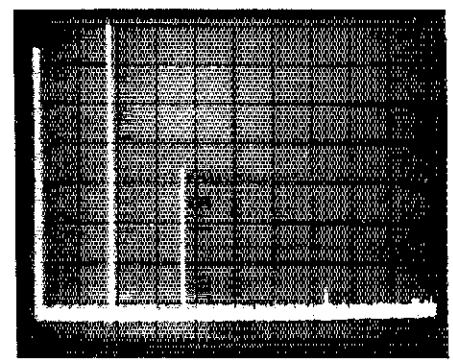


Fig 2—Worst-case spectral display of the QRP Three-Bander. Each horizontal division represents 10 MHz; each vertical division represents 10 dB. The spike at far left (the spectrum analyzer's first-local-oscillator signal) serves as a convenient "0 MHz" reference. When this spectrogram was taken, the QRP Three-Bander was producing 4 W (14.08-V dc supply) at 18.07 MHz. All harmonics and spurious emissions are at least 36 dB below peak fundamental output. The QRP Three-Bander complies with current FCC specifications for spectral purity.

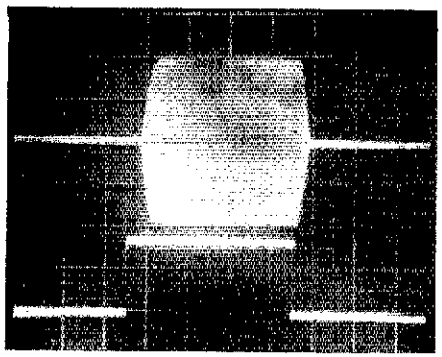


Fig 3—The QRP Three-Bander's CW-keying waveform at 18.07 MHz. The upper trace is the RF envelope; the lower trace depicts the actual key closure. Each horizontal division represents 5 ms.

phono jacks with batteries—phono plugs can short-circuit all too easily. I use Molex® connectors and fuses with my battery packs for safety.) The presence of identical keying and power-supply connectors isn't a problem with this rig: Nothing blows up if the key and power-supply cables are interchanged.

Construction Details

Decide early on whether you'll build the transceiver over a ground plane or on a PC board. If you decide to build a PC-board version, I highly recommend glass-epoxy (G-10 or FR-4), copper-clad circuit board over cheap phenolic board because of glass-epoxy's generally higher quality—and because glass-epoxy's greater heat tolerance allows the desoldering and replacement of components with minimal damage to the board. (This is especially important if you're new to building; you may need to fix wiring goofs.) I've made the copper pads for the wires between the board and off-board components extra large, just in case you have to do a lot of resoldering. (Small pads tend to lift off the board if subjected to too much soldering heat.) This is a trade-off in the case of the VXO-capacitor wires, though: The narrower the pads for C22 and C28 wires, the wider the VXO tuning range per crystal.

Whether you build your transceiver on a PC board or with ground-plane construction, I recommend that the transceiver circuitry be completely shielded when in use. It's important that there be grounded metal between the VXO capacitors and your fingers. Otherwise, you may experience the magic-wand effect that long-time hams call *hand capacitance*. (The VXO-capacitor stators [immovable plates] are at a high impedance above ground, and nearby objects—including you—can be "seen" by those circuit points unless a grounded shield is interposed. You shouldn't be able to tune your receiver just by bringing your hand close to the tuning knob!) Complete shielding of the transceiver circuitry also helps minimize hum and microphonics in the NE602 detector, especially when the transceiver is used with a poor RF ground.

Wind your inductors and transformers before you start wiring the circuit. Amateur radio-equipment builders commonly count coil turns wrong; this usually results in coils wound with one turn too many. (Hint: With toroids, just passing the wire through the core counts as one turn.)[6,7]

Because this is an RF project, keep component leads short, as shown in the photographs. Long leads can induce excessive noise and hum into the circuit. (If you're *really* unlucky, overlong leads may cause the circuit to oscillate when it should be amplifying.) Transformers T1 through T3 aren't critical with regard to mounting—they can either lie flat or stand upright. (Some builders like to glue toroids down; I skip the glue so the coils can be removed easily if necessary.) I used screws, lock washers and ¼-inch-long metal spacers to mount my transceiver boards in their boxes.

Q8, the transmitter power amplifier, must be heat-sinked. Because the MRF237's case is connected to the transistor emitter (instead of the collector, as is usually the case with metal-cased BJTs), you can heat-sink Q8 merely by soldering its case to the circuit-board ground foil (or to the ground plane, if you're undertaking ground-plane construction.) That's what I did in my Three-Bander. One small solder joint does the job; you needn't solder the entire case perimeter.

I used three-hole-mount phono jacks (two holes for mounting screws and one for the jack barrel) because they don't loosen with use as easily as single-hole mount types do. For the same reason, I took the time to drill the extra holes necessary to seat the anti-rotation tabs on the **GAIN** and **SIDETONE LEVEL** controls because seating the tabs—instead of breaking them off—results in controls that almost never work loose from the panel.[8]

Testing

None of the Three-Bander's circuits need be trimmed or aligned beyond the adjustments possible with its panel controls, so you need only verify that it works. I suggest powering the transceiver with a small supply during testing—a 12- to 15-V regulated power supply capable of producing no more than 0.5 to 1 A is fine. (A supply capable of sourcing 7 or 10 A invites the possibility of serious smoke and component destruction if you make a wiring mistake. Don't use batteries, either: Short-circuited, they can source enough current to melt wires!)

The first test is to determine whether or not the Three-Bander can hear its own transmit oscillator. Set the **GAIN** control to the middle of its rotation. Plug in crystals

On the Air with the QRP Three-Bander

What can you expect of the QRP Three-Bander? In three brief operating periods, I snagged OK3CQR, EA8AB, OK2KFM, KK6H, WB6YBT, AF4S and W9MNU at 18 MHz, and KF5OL and G3FGT at 21 MHz—nine contacts, four countries, four states and three continents. The antenna? Fifty or so feet of wire tossed in a tree and worked against a baseboard-heater "ground."

The QRP Three-Bander's receiver is more than satisfactory, considering its simplicity. There's audio to spare; I didn't have to run the **GAIN** control wide open all the time. The receiver is a bit microphonic, but not annoyingly so. I heard a bit of hum at some settings of the **RX PEAK** control—probably because I used an ac-operated power supply in conjunction with my crummy RF ground. Sometimes, I had to use **RX PEAK** to minimize AM "breakthrough" from strong 17- and 21-MHz broadcasters. All this means is that I'll build my version of the QRP Three-Bander with a front-panel-peakable front end. (I didn't hear one iota of breakthrough from local medium-wave broadcasters, by the way.)

Full break-in is fun with the QRP Three-Bander. Zack Lau has solved several problems at once by incorporating audio limiting into this transceiver: "De-thumping" the rig's TR switching, protecting the operator's ears and headphones from overdrive, and ridding the rig's sidetone of monotony. (In transmit, you hear the sidetone [assuming that you've set its **SIDETONE LEVEL** control to allow this, of course], a tone corresponding to the frequency difference between the receive and transmit VXOs, *and* the products of intermodulation between these signals as they mix in the Three Bander's audio-limiting circuitry. Result: The rig's "sidetone" rarely sounds the same two QSOs in a row!)

The QRP Three-Bander's differential keying is a class act. Listened to with my NRD-525 receiver, the Three-Bander's CW sounds absolutely A1 (pun intended) at 18, 21 and 24 MHz. (No "*Sure* the keying's too hard—but heck, it's QRP" excuses are necessary for *this* low-power rig.) If you must key an oscillator for CW, this is how to do it.

Working all continents will be easy with this rig. Who'll be first to work all *states* with a Three-Bander? It probably won't be me—at least, not unless I build mine soon: Other HQ staffers are lining up for *their* stints with KH6CP's QRP Three-Bander!—*David Newkirk, AK7M*

How About Modifying the QRP Three-Bander?

I'm sure that many of you would like this transceiver to cover different bands—14 or 28 MHz, for instance. The problem is that if I'd taken the time to work out the details of all such permutations before publishing this article, you'd never have *seen* this article! The first step in getting a successful equipment design off the drawing board and into reality is defining the limits of what you want to accomplish—so I decided to design the QRP Three-Bander to cover only the 18, 21 and 24-MHz amateur bands. That said, though, I do have some untested Three-Bander-modification hints for the adventurous.

First of all, most of the QRP Three-Bander's RF circuits are broadbanded enough to cover the HF spectrum without modification. The exceptions are the NE602's tuned input circuit (C1-T1), the transmitter-output low-pass filter (C37-C40, L1-L3), and the TR switch filter (C36, C41, C42, and L4-L6). The variable crystal oscillators should work fine from 3.5 to 28 MHz with fundamental-mode crystals; keep in mind, however, that a VXO's tuning range generally *decreases* as the crystal frequency is lowered.

You may need to add a few more turns to T4's primary winding on the low bands, but T4 is pretty broadband, too.

The TR switch is a bit tricky to design—you can't get the peaks in a high-ripple band-pass filter to fall exactly where you want them merely by poking at a calculator—but you can always use Lewallen's single-band version (see Note 4 of the main text). If you use a rotary switch for the TR circuit, receiver front end and transmitter output filter, getting the QRP Three-Bander to cover five or six bands shouldn't be *too* difficult. . . —*KH6CP*

at Y1 and Y2, both on the same frequency, and set the **RX PEAK**, **RX FREQ** and **TX FREQ** capacitors so that their plates are half meshed. Press the **SPOT** button and adjust **RX FREQ** to find the transmitter signal. If you're lucky, you now have an expensive code-practice oscillator! If you can't hear anything at all, even after trying the entire range of the **GAIN** control, there's a fault in the receiver audio chain.

If you can meter your power supply's output current, you can confirm that the transmitter works by attaching a 50-Ω dummy load to (a 2-W carbon or metal-oxide resistor) and briefly shorting the **KEY** jack. If the transmitter is working, the transceiver's current drain should increase to 200 or 300 mA with keying. You can also use an oscilloscope, RF wattmeter or RF voltmeter to measure the transmitter output.

Using the Radio on the Air

The ultimate test of a home-brew rig is making contacts. Although D-C receivers are notorious for fooling their operators into transmitting on the wrong frequency, the QRP Three-Bander's independent transmitter and receiver oscillators can help you avoid this problem. Perhaps the easiest way is to let other stations tune you in properly by calling CQ on a clear frequency! The second way to be sure you've spotted your transmitter on the other station's frequency is to adjust **TX FREQ** so that your spotting signal (1) has the same pitch as the incoming signal and (2) "tunes the same way" as the incoming signal. In other words, if, once you've spotted your transmitter, adjusting **RX FREQ** causes your spotting signal to rise in pitch as the incoming station falls in pitch, or vice versa, you've set your transmitter to the wrong frequency and must readjust it to "the other side of zero beat" to put your signal in the other station's receiver.[9] Another approach is to adjust **RX FREQ** for zero beat with the incoming signal, press **SPOT**, and adjust **TX FREQ** to zero beat your transmitter to your receiver *and* the incoming signal. Once you've done this, adjust **RX FREQ** to receive the incoming signal at the pitch you want. This latter approach works well on a busy band: After you've spotted your transmitter, readjust **RX FREQ** to receive the less-interfered-with "side" of the received signal. (Incidentally, you can zero-beat your transmitter to fairly strong incoming stations by pulling out the receive crystal [Y1] and adjusting the spotting signal to zero beat. In this case, the spotting signal acts as the receiver local oscillator. The spotting and incoming signals will have exactly the same pitch when you plug the receive crystal back in.)

Adjust **RX PEAK** for maximum received-signal strength. If no man-made signals are audible, adjust **RX PEAK** for maximum background noise. You can also use this control as an attenuator by mistuning it—a useful feature when strong signals overload the rig's mixer. Usually, detuning **RX PEAK** just enough to reduce the culprit signal below the overload point preserves sufficient desired-signal sensitivity for you to keep operating.

Adjust the **GAIN** control for a comfortable listening level; this control does not affect the sidetone level. For finding stations, I adjust **GAIN** so I can just hear the background noise.

The **SIDETONE LEVEL** control adjusts what its name implies. Although a sidetone is unnecessary with a straight key, it's quite handy—if not essential—with electronic keyers.

The **SPOT** button turns on the QRP Three-Bander's transmit oscillator, allowing you to adjust your transmit frequency without actually transmitting a signal on the air. (Sweeping a signal across a band is considered poor amateur practice—even for antenna testing.)

Summary

The QRP Three-Bander gets you going on three of our hot high bands in style, and with enough power to work the world. Build it, use it—and have fun!

Notes

[1]Kits of parts for the QRP Three-Bander are available from RADIOKIT, PO Box 973, Pelham, NH 03076, tel 603-437-2722, for $99 each, plus $4 each for shipping via the United Parcel Service in the US. (Canadian and overseas orders are welcome; contact RADIOKIT for details.) The kit price includes a PC board, an unpainted Ten-Tec enclosure and all QRP Three-Bander components *except crystals*. The ARRL and *QST* in no way warrant this offer.

A PC-board template and parts overlay for the QRP Three-Bander are available for a business-size SASE from the Technical Department Secretary, ARRL, 225 Main St, Newington, CT 06111.

[2]This technique, also known by the unfortunate pejorative term *ugly construction*, entails supporting circuit components—connected directly to each other by short leads—above a thin copper sheet (ground plane). Despite their appearance, circuits built in this way generally work better than their PC-board-built counterparts because air is a better dielectric than fiberglass or phenolic. Builders well-versed in ground-plane construction can generally build the ground-plane version of a given circuit faster than its circuit-board equivalent.

[3]R. Lewallen, "An Optimized QRP Transceiver," Feedback, *QST*, Nov 1980, p 53.

[4]R. Lewallen, "An Optimized QRP Transceiver," *QST*, Aug 1980, pp 14-19. I highly recommend this article to anyone who wants to build a 40-meter QRP transceiver.

[5]Most of the frequency variation provided by C22 and C28 occurs at the low-capacitance end of their capacitance spans. Thus, achieving the smallest possible minimum capacitance at C22 and C28 is especially important to builders who duplicate this project with ground-plane construction because of the generally lower stray capacitances this construction method affords. Less stray capacitance in the VXO circuit maximizes the VXO tuning capacitor's contribution to capacitance *change* in the circuit.

[6]Fig 70 on page 2-37 of the 1989 *ARRL Handbook* shows several aspects of toroid construction, including how to count toroid turns accurately, and how to wind a toroidal transformer (like T1, T2 and T3 in this project).—*Ed.*

[7]The inductances listed for L1 through L6 are *measured* values. If you attempt to verify these inductances by using well-known toroid-inductance formulas to work backward from the core and turns values given, you'll come up with different inductance values. This is so because simple formulas for calculating the inductance of toroids tend to overestimate the inductance. (Such formulas are easy to spot: They fail to take wire thickness into account, returning the same inductance whether you use wire so thick you can barely wind it, or hairlike wire that's nearly invisible!)

[8]These are important considerations in portable QRP operation because you've usually left the necessary retightening tools at home!

[9]Because the days when radio amateurs routinely tuned for replies over a significant portion of a band are long gone, accurately spotting your transmitter is important. Spotted on "the wrong side of zero beat," but at the same pitch as the incoming signal, your transmitter is twice that pitch away from the incoming signal—for example, *1.4 kHz away* from an incoming signal tuned to produce a 700-Hz pitch.—*Ed.*

Is Amateur Radio Hazardous to our Health?

What really was said about cancer rates and Amateur Radio, and what we can do about it.

By Ivan A. Shulman, MD, WC2S
6041 Cadillac Ave
Los Angeles, CA 90034

When it was reported in an Associated Press release that there was an increased rate of death due to certain types of cancer in Amateur Radio operators, this information was rapidly picked up by the radio community. As a physician who specializes in cancer surgery, I received many calls from amateur and nonamateur friends to find out more about what was going on and what I thought about it. As in many reports on medical topics in the lay literature and on television, there frequently is a difference between what is reported and what actually was said in medical articles, and this and other recent reports are no different.

After much time and consideration, several important concepts became apparent to me, and I hope that by making this report in *QST*, it will help us all to better understand what really was said, and what is known about the reported association of leukemias and other blood cancers with Amateur Radio. This article does not purport to completely cover all the important articles and research studies which have ever been written on the effects of electromagnetic radiation on human biology, but is instead, an effort to review that literature which might be useful to Amateur Radio operators interested in responding to the questions that have been asked.

Biologic Background

Radio-frequency waves are a form of electromagnetic waves, and in the frequencies of concern to Amateur Radio operators, these represent a form of nonionizing radiation. The terms ionizing and nonionizing radiation are frequently confused, and it is helpful to clarify what I mean by these terms early in our discussion.

Ionization occurs when there is enough energy in the radiation to displace an electron from an atom. Radiation that produces this effect has a very short wavelength, a high frequency and high energy level, and is typically that described as X-rays and gamma rays. Nonionizing radiation is otherwise known as infrared and radio-frequency waves, which are at a lower energy level, and have lower frequencies and longer wavelengths than ionizing radiation. Ionizing radiation is dangerous to living organisms in that it affects cellular elements such as DNA in the cell nucleus, leading to genetic damage in the individual cell, and mutations in future generations of cells. Although the energy level of nonionizing radiation is lower and thus may not affect large molecules or generate measurable amounts of heat in the same manner as ionizing radiation, there is substantial evidence that nonionizing radiation has subtle effects at a more basic cellular level, including effects on hormones, enzymes and the cooperative mechanisms involved in maintaining the integrity of intracellular systems.[1]

Experiments regarding the effects on human tissue of nonionizing electromagnetic fields have been conducted for many years.[2] The findings of these studies indicate that a modulated electromagnetic field, that is, one in which the energy is cycled on and off or is varied by intensity or frequency, has a greater inhibitory effect on the ability of cells in the body to communicate with each other than does a field in which the current remains at a steady and unmodulated strength.

Studies indicate that even in a weak electromagnetic field there is a modification of calcium binding at the cell membrane, as well as an alteration of a variety of calcium dependent enzyme systems which work between cells.[3] Experiments have noted that the effect on calcium flow in and out of cells is frequency dependent, and that curves can be drawn demonstrating these "frequency windows." Specifically, the combination of a very high or ultra high frequency carrier (147 or 450 MHz) modulated at specific extremely low frequencies (16, 40 or 60 Hz) has been studied and appears to be of biologic significance.[4]

Other studies have looked at the effects of electromagnetic energy on cells that have specific immune functions. An important type of white blood cell called a T-lymphocyte is involved in the recognition and destruction of foreign and malignant cells. There is evidence that the normal functioning of these cells is significantly reduced by electric fields that simulate 60-Hz high voltage power line fields and by weak microwave fields that are amplitude modulated at 60 Hz.[5,6] The mechanism of this process is not clear, but may also be related to interactions at the level of the cell membrane.

More rapidly dividing cells, such as those in the bone marrow or small intestine, are usually more sensitive to the effects of both ionizing and nonionizing radiation than are those which divide more slowly. Thus, it is rapidly dividing cells that are more likely to demonstrate changes in response to exposure to these types of energy. However, cells which divide more slowly have less of an ability to repair any damage done to them by exposure over a long period of time. It is important to recognize that these effects are not necessarily dependent on damage to DNA or other cellular markers.

Evidence at this time seems to suggest that an appropriate interpretation of this data is not that nonionizing energy necessarily causes cancer, but that it may act instead to promote the efficacy of other agents in doing so.

Previous Studies

In 1979, initial questions were raised regarding a positive relationship between high current electrical configurations in homes and the incidence of cancer deaths in children living in the Denver area.[7] Later, similar findings were noted for adults living near high current 60-Hz wiring as well.[8] Because of criticisms relating to the methodologies and assumptions used in these studies, other investigators looked at these same issues again, and came to similar conclusions.[9,10]

It had been reported as early as 1982 that there appeared to be an increased death rate due to leukemia in people who were exposed to magnetic and electric fields in the course of their work.[11,12] Additional articles appeared in 1983[13,14] and 1985[15-18] which also suggested that electrical workers in general were at an increased risk of leukemia and that electromagnetic fields might be a cause of this form of cancer. A time/effect relationship has also been suggested for certain forms of brain tumors and occupational exposure to microwave and radio-frequency electromagnetic radiation,[19,20] where the risk was 10 times as great in those workers who had industrial exposure to soldering fumes, solvents and a variety of other chemicals. Other reports have reviewed the possible relationship between spontaneous abortion rates and the use of electric blankets,[21] video display terminals,[22] and ceiling cable electric heat.[23] Cataract formation and damage to the retina has also been reported in humans exposed to high intensity electromagnetic fields and microwaves.[24]

Dr Milham's Study

The recent report which stirred up the most

[1]Notes appear on page 33.

concern because it made particular reference to Amateur Radio operators, appeared in the January 1988 issue of the *American Journal of Epidemiology*, a respected and prestigious medical publication.[25]

In 1982, Samuel Milham, Jr, MD, MPH, who works in the Epidemiology section of the Washington State Department of Social and Health Services, reported that a study of workers whose stated occupation on death certificate records suggested an exposure to electrical or magnetic fields had a higher rate due to leukemia.[26] In 1985, at the suggestion of an Amateur Radio operator (W2EVE), he looked at all the "Silent Keys" listings that appeared in *QST* and studied the cause of death of amateurs who died between the years 1971 and 1983 and who lived in Washington State and California at the time of their death.[27]

To simplify things slightly, only males were studied as there were very few women among these deaths. A total of 1691 death certificates were identified with these Silent Keys.

Using a standard statistical analytic technique called proportionate mortality radio (PMR), and an analysis of all US deaths as a comparison group, 12.6 of the 1691 amateurs should have died from leukemia. Instead, 24 deaths were observed with a statistical significance of $p < 0.01$, meaning that there was less than a 1 in 100 chance that this was a random occurrence.

In the largest study reported,[28] Milham has expanded on his original work. He first identified all licensed amateurs with addresses in California and Washington State. This was followed by a computerized and manual review of all deaths of persons whose complete names and date of births corresponded to the list of known amateurs for the period January 1, 1979 to June 16, 1984.

A total of 67,829 amateurs were identified and 2485 deaths were studied. Eighty-four percent (2083 of 2485) deaths occurred in California, so this study was weighted heavily towards the California experience. After making certain statistical adjustments, the overall death rate for amateurs was no different than it was for the population of both states at large. Likewise, the overall death rate for all forms of cancer among amateurs was not significantly different from the larger population.

However, within this cancer death rate, there was a definite disproportion of deaths due to cancers of "other" lymphatic tissues, such as multiple myeloma and non-Hodgkin's lymphomas. The death rate for all leukemias was only slightly, but not statistically significantly, increased. Among those leukemias, however, one form particularly (acute myelogenous leukemia) was significantly increased. It was concluded that the increased number of only these highly specific forms of blood disorders, and not others, suggests that a biologic cause and effect is present.

It was not possible to make a direct analysis of any occupational link with these excess deaths due to the fact that this information was readily available only for Washington State deaths. It should be noted that of these 402 deaths, 31 percent of the amateurs apparently worked in or about electromagnetic fields as technicians, radio operators or television repairmen. Of all deaths in Washington State during this time, only 3 percent of the population worked at these occupations.

In addition, among Washington State amateurs, 5 of the 11 deaths due to leukemias, lymphomas or multiple myeloma, were in people who had such occupational electromagnetic exposures. It was pointed out that workers in these occupations also were exposed to other possible hazards, such as fumes from solder and toxic chemicals such as the polychlorinated biphenyls (PCBs), and asbestos, any of which in themselves might conceivably cause cancer as well.

No other cause of death was noted to be higher than normal in the amateur population, and in fact, several important and common causes of death were less than what would be expected from the population as a whole. Deaths due to cancer of the pancreas and the lung, as well as all deaths due to respiratory diseases (pneumonia, asthma, emphysema), circulatory diseases (those of the heart and blood vessels) and accidents were less in amateurs as a group than in the overall population. It was even suggested that there are fewer cigarette smokers among members of the American Radio Relay League than in the general US population as a whole.

Milham concluded that Amateur Radio licensees in California and Washington State do have a higher death rate due to acute myelogenous leukemia, multiple myeloma and possibly other specific types of lymphoma. He felt that exposure to magnetic or electrical fields either as a consequence of work or hobby should be considered among the cause of these rates.

Comments on these Studies

It is important to recognize that studies based upon death certificate data alone are always subject to certain limitations. Data inaccuracies, from input as well as in coding, are not uncommon, and when one is measuring the incidence of small or rare occurrences, this may cause an inadvertent diminution or magnification of the determination of these occurrences. None of the studies discussed here look at an actual measurement of the electromagnetic or toxic chemical exposure that any of the deceased individuals may have had. The issue of what is called "confounding factors" such as the interaction of the effect of toxic chemicals and electromagnetic fields of different levels of energy is certainly unknown. As a result, statisticians may frequently differ on the interpretation of identical data.

On the basis of these research papers, however, it is now apparent that the data derived so far must be considered significant enough to support further research into both the epidemiology of and the biologic mechanisms involved in these effects. Some of that research is presently being done both in the United States and abroad and new articles are being published in the scientific literature frequently.

Exposure Standards

The question of exposure standards also deserves comment. In 1982, the American National Standards Institute (ANSI), a private, commercially sponsored organization, published a list of standards based upon the thermal effects of electromagnetic fields upon tissue.[29] There is much controversy regarding the validity of measuring this type of effect on biologic tissues as there is clear evidence that adverse tissue effects can occur without a detectable rise in temperature.[30] It should be noted that Australia, Sweden and the Eastern bloc countries as well as localities in the states of Oregon and Massachusetts have issued standards which recommend significantly lower exposure levels. Another voluntary standard has been proposed by the National Council for Radiation Protection and Measurement (NCRP), which is notably more stringent than the current ANSI standards.[31] ANSI is presently in the process of revising their standards.

It is interesting to note that the US Environmental Protection Agency has recently decided to defer the issuance of standards for exposure to electromagnetic fields under its RF Radiation Guidance Program for budgetary restrictions and other priorities. Despite the requests of the Federal Communication Commission, the National Association of Broadcasters, the Electromagnetic Energy Policy Alliance (of which the ARRL is a senior associate member) and other national organizations to complete this important work, the EPA has decided to put aside many years of effort on these guidelines and to focus its attention on other matters which it considers to be of greater public concern.

Hand-Held Radios

An article published recently studied the specific absorption rates in models of the human head exposed to hand-held radios operating in the 800-MHz band, which is where most cellular telephones are used.[32] The authors studied the RF energy absorbed by simulated tissues in the head (eye, brain, muscle, fat and bone) while holding the transmitter in vertical and tilted positions about the head. Also, a ½-wavelength antenna operated at 1.0 W power output was compared to a 5/8-wavelength antenna operated at 1.0 and 1.8 W. This study indicated the presence of a "hot spot" in the eye while using a ½-wavelength antenna, and one in the frontal portion of the brain while using a 5/8-wavelength antenna.

The authors concluded that if the transmitter is operated in a vertical position and is held at a distance of about 2 inches (5 cm) from the face during normal use, the specific absorption rates would not be significant enough to warrant concern, at least with reference to the present ANSI standards. These current ANSI standards essentially consider any device generating less than 7 watts output to be safe, an assumption with which almost all experts currently would not agree. Other studies using hand-helds operating at lower frequencies and different power outputs are being conducted and evaluated with refer-

ence to more stringent standards.

What Does This Mean?

What does all this really mean for us as amateurs? We all know that there are intrinsic risks in all activities that we do every day. How many of us still smoke, or are overweight or do not bother to fasten our seat belts in our cars? Knowing about risks only sometimes causes us to change our ways. As Amateur Radio operators we certainly do not have any hesitations about discussing and protecting ourselves from the dangers of high voltage circuitry. Nor do we shy away from trying to prevent the risk of accidental falls from roofs or antenna towers.

Likewise, we should recognize a relatively newly identified environmental hazard which may be significant to those of us even without occupational exposure to electromagnetic fields or toxic substances. No one is absolutely certain about what may be causing this increased proportion of special cancers. Therefore, prudence dictates that Amateur Radio operators should take those simple measures which decrease the possibility of our personal exposure to electromagnetic fields or toxics that we may contact as a consequence of our interest in Amateur Radio. Articles have been published in *QST* and other Amateur Radio publications regarding some precautions in the past.[33-37] This current list includes some recommendations which are new, particularly in view of recent information.

Preventive Measures

1) Do not stand or sit close to your power supplies or linear amplifiers while operating, even when they are in stand-by mode.

2) Stay at least 24 inches away from any power transformer, electrical fans or other source of high level 60-Hz magnetic fields while in operation.

3) Do not tune up or operate a high powered linear amplifier while the shields or covers are off.

4) Run your transmission lines away from where you or other people sit in or near your shack.

5) Properly terminated coaxial transmission feed lines should be used in preference to open-wire or end-fed antenna installations which come directly into the transmitter, as the RF radiated from a coaxial feed line is much lower.

6) Use common sense about placing all antennas well away from yourself and others, especially for VHF, UHF and particularly microwave applications. No one should be in the near field of an antenna.[38]

7) No person should be near any transmitting antenna while it is operating. This is especially true for all mobile or ground mounted vertical antennas. The use of indoor transmitting antennas which are close to people in a house or apartment should be reconsidered.

8) Use the minimal power needed to make a QSO, especially if the antenna is less than 35 feet above the ground.

9) Hand-held radios should be used on the lowest power setting needed to carry out communications.

10) Hand-helds should be kept as far from the head as possible when operating. The use of a separate microphone or similar device is recommended.

11) Transmissions using a hand-held radio should be kept as short as possible.

12) Power density measurements should be made before running more than 25 watts in a VHF mobile installation, particularly if the antenna is rear-deck mounted and passengers may ride in the back seat. The safest mobile antenna location is in the center of the metal roof.

13) The development of an accurate inexpensive power-density meter would be of major benefit to the Amateur Radio community so that RF power-density measurements could be taken in all radio installations. Because of the current high cost of such devices, groups of amateurs or clubs may wish to purchase one and share in its use.[39]

14) Soldering should only be done in a well ventilated area. A small fan should be used to blow away toxic fumes.

15) When using toxic chemicals, such as when etching PC boards or repairing fiberglass, wear gloves and goggles, use proper tools, and avoid contact with any of the chemicals. If accidentally contaminated, wash off the compounds immediately with copious quantities of water.[40] Again, the importance of always working in a well ventilated area with personal protective covering cannot be overemphasized.

16) Hazardous chemicals, such as those in the PCB class, are used in some capacitors and dummy loads. Use extreme care in handling these materials, and consult with the appropriate local authorities to determine the proper means of disposing of these chemicals in an environmentally responsible way.

Some Observations

To my knowledge, no other established guidelines are available to prevent potentially harmful exposure. Therefore until such time as a clearer picture emerges, we should follow these simple common sense precautions.

There is no question that additional information is needed and will ultimately be forthcoming on this important issue. This data will certainly be difficult to interpret, and confusing to many of us, both in the amateur and nonamateur community. We must therefore be prepared to work together to arrive at reasonable conclusions and appropriate actions.[41]

In preparing this paper, I personally communicated with several of these experts in the field whose works are referenced below. All of these experts, including Dr Milham, agreed that none of them would have any hesitation regarding their own personal use of currently available Amateur Radio equipment, provided that it was properly installed and operated, and that the recommended precautions were followed.[42] Unanimously, they all feel that no one should stop operating because of concern for the possible risk of illness, as these risks appear to be so relatively low.

Am I worried? Absolutely not. With common sense and safe operating practices, I look forward to many more years of enjoyment and satisfaction as an Amateur Radio operator.

Acknowledgments

The author wishes to thank those many individuals who provided encouragement, information, suggestions and were willing to offer multiple critiques of the numerous drafts of this article: W. Ross Adey, MD, (K6UI), Jim Cox (K7JAJ), Fried Heyn (WA6WZO), Thomas Mack, MD, MPH, Samuel Milham, MD, MPH, John Peters, MD, Tod Olson (KØTO), Wayne Overbeck, PhD (N6NB), David Rodman, MD (KN2M), Joseph Salvatore, MD (N1DJH), William Tallon (W6IPM).

An Amateur Radio operator continuously since 1963, Ivan Shulman says he was raised on Amateur Radio, and credits his late father W2SBX with getting him started. As a Fellow of the American College of Surgeons, Dr Shulman works as a general surgeon with a special interest in cancer of the thyroid, breast and gastrointestinal tract. In addition to his medical and radio activities, he has served as the physician for the Los Angeles Philharmonic on tours to Mexico, Japan, Korea and Europe. He also occasionally plays extra oboe with the orchestra as the need arises. When he manages to get on the air, he enjoys DX chasing and a good rag chew either DX on 20 meters or on UHF. In whatever spare time is left, he is busy introducing his wife and two young children to the ways of Amateur Radio.

Notes

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[2]Adey W. R. Tissue interactions with nonionizing electromagnetic fields. *Physiol Rev* 1981; 61:435-513.

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[10]An in depth review of these articles and the controversies surrounding these topics written by Paul Brodeur was published in June 12, 19 and 26, 1989 issues of *The New Yorker* magazine.

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[12]Wright W. E., Peters J. M., Mack T. M. Leukemia in workers exposed to electrical and magnetic fields. (Letter) *Lancet* 1982;2:1160-71.

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(continued on page 38)

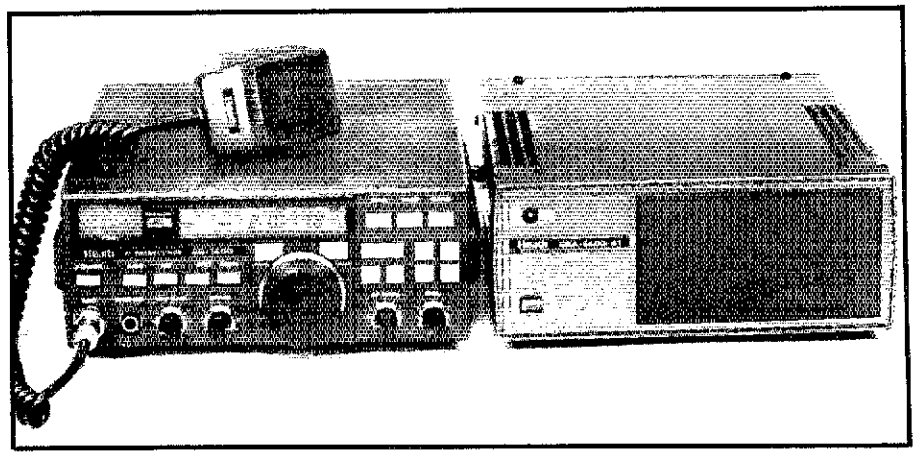
Product Review

Conducted By James W. Healy, NJ2L
Assistant Technical Editor

Heath SB-1400 MF/HF Transceiver

Reviewed by Kirk Kleinschmidt, NTØZ

The SB-1400 MF/HF transceiver is, in a way, a departure from Heath's traditional Amateur Radio offerings—at least in their MF/HF transceiver line. Although most of Heath's previous ham-radio equipment was designed by Heath®, the '1400 is custom manufactured for Heath by Yaesu, after Yaesu's popular entry-level FT-747GX transceiver. In addition to the SB-1000 linear amplifier and VHF/UHF transceivers that are made for Heath by other companies, we can expect more products of this type from Heath in the future—including, perhaps, a high-performance shortwave receiver.



First Impressions

The SB-1400 arrived at ARRL HQ in two boxes. One box contained a 100%-duty-cycle power supply. It's nearly as large as the rig, and it weighs a lot more. That struck me as kind of funny—a massive, super-duty power supply doesn't seem to go with a lightweight, compact transceiver. A smaller, lighter-duty power supply is not offered with the '1400. You certainly don't need to worry about power-supply failure, though!

Setting up the SB-1400 and its supply is a snap. After connecting the power supply to the rig via its 4-pin connector and plugging the supply into a power strip, there's not much left to do, other than connecting a suitable antenna. Microphone and headphone connectors are located on the front panel. The power supply has a built-in speaker. The '1400 is obviously designed for ease of use. This isn't surprising: According to Heath, a lot of effort went into the layout of the front and back panels. It shows.

After quickly reading the SB-1400's operation manual, I turned on the supply and the radio (in that order, as suggested in the manual). Everything worked fine.

Operating Impressions

Because the SB-1400 is a close cousin of the Yaesu FT-747GX, you can get a detailed description of most of the SB-1400's features from Dave Newkirk's August 1989 *QST* review of the FT-747GX.[1] In addition to having a different front-panel layout than the FT-747GX, the SB-1400 allows selection of AGC-decay time, independently of mode, via a front-panel switch. (The FT-747GX's AGC-decay times are unalterably related to mode, with one exception: An internal switch allows selection of fast or slow AGC decay for CW reception.) The SB-1400's display is slightly different than the '747's, and somewhat different tuning-speed selections are available in the AM and FM modes.[2]

Table 1
SB-1400 Tuning-Step Size v Mode

Mode	*FAST on*	*FAST off*
SSB/CW	2.5 kHz	25 Hz
AM	1 kHz	100 Hz
FM†	12.5 kHz	5 kHz
FM††	10 kHz	5 kHz

†with optional FM board (not tested).
††with optional FM board, and selected by the control sequence described in the SB-1400 operating manual.

Overall, I am pleased with the performance of the '1400. It packs a lot of versatility into a very compact enclosure. My first contact with the rig was with a ham on Pitcairn Island (VR6) on 10 meters. As soon as I heard her calling CQ, I started frantically trying to extricate the microphone from its plastic bag. I quickly set the mike gain to an appropriately low level, and was surprised when she came back to my 10- or 20-W signal. That contact turned out to be a good omen: It was the first of my many DX and stateside QSOs with the '1400.

The SB-1400 doesn't have provisions for metering automatic level control (ALC) voltage or SWR, and its RF-output meter only indicates *relative* output. Because there's no ALC metering, tuning up the rig on SSB involves setting the mike gain so the meter needle deflects only to a certain point—akin to many rigs of early-'70s vintage. This method of tuning up on SSB is potentially less accurate than using an ALC indicator. There is no built-in speech processor; maybe that's why the '1400 received such good audio-quality reports from many of the stations I worked!

The SB-1400's noise blanker doesn't work well on power-line noise, and it works only marginally well on automotive ignition noise. The rig's tuning rates (see Table 1) also took some getting used to. The fast rate is *really* fast. You can zip right out of the ham band before you know it! The fast rate is great for quickly jumping to another part of the band, but it's not appropriate for tuning a subband. The slow rate, used for most tuning, I found to be too slow. A spinner post or finger hole in the knob would be a welcome addition; in the absence of one, I turned the tuning knob by thumbing the knob rim.

Like the FT-747GX, the review SB-1400 exhibits considerable high-end audio rolloff on receive. The overall SSB receive bandwidth of the unmodified SB-1400 was just *1100 Hz* at −6 dB—with a 2.5-kHz-wide IF filter in line! Likewise, the SB-1400's AM-receive audio is muddy. Fortunately, the receive-audio "demuddification" fix described in the August FT-747GX review also works for the SB-1400: Removing a capacitor from the SB-1400's audio-amplifier circuit moved the rig's high-end,

[1] D. Newkirk, "Yaesu FT-747GX MF/HF Transceiver," Product Review, *QST*, Aug 1989, pp 33-36, 52.

[2] To see the differences, compare Table 1 in this article to Table 1 in August's FT-747GX review.

Table 2

Heath SB-1400 Transceiver, Serial No. 8K020058

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receiver, 100 kHz to 29.9999 MHz; transmitter, 1.5-1.9999, 3.5-3.9999, 7.0-7.4999 10.0-10.4999, 14.0-14.4999, 18.0-18.4999, 21.0-21.4999, 24.5-24.9999, 28.0-29.9999 MHz.	Receiver, 100 kHz to 29.999975 MHz; transmitter as specified, plus an additional 75 Hz at the upper end of each range.
Modes of operation: LSB, USB, CW, AM, FM†	As specified.
Frequency display: Not specified.	6-digit, green-backlit LCD.
Frequency resolution: Not specified.	Display, 100 Hz. Actual tuning resolution varies with mode and tuning speed as shown in Table 1.
Power requirement: 13.5 V dc ±10%, 19 A max at 100 W output.	At 13.5 V dc and 14.1 MHz, 17 A for 111 W output and 1.08 A during receive at full audio output.
Transmitter	*Transmitter Dynamic Testing*
Transmitter output power: SSB, CW, and FM†: 100 W PEP/DC; AM: 25 W, carrier.	CW, 106 to 111 W PEP, depending on band; SSB, 110 to 115 W PEP, depending on band, AM, as specified; FM not tested.
Spurious signal and harmonic suppression: Harmonic, better than 50 dB; non-harmonic, better than 40 dB.	See Fig 1.
Third-order intermodulation-distortion products: Better than −25 dB at 100 W PEP output.	See Fig 2.
CW-keying waveform: Not specified.	See Fig 3.
Transmit-receive turnaround time (PTT release to 90% audio output with an S9 signal): Not specified.	17 ms.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: SSB and CW: (CW bandwidth not specified) for a 10-dB (S+N)/N ratio, 0.5 μV from 0.5-1.5 MHz (0.1-0.5 MHz not specified) and 0.25 μV above 1.5 MHz.	Minimum discernible signal (noise floor) with "CW narrow" filter: 1.0 MHz, −135.5 dBm; 3.5 MHz, −135.5 dBm; 14 MHz, −136.0 dBm.
AM: (bandwidth not specified) for a 10-dB (S+N)/N ratio, 2 μV from 0.5-1.5 MHz (0.1-0.5 MHz not specified) and 1.0 μV above 1.5 MHz.	"AM wide" filter, with test signal 30% modulated with a 1-kHz tone: 1.0 MHz, −119.5 dBm (0.24 μV); 3.8 MHz, −119.0 dBm (0.26 μV); 14 MHz, −121.5 dBm (0.19 μV).
FM†: 0.7 μV for 12 dB SINAD above 28 MHz	Not tested.
Receiver dynamic range: Not specified.	Blocking dynamic range††: 3.5 MHz, 112.5 dB; 14 MHz, 112.5 dB. Two-tone, third-order intermodulation distortion dynamic range††: 3.5 MHz, noise limited at 91.0 dB; 14 MHz, noise limited at 92.0 dB. Third-order input intercept: 3.5 MHz, +1 dBm (based on the noise-limited 3.5-MHz, 3rd-order-IMD dynamic-range measurement above); 14 MHz, +2 dBm (based on the noise-limited 14 MHz, 3rd-order-IMD dynamic-range measurement above).
S-meter sensitivity (μV for S-9 reading): Not specified.	30 μV at 1 MHz, 30 μV at 14.2 MHz, 39 μV at 29 MHz.
Squelch sensitivity: SSB/CW/AM: 4.0 μV from 0.5-1.5 MHz, 2.0 μV above 1.5 MHz; FM†: 0.32 μV.	At 14.2 MHz: Min, 2.1 μV; max, 2800 μV; FM not tested.
Receiver audio output; more than 2.5 W at 10% total harmonic distortion (THD) into an 8-Ω load.	2.15 W into 8 Ω at 10% THD
Color: Gray.	
Size (height, width, depth): 3-11/16 × 9-3/8 × 9-3/8 inches.	
Weight: 7.25 lb.	

†Requires installation of optional FM board.

††Blocking dynamic range and third-order IMD dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

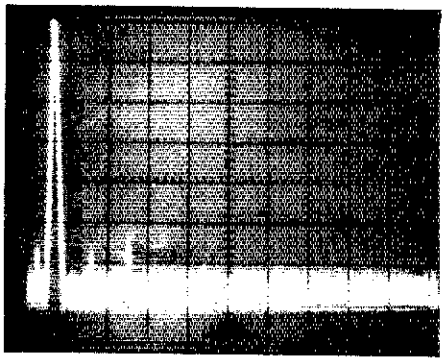


Fig 1—Worst-case spectral display of the Heath SB-1400. Horizontal divisions are each 2 MHz; vertical divisions are each 10 dB. Output power is approximately 105 W at 1.8 MHz. All harmonics and spurious emissions are at least 53 dB below peak fundamental output. The SB-1400 complies with current FCC specifications for spectral purity.

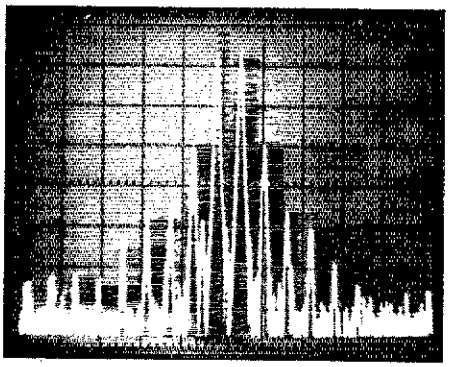


Fig 2—Spectral display of the Heath SB-1400 during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 30 dB below PEP output, and fifth-order products are approximately 44 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 110 W PEP output on 14.2 MHz.

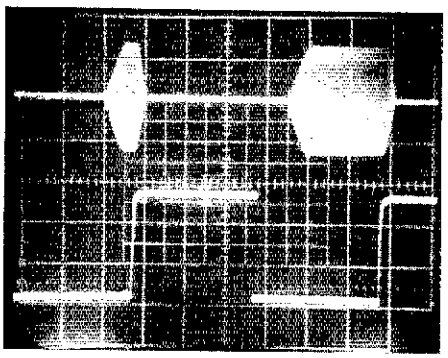


Fig 3—CW-keying waveforms for the Heath SB-1400 in the semi-break-in mode. The upper trace is the RF envelope; the lower trace is the actual key closure. Each horizontal division is 10 ms. Note that the first transmitted dot (immediately after key closure) is shortened to less than half of normal length.

6-dB rolloff point to between 2000 and 2100 Hz. Result: Crisp, communications-quality audio.

Fortunately, Heath has acted quickly to help SB-1400 owners make this fix to their rigs. If you're an SB-1400 user, contact Heath and request a copy of the *Bandwidth Modification for the Heath HF Transceiver Model SB-1400*. This five-page document clearly shows the steps you'll need to take to remove the problem capacitor from the audio-amplifier circuit. In typical Heath-documentation style, this bulletin takes you through the modification step by step, starting with a list of tools you'll need, and has several excellent diagrams showing how to undertake the modification. Heath has also promised to include this document—complete with a piece of desoldering braid—with all the SB-1400s that are currently in stock. After current stock is depleted, new SB-1400s will come from Heath without the culprit capacitor.

Here are some of the things I *like* about the SB-1400: It's physically small, so it doesn't take up too much space on my operating table; it's *extremely* easy to use (perfect for first-time transceiver users); it has dual VFOs, easy-to-use programmable memories, general-coverage receiver, computer-interface capability, and more; solid receiver performance; a built-in CW filter; and—importantly—a very reasonable price tag.

Once I got used to the radio's quirks, I had a blast with the SB-1400. I worked lots of DX, especially on 80 and 40 meters. And, the rig never gave me a bit of trouble.

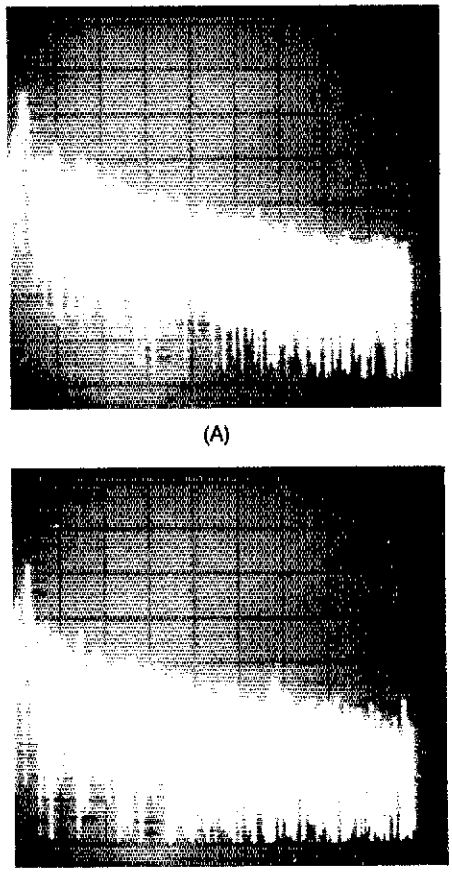
The SB-1400 should appeal to those who need a capable-yet-portable transceiver. You can easily pick up the '1400 with one hand; it's about the same as picking up a large hardcover book. Shuttling the rig between the car and the shack should pose no problems.

SB.COM: Computer-Control Software for the SB-1400

Heath has introduced software for IBM® PC and compatible computers that allows control of most of the SB-1400's functions.[3] The software also supports Heath's HV-2000 Voice Card (see Product Review, Dec 1987 *QST*), works with the Yaesu FT-747GX transceiver, and can be made memory-resident, allowing you to run another application—such as a packet-radio terminal program or logging program—at the same time, popping up SB.COM whenever you like.

The software is supplied on a 360-kbyte, 5¼-inch floppy disk that contains several files: the program itself, a documentation file and printing utility, and a program called DRAWME.COM, which writes a schematic of a suitable radio-to-computer interface circuit on the screen. The review software was also supplied with an optional hardware interface that I installed inside the SB-1400 in about five minutes. The software is available by itself, or bundled with the interface board and a serial cable for the PC-to-radio connection.

[3]Excluded are AF gain, squelch, drive and mike gain.



(A)

(B)

Fig 4—Spectral display of the SB-1400 transmitter output during composite-noise testing. Power output is 110 W at 3.5 MHz (A) and 110 W at 14 MHz (B). Each vertical division is 10 dB; each horizontal division is 2 kHz. The scale on the spectrum analyzer on which these photos were taken is calibrated so that the log reference level (the top horizontal line on the scale in the photos) represents −60 dBc/Hz and the baseline is −140 dBc/Hz. Composite-noise levels between −60 and −140 dBc/Hz may be read directly from the photographs. The carrier, which would be off the left edge of the photographs, is not shown. These photographs show noise at frequencies 2 to 20 kHz offset from the carrier.

The Screen

The upper part of SB.COM's screen display shows the date and time, current frequency, operating mode, filter bandwidth and selected VFO or memory channel. This segment of the display closely resembles the SB-1400's readout—but is larger. The program's large frequency-display numerals are easy to see. The bottom two-thirds of the screen shows the frequencies and modes stored in the SB-1400's 20 memory channels. Receive and transmit frequencies are displayed for split-frequency operation, and each memory can be labeled with a description of its contents. This is quite useful for keeping track of shortwave-broadcast stations or utility frequencies. The extreme bottom of the screen displays the function keys and their associated functions.

General Operating Information

The software features two basic operating modes—one for changing frequencies, VFOs and memory selection, the other for changing modes and filter bandwidths. There are two ways to change frequency: via the arrow keys, to manipulate the screen's frequency display digit by digit; and by using the numeric keypad to enter a desired frequency.

In sum, I found the software to be quite functional and fun to use. Some of the program's control sequences seem somewhat clumsy, such as its two methods of changing operating frequencies. Part of the problem may be that I'm so used to speedily rotating knobs and pushing buttons on the rig itself that, when I use the computer interface, something as simple as fine-tuning a station requires more effort than simply turning the radio's tuning knob. This feeling would likely go away after a period of using *only* the interface software to control the rig.

I found the software useful for manipulating the SB-1400's memory channels. It's a snap to switch among different memory-channel banks, because the program allows you to store the information on disk and retrieve it later. The program effectively expands the SB-1400's memory-channel capability to several hundred or more—the maximum number is limited only by disk space! If you're interested in taking advantage of the SB-1400's computer-interface capability, the software package's $40 price (without the serial cable and hardware interface) seems reasonable for the utility it provides.

Summary

If you're in the market for an inexpensive, competent rig that's lightweight and compact, the SB-1400 is an excellent choice. Heath's nationwide network of retail outlets—and their reputation for service—should bring them long-term success with equipment such as the SB-1400.

Thanks to Dave Newkirk, AK7M, for contributing to this review.

Price class: SB-1400 with SBA-1400-4 heavy-duty power supply, $900 (when ordered as a package from Heath as model SBS-1400-1); SBA-1400-7 software package, $40; SBA-1400-8 cable and interface package (available in mid-November), $50. Manufacturer: Heath, Benton Harbor, MI 49022, tel 616-982-3200.

Technical Correspondence

Conducted By Paul K. Pagel, N1FB
Associate Technical Editor

TOUGHER CDR TR-44 GEARS

☐ This past winter, the pot-metal ring gear on my CDR TR-44 rotator broke. Luckily, I had a spare rotator ready to install. I called Telex-HyGain (402-465-7021) to obtain some parts for the damaged rotator. I learned that the ring gear installed in the HAM IV and older HAM-M rotator (part no. 51494-10) is made of steel and can be used as a replacement for the CDR TR-44 ring gear. I figured the steel gear should last longer than the original gear, so I ordered a couple of them and installed one in the damaged rotator. The original CDR TR-44 replacement gear costs $4; the HAM IV/HAM-M steel gear costs $12. I'm sure this steel gear is worth the $8 cost differential.

Other steel replacement parts include the final gear pair (part no. 50107-00)—$19.50 for the pair—and the gear and pinion (part no. 50111-00) that drives the final gear pair, $21.70. The position-indicating potentiometer (part no. 51460-10) costs $18.37, and a supply of grease (part no. 51497-10) is $1.—*Richard W. Arthur, WB2KHH, 1378 Division St, Charlton, NY 12019*

BAUD RATE—UGH!

☐ I've an amplifying comment to Bruce Hale's "Bauds v Bits Per Second."[1] Since baud already signifies a rate of information exchange, the commonly used term "baud rate" really means the rate of a rate, or the rate at which the pulse rate is changing.

For any stable system, the "baud rate" must be zero! A system operating at 1200 bauds, with a "baud rate" of 300, implies that the system line pulse rate is varying cyclically between 900 and 1500 pulses per second (1200 ± 300)! "Baud rate" is a term used only by those who don't understand the meaning of the term *baud*. From here on, let's avoid the confusion by not using the term "baud rate."—*Ernest J. Moore, VE3CZZ, 37 Ashgrove Cres, Nepean, Ontario, K2G 0S1, Canada*

TWO BANDS, NO COIL SWITCHING

☐ I enjoyed John Reh's article in April *QST*.[2] Being an engineer and mathematician, I wondered if the 12- and 30-meter antenna could be made to work without *physically* switching out the coil on 30 meters. (Reh's article suggests the use of a switch or relay to remove the loading coil from the antenna circuit.)

Consider the antenna circuit shown in Fig 1, where a capacitor has been added in series with the loading coil. The idea is to have the capacitive reactance cancel the inductive reactance on 30 meters, but leave an inductive reactance of approximately 155 ohms in the circuit when operating 12 meters. An inductor value of 1.18 μH and a capacitance value of 209 pF will do the trick. Using Equations 1 and 2,

$$X_L = 2\pi fL \quad \text{(Eq 1)}$$
$$X_C = 1 \div 2\pi fC \quad \text{(Eq 2)}$$

you can calculate the inductive and capacitive reactances of these components at 12 and 30 meters. At 24.94 MHz (12 meters), the inductive reactance is 184.82 ohms and the capacitive reactance equals 30.53 ohms. This leaves a net inductive reactance of 154.29 ohms. At 10.125 MHz (30 meters), the inductive and capacitive reactances effectively cancel each other (75.3 and 75.2 ohms, respectively), and the series network looks like a short circuit at this frequency.

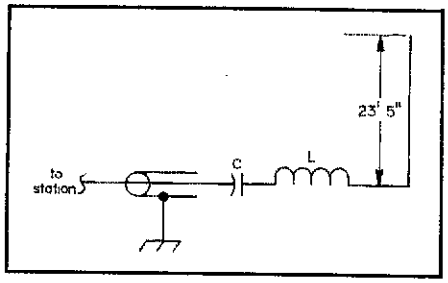


Fig 1—By adding a capacitor in series with the loading coil, no switch or relay is required to operate John Reh's 12- and 30-meter antenna on both bands. See text.

A similar approach can be used for the 17- and 40-meter bands (using the 32' 3" vertical radiator). For those bands, a 1.62-μH inductor and 301-pF capacitor are needed.—*Paul D. Carr, N4PC, 97 West Point Rd, Jacksonville, AL 36265*

☐ Re John Reh's article[2] regarding the conversion of 1/4-λ 40- or 30-meter verticals to 5/8-λ antennas on 17 and 12 meters: I suggest that automatic two-band capability be considered when establishing antenna height and the loading coil inductance. I shortened my 40-meter vertical approximately 12 inches and found an inductance that gave me 40- and 17-meter band operation with an SWR of less than 1.4:1 across each band.

The inductor I use is made from B&W air-wound coil stock (no. 3033)[3]. This coil is 3 inches in diameter, and has 3-1/8 turns of no. 12 wire wound at 6 turns per inch and provides an inductance of about 2.8 μH. I experimentally determined the correct tap position.—*James J. Johnson, W8EUI, 709 Dartmoor Rd, Ann Arbor, MI 48103*

THE MFJ-986 ON 17 METERS

☐ When the 17-m band opened for our use, I eagerly anticipated being among the crowd on opening night! In fact, I'd recently purchased a new MFJ-986 Differential-T™ antenna tuner to allow me to operate on the new band. Imagine my chagrin when I couldn't get an SWR reading below 5:1 when trying to load my doublet antenna through the tuner!

For over three weeks, I tried everything I had learned—in over 30 years as a ham—to correct the problem. Because I was using tuned feeders, I tried lengthening and shortening them. I carefully remeasured my antenna; I removed it, replaced it with another—nothing worked. In desperation, I put up a 17-m dipole, fed it with 50-Ω coax, and still couldn't get less than a 5:1 SWR on 17 meters when using the tuner!

I suspected the problem was not in the antenna because I could dump 100 W from my transceiver directly into a dummy load, but when I tried to feed the dummy load through the tuner, there was that 5:1 SWR again! The mystery deepened when I tried using a small, 100-W T match on the various antennas. The T match loaded every antenna I tried it on, even with the limited inductance resolution afforded by its tapped inductor.

My next step was to look inside the MFJ-986. Everything appeared fine. All the connections were soldered properly—no "cold" joints—and all leads were as short as possible. Because the MFJ-986 uses a *differential* capacitor to replace the traditional input- and output-side variable capacitors in the T-match circuit, I reasoned that there must be a problem with ratios of capacitance to inductance. In the '986, there are three fixed, 330-pF, 3-kV capacitors across the variable capacitor, apparently to yield more capacitance on 160 meters. Tuning into the dummy load, I tried clipping these capacitors out of the circuit, one at a time, to see if the SWR decreased. Removing two of the capacitors failed to change the situation (except to make tuning on 160 meters impossible), but taking out all three capacitors did bring the SWR down to 2:1.

I felt I was on the right track, but I was ruining the "all-band" capability of the tuner. I reconnected the three capacitors, then tuning into the dummy load, tried to

[1] B. Hale, "Bauds v Bits Per Second," Technical Correspondence, *QST*, May 1989, pp 50-51.

[2] J. Reh, "Simple 5/8-Wave Verticals for 12 and 17 Meters," *QST*, Apr 1989, pp 19-20. See also Feedback, *QST*, Aug 1989, p 41.

[3] Available from RADIOKIT, Box 973, Pelham, NH 03076, tel 603-437-2722.

find just where—in the vicinity of 18 MHz—I could find a match. To my surprise, a sharp dip occurred at 18.229 MHz, about 60 kHz above the upper band edge. Again, I clipped out the fixed capacitors, and found that the SWR dropped to less than 2:1 at 18.170 MHz, but climbed rapidly at any lower frequency.

At this point, I called in the big guns. I discussed the situation with Bill Fanckboner, W9INN (who has done some consulting work with MFJ on the tuner), and with the engineers at MFJ. There seemed to be no explanation for the phenomenon as all the tuners they checked operated normally at 17 meters.

Finally, Bill tried the same procedure I had, looking for resonance around the 18.1-MHz range. He found that several '986s in his shop displayed the same difficulty mine had, but just *outside* the band edges. After MFJ ran similar tests, Steve Pan, KF5C, of MFJ decided the problem was with the roller inductor in my unit. A new roller inductor was supplied immediately by MFJ, and the problem was solved!

The inductors used in the '986 tuners are not manufactured by MFJ. The company buys them from a contractor who builds them to MFJ's specifications. When I compared the two inductors I had, I initially could find absolutely no obvious differences between them. Both had the same number of wire turns of the same wire gage, on the cores of the same diameter. After careful inspection, however, I saw that the *spacing* or *pitch* of the wire turns at the low-inductance end of the coil was slightly different on each of the two inductors.

Because the wire is wound helically—not linearly—on the form, a minor shift in pitch at the low-inductance end of the coil will throw off the inductance/capacitance ratio just enough to create a barrier to proper tuning. When this occurs outside our bands, there is no problem. But when it occurs inside the band, it can be frustrating.—*Drayton Cooper, N4LBJ, PO Box 5, Bowling Green, SC 29703*

COAXIAL-CONNECTOR ALPHABET SOUP

☐ N, C, TNC, BNC, SMA—have you ever been bewildered by the alphabet soup of letters used to identify your coaxial connectors? Well, there are some interesting stories behind those letters.

Until the 1930s, binding posts and parallel wires were used for feed lines. When the first RF coaxial cables were marketed, the UHF connectors (PL-259 and SO-239) were introduced for these new feed lines.

During WW II, the requirements for a better connector for radar use prompted two designs. The first was developed at Bell Labs by Paul Neill and identified as the type N connector. At the same time, another connector was devised by Carl Concelman. Named the type C connector, it was the first designed as a true 50-ohm connector. By *reactive cancellation*, the inductance in the connector is balanced out by the dielectric material used to fill the connector. Reactive cancellation allows the connector to have a low SWR well into the GHz region.

Later, Neill and Concelman collaborated on the design of a miniature bayonet locking connector. This was dubbed the Bayonet Neill-Concelman or BNC connector. Some time after that, an improved, threaded version for airborne use was developed and called the Threaded Neill-Concelman or TNC connector. (Ever notice how easily a male N connector fits on a female BNC or TNC connector?)

For precision microwave use, a series of subminiature connectors were produced—A, B and C. Of these three, the A, or subminiature A (SMA), is the most popular. —*Kent Britain, WA5VJB, 1626 Vineyard, Grand Prairie, TX 75052*

[This information originally appeared in *QEX*, May 1985.—*Ed.*]

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary.

Feedback

☐ In "Sporadic-E Propagation at VHF," *QST*, April 1988, the formula in note 17 on p 39 should read:

$$d = 420 \sqrt{\left(\frac{533f}{f_m}\right)^2 - 1}$$

where

d = path distance in km
f = working frequency in MHz
f_m = maximum usable frequency in MHz

☐ Dick Carey, W6GHD, has pointed out an error in "Power-FET Switches as RF Amplifiers," April 1989 *QST*. T2 in Fig 1 should be wound on an Amidon BN-43-302 balun core rather than the specified BN-43-3312, which is somewhat larger. Also, R1 mounts vertically on the PC board rather than flat, as shown in Fig 3.

Is Amateur Radio Hazardous to our Health?

(continued from page 33)

[15]Calle E. E., Savitz D. A. Leukemia in occupational groups with presumed exposure to electrical magnetic fields. (Letter) *N Eng J Med* 1985;313:1476-1477.

[16]Milham S. Silent keys: leukemia mortality in Amateur Radio operators (Letter) *Lancet* 1985;1:812.

[17]Milham S. Mortality in workers exposed to electromagnetic fields. *Environ Health Persp* 1985:62;297-300.

[18]Pearce N. E., Sheppard R. A., Howard J. K., Fraser J., Lilley B. M. Leukaemia in electrical workers in New Zealand. (Letter) *Lancet* 1985;1:811-2.

[19]Thomas T. L., Stolley P. D., Stemhagen A., Fontham E. T. H., et al. Brain tumor mortality risk among men with electrical and electronic jobs: a case-control study. *J Nat Ca Inst* 1987;79:233-238.

[20]Lin R. S., Dischinger P. C., Conde J., Farrell K. P. Occupational exposure to electromagnetic fields and the occurrence of brain tumors. An analysis of possible associations. *J Occ Med* 1985;27:413-419.

[21]Wertheimer N., Leeper E. Possible effects of electric blankets and heated waterbeds on fetal development. *Bioelectromagnetics* 1986;7: 13-22.

[22]Goldhaber M. K., Polen M. R., Hiatt R. A. The risk of miscarriage and birth defects among women who use visual display terminals during pregnancy. *Am J Indust Med* 1988;13:695-706.

[23]Wertheimer N., Leeper E. Fetal loss associated with two seasonal sources of electromagnetic field exposure. *Am J Epidemiol* 1989; 129:220-224.

[24]Rodman D. Personal communication.

[25]Milham S. Increased mortality in Amateur Radio operators due to lymphatic and hematopoetic malignancies. *Am J Epidemiol* 1988;127:50-54.

[26]See Note 11.

[27]See Note 16.

[28]See Note 25.

[29]ANSI. American national standard safety levels with respect to human exposure to radio frequency electromagnetic fields (300 kHz to 100 GHz) *ANSI C95-1*. New York, NY: IEEE, 1982.

[30]See Notes 1-3.

[31]NCRP. Biological effects and exposure criteria for radiofrequency electromagnetic fields. *NCRP report No. 86*. Bethesda, MD:1986.

[32]Cleveland R. F., Athey T. W. Specific absorption rate (SAR) in models of the human head exposed to hand-held UHF portable radios. *Bioelectromagnetics* 1989;10:173-186.

[33]The June and July 1978 issues of *QST* have several articles on the subject of radiation and chemical hazards in the shack. These include a discussion of the concepts of near field and far field power densities as well as the hazards of fiberglass catalysts.

[34]*The ARRL Handbook for the Radio Amateur*, 66th ed. p 37-2. Newington, CT: ARRL, 1988.

[35]Davidoff, M. *The Satellite Experimenter's Handbook*, 1st ed. Chapter 7:7-9. Newington, CT: ARRL 1984.

[36]*The ARRL Antenna Book*, 15th ed. Chapter 1:16-18. Newington, CT: ARRL, 1988.

[37]Davidson D. RF safety practice. In: *ARRL Microwave Book*, 1st ed. (in press). Newington, CT: ARRL.

[38]See Note 29.

[39]Power-density meters and probes are commercially available from Narda Microwave Corp (435 Moreland Rd, Hauppauge, NY 117788) and General Microwave Corp (5500 New Horizons Blvd, Amityville, NY 11701).

[40]See Note 29.

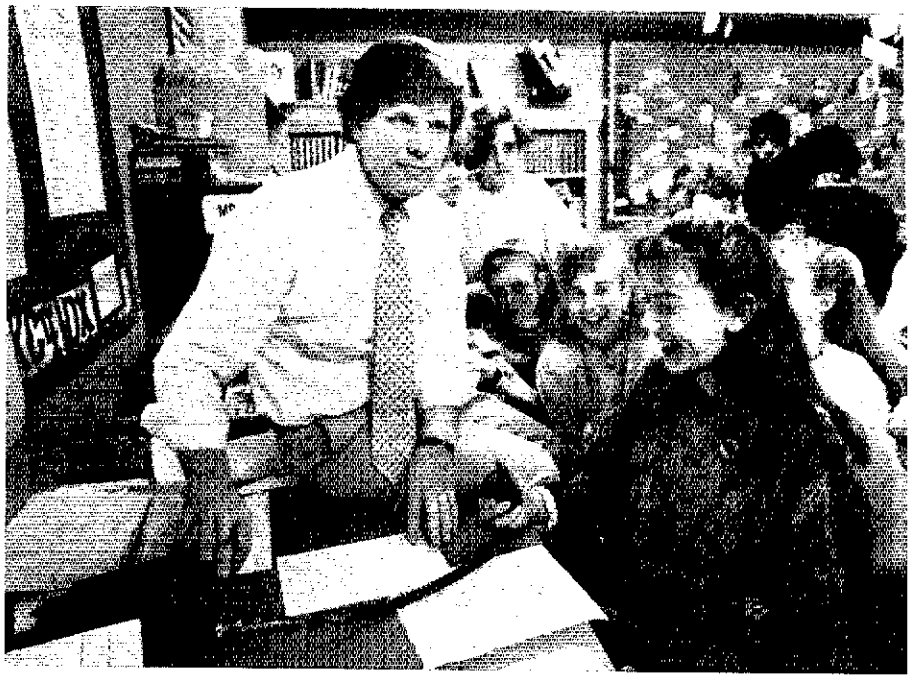
[41]US Congress. Office of Technology Assessment. *Biological Effects of Power Frequency Electric and Magnetic Fields—Background Paper, OTA-BP-E-53* (Washington, DC: US Government Printing Office, May 1989). This recent document, which was prepared at the request of Congress by the Department of Engineering and Public Policy of Carnegie Mellon University in Pittsburgh, discusses the present state of knowledge on the health effects of low frequency electric and magnetic fields. It also describes current US funding levels and research programs, and provides significant information on regulatory activity including existing and proposed field exposure standards. No doubt it will be considered to be a major governmental statement on the problems discussed here, and will be a standard reference for consideration in the future.

[42]Milham S. Personal communication.

The Bardstown Experiment

A refreshing account of how the school system, the local club and a ham newspaper editor put Amateur Radio in the classroom—and surpassed their wildest expectations.

By David Greer, WE4K
RR 1 Box A-1
Richland, IN 47634



Bardstown Middle School (KY) teacher, Chris Luvisi, KC4IDX (l), adjusts the volume on the rig, while operator Jackie Saltsman, KC4INS, and other Novices chuckle over one of their contact's comments. *(photos Terry Boyd,* The Kentucky Standard*)*

The day 10-year-old Rusty Ballard passed his Novice exam and ran down the hallway of Bardstown Middle School shouting, "I'm a ham, I'm a ham," I knew the hard work had paid off.

The hard work had produced an impressive scorecard: 63 students between the ages of 10 and 13 and two teachers had obtained their Novice licenses. But they are more than merely licensed. They are active daily from a well-equipped classroom station. They are talking to the world on 10-meter SSB and loving it. More importantly, they are learning.

Can Amateur Radio hold any fascination for a generation that's computer literate, videowise and microwave open—jaded on compact disc before they enter kindergarten? I wondered—but the answer is yes.

They peppered me with endless questions: "How do I get a Ten-X number? When's the next hamfest? How do I make a dipole for 10 meters? What do I have to do to upgrade to General?"

I spent a whole day with the students about a month after they received their licenses. Their enthusiasm for Amateur Radio was mushrooming due to their access to the classroom station and the excellent propagation that put the world at their fingertips. Over half said they wanted to set up stations at home.

However, all had not always been so rosy. Many of the students had gone into the ham radio course with great fear of the unknown. For many of them, it was the most difficult classroom challenge they had ever faced.

"You really don't know what it's like until you make your first contact," said 13-year-old Judge Carothers, KC4IMW. His view was shared by many of the students. You can explain what Amateur Radio is all about and show videotapes back-to-back for months, but no one—particularly youngsters—can appreciate the allure of our hobby or the thrill of talking to exotic places, until they can actually see and operate an amateur station themselves.

"I didn't want to do it at first," said Rhonda Parrigin, KC4IMS, a 12-year-old sixth grader. "After you talk to somebody, it's fun. Now I want one of my own." I would soon learn that was an understatement. Rhonda became one of the most die-hard ham radio fanatics of the group.

"When we got the ham radio and we made our contacts, I got very interested," said 11-year-old Leslie Morgan, KC4IZW, a sixth grader.

Now, the students' everyday conversation is peppered with ham radio terms. Splatter, QRM, and DX are now part of their world.

"Learning ham radio is probably the most fun thing I've done in school," said 11-year-old Christy Hutcherson, KC4JAA.

Many of the students fondly recall their first QSO. "I was really nervous," said 13-year-old Beth Campbell, KC4INQ. "It was really an exciting experience." Twelve-year-old Sarah Lawson, KC4IMG, worked a station in the Canary Islands for her first QSO. "He said he'd never visited Kentucky," Lawson recalled. "I told him it was really pretty here."

Amateur Radio was proving to be a valuable classroom experience, according to Chris Luvisi, KC4IDX, the students' teacher. "One of our goals in gifted education is to teach communication skills and expose kids to different cultures," he said. "I've taught for nine years, and I've never seen kids as excited as the day they passed their license exams. They were afraid at first. It was something they'd never done before...or even considered."

The Beginning

The Bardstown Experiment, as I call it, began in the spring of 1988. As editor of the local newspaper, middle school teacher Luvisi had asked me twice to guest lecture his students on journalism. Luvisi's stu-

dents are part of a program for exceptionally bright and inquisitive students. They had impressed me with the quality of their questions during my presentation.

After my second visit, I began to think this might be the perfect opportunity to test a long-held personal theory that Amateur Radio offered its own version of a living classroom textbook with its emphasis on physics, geography, social studies, languages and learning the discipline of on-air operating procedures. Plus, the hobby gives youngsters the opportunity to interact with adults on an equal basis—in my opinion, a valuable experience.

I asked Luvisi if I could return later to make a presentation on Amateur Radio to one of his classes. He said yes, later admitting he was agreeable at the time only to return the favor of my speaking to his classes.

Armed with a videocassette of "The New World of Amateur Radio," the presentation was made. The students were enthusiastic about Amateur Radio, but Luvisi was even more hooked because he immediately saw the benefits of ham radio as a teaching tool.

That summer Luvisi began studying for his Novice license. By fall he had designed a ham radio course for his fifth- through eighth-grade classes based on *Tune in the World with Ham Radio*. For eight weeks in the fall and early winter of 1988, 63 students and another teacher, Janet Strickland, Luvisi's assistant, studied ham radio daily for an hour.

It came time for Luvisi to take his Novice exam. Many of the students were wrestling with the Morse code and theory. Probably, some of them secretly hoped their teacher would fail his exam, so that he might decide it was really too difficult for the yougsters, too, and give up this "crazy" idea of making them all ham radio operators. No such luck—Luvisi passed his Novice exam with flying colors and became KC4IDX.

As the students continued to struggle with the code and theory over the next several weeks, I made several guest lecturer appearances. I answered questions galore. I emceed an Amateur Radio version of the old College Bowl TV quiz program. We practiced CW. We sweated.

For many of the students, this was the most difficult academic challenge they had ever faced. However, they could not back out. Luvisi knew his students well. He knew school was too easy for most of them. Seldom had they been challenged in the classroom. That's why the course was designed so they could not fail. It wasn't allowed. That's why this radio course was not optional, as it often has been at other schools. It was mandatory. To pass the Novice exam meant getting an A in the class. To fail meant getting an F.

After beginning the ham radio course, some of the students who found it rough going wanted to drop out. Luvisi talked them into sticking with it, offering lots of encouragement along the way. Practice tests designed to be easily passed and build confidence were given before the one that counted. "Everybody succeeds," said Luvisi. "It just takes some longer than others."

LaToya Keene, KC4IZM (center), is all smiles while making her first contact.

Just before Christmas, Jim Brooks, N4SRT, president of the local Amateur Radio club, and I administered the Novice exams. Forty of the 63 students passed after the first round of testing. Other students were tested, tutored and retested until they passed. They were not allowed to fail.

The Present

After receiving their licenses and getting on the air, nearly all the students said they were glad they had stuck it out. The effort had been worthwhile, they admitted. At least a third of the students are head over heels about ham radio.

"I felt like nothing could be worth this much trouble, but it was," said fifth grader Gail Smith, KC4ISM.

One of her classmates, 10-year-old Edmund Sauer, KC4ISL, was among the most hooked. Within weeks of getting his license, Edmund had worked over 30 countries and had several DX QSL cards. He was maintaining schedules with hams in Europe and sounding like an old timer at the mike. Edmund's assessment of ham radio was simple: "I'm loving it!" he told me.

The students discovered that working DX had increased their awareness of geography. "It makes me want to visit those countries," said Steve McNear, KC4ING, a sixth grader.

"They flip through the *Callbook* and atlas the moment they hear someone," said teacher Janet Strickland, KC4INU.

Several of the students made their first contacts the day I spent with them. Jackie Saltsman, KC4INS, a seventh grader, snagged Frank, KX1T, in New Hampshire for her first QSO. Then she worked Al, K1WQU, in Vermont for her second contact. Then a station from California called. Pretty soon Jackie had a pileup going on the frequency. She handled it like an old timer.

Then LaToya Keene, KC4IZM, another seventh grader, made her first contact.

Ann Barnes, KC4INH, an eighth grader, called CQ and attracted the attention of two stations in the seventh call area on her very first call. Anthony Green, KC4IOF, let out a CQ and snared Mitch, NH6JC, in Hawaii.

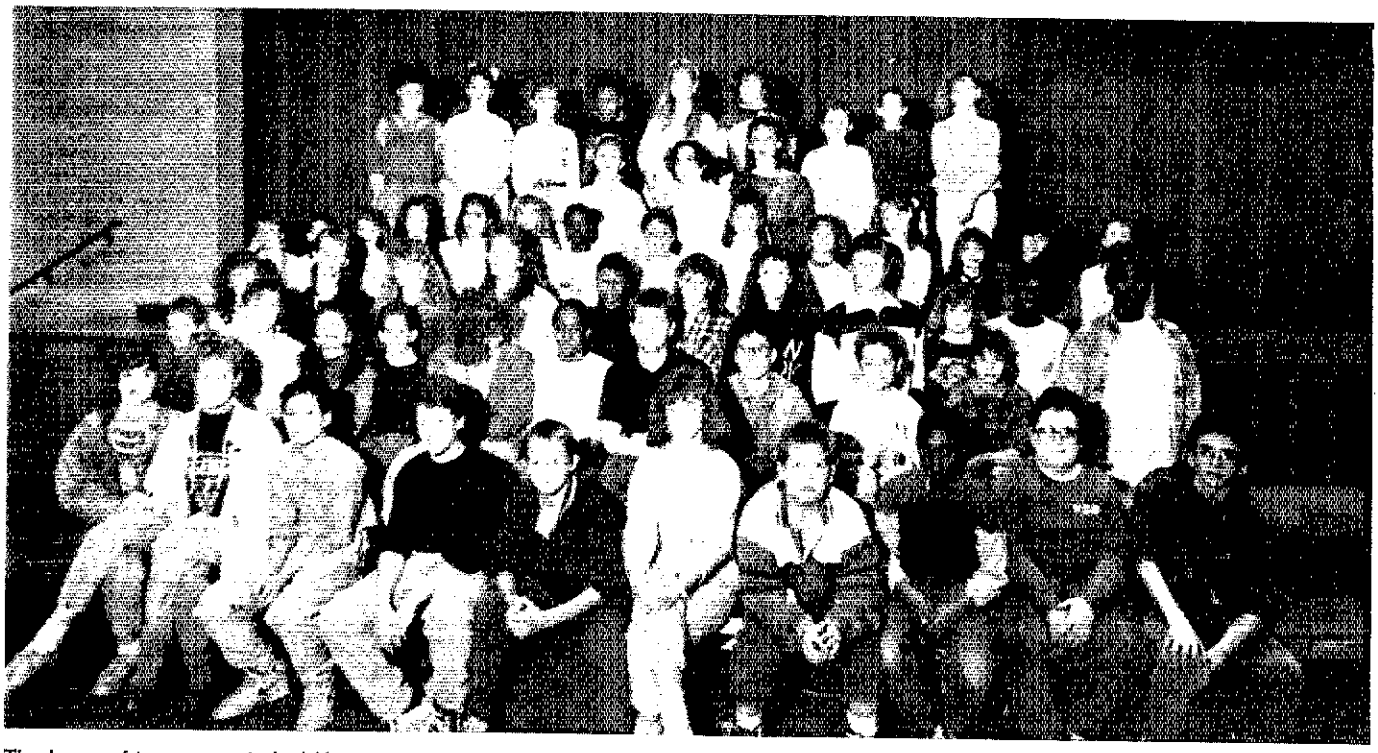
"Can I go now?" another student asked Luvisi, as the youngsters competed for rig time.

"Our biggest problem has been we have one radio between 63 students," Luvisi said. Many students began coming to school early, skipping lunch or staying after school to operate the rig.

Not only were youngsters learning geography firsthand, but solar flares provided a valuable hands-on lesson in physics, too. The flares knocked out all HF communications for several days, and the students learned what effects these disturbances can have.

The Station

By obtaining grant money from local sources, Luvisi purchased a 30-foot tower, coax, rotor, power supply and a triband beam. The antenna was mounted on the school roof at a height of 45 feet by the local ham club, the Kentucky Amateur Radio Society. A Radio Shack® HTX-100



The hams of tomorrow—today! Here are the Amateur Radio students of Bardstown Middle School. Sixty-three students between the ages of 10 and 13 and two teachers obtained their Novice licenses.

25-watt transceiver was purchased as a first rig. The students loved it because it wasn't intimidating to use.

Luvisi estimates he spent less than $1500 on setting up the station. It was cheaper than one classroom computer. That made it easy to sell the concept to the school administration and superintendent.

Later, Kenwood USA generously donated a new TS-140S transceiver and power supply to the school. The HTX-100 and a 10-meter dipole became a loaner setup for students to take home for additional rig time.

Other schools began to take notice of the project's success and inquired about the program.

The students were well received on the air from other hams. Many contacts said they specifically enjoyed talking to a school. One was a ham in Botswana who said, "I couldn't resist. I called just because you were a school."

The Future

Interest in ham radio has been keen among students and teachers in the adjacent high school. Plans call for Luvisi to teach a ham radio course at Bardstown High School this fall. Plus, seventh and eighth graders will take an upgrade course to Technician/General. The local ham club is putting together a volunteer examiner team, so students can upgrade locally. The purchase of VHF/UHF gear is on the agenda, so students can get involved in satellite work.

Plans call for the installation of a 2-meter repeater on the school grounds. The students are painting the tower with the school colors. The machine will belong to the local ham club.

Conclusions

Months after the project began, Chris Luvisi and I looked back and agreed the success had far exceeded our wildest expectations. We never dreamed all 63 students and both teachers in the gifted education program could get their licenses. We never thought the project would be so well received by the students, their parents and the community.

Many parents told me how much their children enjoyed learning about ham radio. The students were having fun, and the school and its administrators were supportive. What else could we ask for?

I asked the students which had been harder to learn—Morse code or the theory and regulations? Most said the code. Luvisi and I agreed that the seventh and eighth graders had the easiest time in learning the code. It was more difficult for the fifth-grade students. It seemed that the older middle school students had better developed study habits and longer attention spans, both vital in listening to a code cassette for 30 minutes nightly. Future teaching efforts may concentrate on the seventh and eighth grades, although individual fifth and sixth graders seemed to show the most enthusiasm for operating the classroom station.

Would the students have been interested in obtaining a codeless, VHF-only license, if one had been available, I asked? They said yes—until I explained it would have excluded them from 10-meter DX. Then the answer was a resounding no.

For me, a mother's comment made while waiting to pick up her daughter summed up the story. School was over for the day and 12-year-old Rhonda Parrigin, KC4IMS, was at the rig calling CQ.

"Rhonda hated this stuff while Mr Luvisi was teaching it," said Mrs Parrigin, "but just look at her now. I can't get her to go home."

Strays

I would like to get in tought with...

☐ anyone who has a schematic, parts list and other info on a TPL Communications FM RF power amplifier, model PA3-1AC. Leslie Hogg, 28423 Kendallwood Dr, Farmington Hill, MI 48018.

***QST* congratulates...**

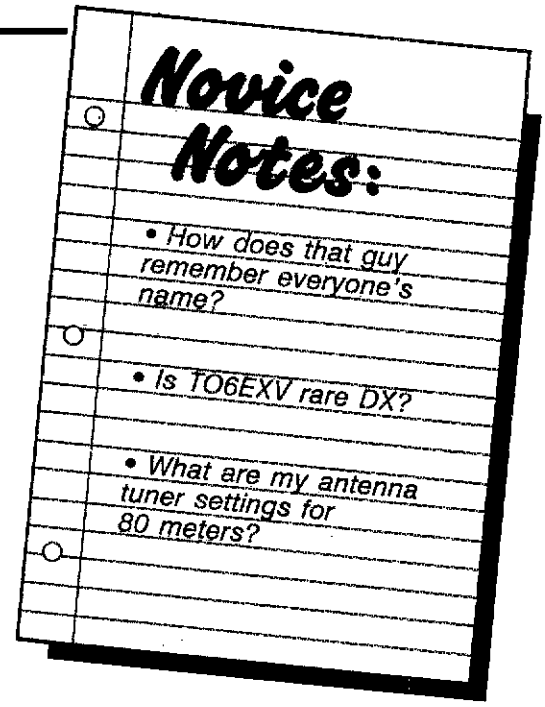
☐ Kenneth M. Miller, K6IR, of Rockville, Maryland, on being elected to the Board of Directors of Interference Control Technology Inc. ICT is an electronics company specializing in the measurement, reduction and elimination of radio frequency interference sources.

☐ Sheldon Weil, K2BS, of Garden City, New York, on receiving the Boy Scout Distinguished Eagle Award. This award, recognizes past Eagle Scouts who have distinguished themselves in their careers and public service.

Cue Cards for the Ham Shack

There are lots of things you need to know when you're talking on the air. Here's how to put powerful information at your fingertips.

By Rick Booth, KM1G
232 Washington St
Norwood, MA 02062



Nine Lima! Yikes, where's that? How can I find out *fast*? If you like DXing, you'll find yourself asking this question. Some day you'll be scouting the DX bands, hear an exotic-sounding call sign, and frantically try to determine what country is on the hook. Do you need to work this station for DXCC (the ARRL DX Century Club award)?

Sure, you need them *all* now. Perhaps you're on the road to WAS (Worked All States) and are concentrating your effort on stateside QSOs. Sooner or later—it just *seems* like later—that elusive 50th state will fall, first in the log and then in your QSL card file. You'll then be hunting fresh game. Chances are it will be DX game on 10 meters, especially with the sunspot cycle getting ready to peak. If you have the right tools within easy reach, you can find what you need quickly. That's important in the fast-paced world of DXing.

For new hams, finding things out can be a matter of trial and error. If you're lucky, you've kept in touch with your Elmer, the amateur who got you started. He or she can probably give you some excellent advice on what you'll need at hand in your shack. A peek inside Elmer's own shack is worth its weight in education, too.

But let's say you earned your spurs on your own or you don't want to "bother" Elmer (even though he'd be more than glad to help). Are there a few little knicks and knacks you can look for, to make life on the HF bands easier? You bet there are, and most of them are either free or really inexpensive.

It's hard to overemphasize speed. When you need information, you need it *right now*. Smooth, efficient operating is fundamental in the Amateur Service, and operating aids are most useful when they're within reach, posted right in sight where you needn't even reach, just look. Ironically, a *VHF* experience vividly brought this home to me.

Going Mobile

Ever wonder how some hams are able to associate a name with every call? I did, especially when I started working 2-meter FM. The light dawned on me early in my ham career when I was riding in a fellow ham's car one day. Someone checked into the local repeater. Call only, no name.

"Hmmm," he said, "Don't I know him?"

He reached for the sun visor on his car, and flicked it over to reveal a computer-generated list of calls, together with the associated first names. Glancing once, he reached for the mike, and confidently keyed it to greet the other station by call *and* first name. Knowing I was new to 2 meters, he glanced in my direction and winked. So that's how! It's not magic or a photographic memory (although both help). It's planning ahead by having a printed roster right next to the mike or key. Public relations at its finest!

Of course we were stopped at a traffic light at the time, and his list wasn't that long, since he already knew most of the regulars. But I had to admit that his little trick was inspirational for my home-station operating as well. It wasn't long before I'd assembled a small array of helpful things I could get at with a flick of my own wrist or eyes. My life on the bands has been a lot easier ever since.

Zooming In

Most of us have access to a photocopier. Next to your station hardware, it can be the most useful operating tool around. Take the Q signals, for instance. Most of us know, or soon learn, a few of them: QSL, QTH, QRM and QRN are four of the best-known. You hear them on both CW and voice, even though they're meant for CW only. But do you know them all? Quick, how about QRA, QRU, QRL, QSK? They save tons of time, but only if they're understood.

Post 'em! That's right, photocopy the list of Q signals from an ARRL publication, such as the League's booklet, *Operating an Amateur Radio Station (OARS)*. Use a zoom copier and get a copy big enough to read from a few feet. Now, tack it on the wall of your shack where you can see it. You're not in the dark anymore. This is especially helpful if you participate in the National Traffic System (NTS) nets on CW. Traffic nets live and breathe by their special *QN* signals, a subset of the standard Q signals. QN signals work work the same way as regular Q signals, except they're used exclusively as shorthand for CW net operations.

You might also want to post the frequency privileges chart, phonetic alphabet and a UTC time-conversion chart. All of these charts appear in *OARS*, *The ARRL Operating Manual*, and other publications.

List Operation

Oh yes, we started off wondering what a Nine Lima was. Well, have you ever heard hams talk DX? "The Vee Kays were in last night, and I heard some Zed Ells, too." Of course, they mean VK, Australia, and ZL, New Zealand. They're talking *prefixes*, the first part of an amateur call that indicates the

Table 1

Conversion Formulas

Fahrenheit to Centigrade (Celsius):
degrees Fahrenheit − 32 × 0.5555 = degrees Celsius.

Feet to meters:
feet × 0.3048 = meters

Miles to kilometers:
miles × 1.609 = kilometers

country. You probably know some by heart already. But I'll bet you don't know them *all*. Few amateurs do, because there is no need.

Prefixes come in two varieties, and posting quick aids in the shack for each can speed things up. The first variety is the regular prefix. For instance, VK is the standard prefix for Australia. Make sure you have a copy of the latest *ARRL DXCC Countries List* booklet at hand: It lists every DXCC country in alphanumeric order by its standard prefix. The *Countries List* also has boxes to check off countries worked and confirmed on each band and mode.

Then there are the not-so-common prefixes. The ITU (International Telecommunication Union), the United Nations agency in charge of telecommunications, assigns whole blocks of prefixes to each country, and then lets each country pass out call signs within those parameters. For example, the ITU has allocated VHA-VNZ *and* AXA-AXZ to Australia. That's why you'll hear your VK friends signing an AX prefix on the air from time to time—VK4XA becomes AX4XA. Usually AX prefixes are used in conjunction with a special celebration Down Under.

The ITU has assigned WAA-WZZ, KAA-KZZ, NAA-NZZ and AAA-ALZ to the US. That's why our amateur calls start with W, K, N or A. You can find a complete list of all international call-sign prefix allocations in *The ARRL DXCC Countries List*, *The ARRL Handbook*, *The ARRL Operating Manual*, and other League publications. Posting the international list can make your DX activities easier.

Let's take our Nine Lima. You hear a station identifying as 9L1CA and glance at your DXCC list or your international prefix list, which you have cleverly posted on the wall. There it is: 9L, Sierra Leone in West Africa! Holy smokes—you need Sierra Leone for DXCC! You hit him with your call immediately, because you identified him *before* the crowd did. Now, with him safely in your log, you listen to the pileup build. Because you had the information, you acted fast and *first*.

What about Tango Oscar? You're patroling the band one day, and you find TO6EZV. Where is he? Check the DXCC list. No? Then it's not a common prefix. Quick, scan the allocation list. Eureka! Tango Oscar falls between TOA and TQZ, which the ITU has allocated to France (see Fig 1). Sure enough, it's an F6 near Paris running a special prefix. Perhaps you want a new prefix, so you give him a call. But if prefixes aren't your bag, and France is already confirmed, you can save yourself time that might otherwise be wasted calling a station you don't need. This, friends, is known as informed decision making. Remember, in ham radio, timing is everything, and you may find a really rare DX station just down the band with *no one* calling him.

Other Tips

Okay, so you found out where Nine Lima is. Where do you point your beam? Rather than blindly turning the antenna until the DX station peaks, post a list of beam headings to different parts of the world. This information is available in *The ARRL Operating Manual* and from suppliers who advertise in *QST* ham ads.

Quick band changing and tune-up is critical to DXing, too. Do you use an antenna matching device, a tuner? Do you tune it from scratch, every time? If you haven't already, make yourself a tuning chart. Insert some paper behind the tuning knobs, and mark the appropriate settings for each band. Or, just make a 3 × 5 file card of knob settings by band and tape it to the front of the tuner. Don't forget that settings can vary, so you'll want to use the "cheat sheet" for general reference, and not in blind faith. You can set up your linear amplifier with the same kind of cheat sheet once you upgrade to General.

Once you start filling up your log with contacts, you'll want to send QSLs. Plan ahead; have some self-addressed envelopes, IRCs (International Reply Coupons) and some stamps on hand. Then you can put the whole package together on the spot, and drop it in the next mail on the way to school or work.

FAA-FZZ	**France**
GAA-GZZ	United Kingdom of Great Britain and Northern Ireland
TAA-TCZ	Turkey
TDA-TDZ	Guatemala
TEA-TEZ	Costa Ricca
TFA-TFZ	Iceland
TGA-TGZ	Guatemala
THA-THZ	France
TIA-TIZ	Costa Rica
TJA-TJZ	Cameroon
TKA-TKZ	France
TLA-TLZ	Central African Republic
TMA-TMZ	France
TNA-TNZ	Congo
TOA-TQZ	**France**

Fig 1—Everyone knows that the F6EZV is a station operating in France; not so obvious is TO6EZV. Having the international prefix allocations posted on the wall, larger than life, allows you in a split second to determine that the station signing the "Tango Oscar" prefix is also in France, thereby saving your adrenalin and your RF for bigger game. It's also good practice for reading the wall chart on your next visit to the optometrist!

Somehow, stamps are never around when you need them, especially if you leave them where other members of the household can get them! For more information about the important subject of QSLing, see my article "Paper Tiger," published in February 1989 *QST*.

Metric conversion references are handy in international ragchewing—most of the world uses the metric system. You'll realize that after a DX ham tells you his weather (WX HR 3C) and antenna height (ANT HR DIPOLE AT 18 METERS) and you want to respond in kind. If you have an outside thermometer handy with a Celsius (Centigrade) scale, you're in business. If not, a conversion chart can be helpful. See Table 1 for a set of formulas for making these conversions. But even if you know the conversion formula, you have enough to worry about in a DX QSO without arithmetic. That's why posting a little chart with metric equivalents of commonly used QSO information to prompt yourself is helpful. Write down the height of your antenna in meters or your distance from the nearest big city in kilometers so that you can rattle them off like a pro. Save the arithmetical calculations for those unexpected queries.

The Bookshelf

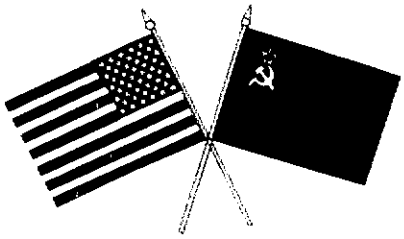
In this article, I've repeatedly mentioned *The ARRL Operating Manual*, *The ARRL Handbook* and *Operating an Amateur Radio Station*. You'll find these books to be useful additions to your bookshelf; they'll serve you well for a number of years, and answer most of the questions that come up in your operating. You can find these books at your local Amateur Radio dealer, or order them from ARRL HQ. See the ads elsewhere in this *QST*.

Another important tool is *The FCC Rule Book* published by the League. The brand-new 8th edition covers the FCC's rewritten amateur rules that took effect September 1. One of the first things new hams learn is to ask, "Where's the manual?" when buying used gear. Yet many don't have on their shelf the "instruction manual" for Uncle Sam's rules! Get a copy of this essential reference source for your radio bookshelf.

And let's get a real atlas in the shack. Random maps are fine, but hams always seem to be in places that aren't on the map, whatever its detail. Wouldn't it be nice if you could just pick his/her QTH out, and tell the other operator something about where he or she lives? A nice surprise.

Read It and Reap

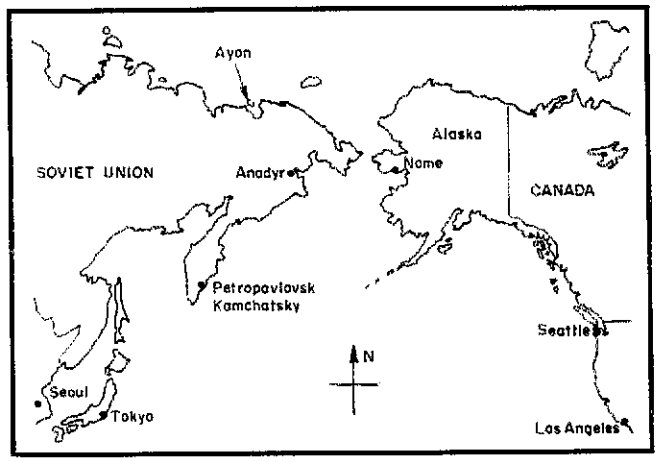
You probably can think of a host of other postable operating aids. Send me a letter with your favorites, and perhaps some day they will form the basis of another installment. The point is, Amateur Radio is an information-oriented hobby. There's a lot to know, and sometimes an overwhelming amount to remember. If you find yourself looking up the same piece of data time after time, do yourself a favor. Copy it, blow it up and post it where you can conveniently see it from your operating position. Eventually, you won't need to look quite so much—but it's a comfort to know you can. QST



Tune in to Glasnost

Part 2—US hams on the air from Soviet soil

By James D. Cain, K1TN
ARRL Contributing Editor
PO Box 42
Andover, CT 06232



Ayon Island, in the Soviet arctic, is the site of one of several DXpeditions by US hams this year.

If there is an Everest for American and Soviet Amateur Radio operators, it is staging "Field Day" together. In 1989 this mountain was scaled, and those reaching the summit say the view is spectacular.

Appropriately, our Everest was in the frigid Soviet Arctic, at USØSU last April.

In the future, new routes to the top will be found, some more daunting. These challenges will be noted, but, like Sir Edmund Hillary, the pioneers will be the ones we remember.

Project SkiTrek pointed the way in the spring of 1988.[1] SkiTrek, with a reciprocal operating arrangement between Canada and the USSR, helped till the soil into which Soviet and American seeds were planted.

SkiTrek was a logical first step for the Soviets: It filled the need for reliable radio communication in the desolate Arctic. Amateur Radio was a natural. If a border stood in the way, well, just come to an agreement.

So When is Field Day?

Three Americans tell the story of how they, and others, secured operating permission in the Soviet Union this year. They "merely" did what hams have done since Marconi. Set up in the field to work the world.

About the only thing the three operations—USØSU, 4J1FS, and US4P—have in common is that they all took place on Soviet soil. 4J1FS added one American to a Finland-USSR operation. Hams on both sides cooked up USØSU to commemorate a historic event in the Soviet Arctic. And US4P featured five hams from the US Northwest who, after a couple of fits and starts, ended up contest operating in Soviet Russia alongside their Soviet counterparts.

Of course, none of these operations was as simple as that.

So we've operated from the USSR. The reverse has yet to take place—when it does, it will amount to the Soviets' own conquest of Everest. The facts are not encouraging: in 1985, the last year for which data is available, perhaps 80,000 Americans visited the USSR; a mere 2,216 Soviet tourists came to the US.[2]

Travel between the two countries always has fluctuated with the political climate but has been climbing the last year or two. Visitors from both countries, ham and non-ham alike, generally are advised to eschew "planned tours" and go it on their own. This requires securing sponsors, both official and unofficial, a task much easier for us hams.

American hams generally are well treated in the USSR, so there is little to fear from being a stranger in a strange land. It is up to us to reciprocate when the Soviets come to town. The situation currently is in a high state of flux (fortunately, nearly all positive).

One stumbling block is operating permission, and the Soviets are ahead of us here. Late last year, the Radio Sports Federation informed ARRL of their interest in a reciprocal operating agreement. ARRL has asked the US Department of State to work with the USSR for a "formal exchange of notes permitting reciprocal operating by amateurs of one country in the territory of (the other)."

This display is set up in the meeting room of the International Computer Children's Camp in Triosk, a scientific center some 40 km south of Moscow. Triosk and Oakland, California, are sister cities. *(photo WA2LQQ)*

For now, if you want to visit some Soviet hams and do a little operating from their shacks, here's how. Schedule your trip well in advance and write to some hams in the areas you plan to visit. Let them know you would like to operate. If you are lucky, you will get an invitation. When you show up with your American license, chances are things already will have been taken care of, or quickly will be. You may get a handwritten permit to operate, but it will be valid.

But a Soviet license is worthless in the US. There are no strings to be pulled. The holder can take a Volunteer Examiner test, but there is no on-the-spot licensing. And there are no VEs in Moscow.

To be blunt, if Yuri Ham visits your shack, he can make some contacts on CW using your call sign. Or he can speak over the microphone with you acting as control operator. There are worse things, but progress this is not.

In a film clip prior to the USØSU operation, the Cable News Network suggested that the joint operation might simply be a (one-time) propaganda ploy by the Soviets. Subsequent operating permission for Americans suggests otherwise. And the fact remains that the USSR opened its doors to us first.

For now, we cannot return the favor.

Problems: Some Familiar, Some Not

When you arrive in the USSR, it would be well to keep in mind the roadblocks Soviet hams must dodge. Here's how *Radio* magazine summarized them:

- Illogical and senseless limitations on Soviet shortwavers (still too many regulations and prohibitions).
- Too few radio parts in stores, while

[1]Notes appear on page 48.

Radiosporting, Volga Style

In June 1937, a Soviet aircraft made the first nonstop transpolar flight from Moscow to Vancouver, Washington. Late in 1985, the Western Washington DX Club (WWDXC) invited Moscow's Central Radio Club to commemorate this event's 50th anniversary.

We proposed a DXpedition by American and Soviet amateurs to the Diomede Islands in the Bering Strait—a week operating on Big Diomede (part of the USSR), followed by a week on Little Diomede (American), just two miles away.

Our plan apparently was too ambitious for the Radio Sports Federation of the USSR (RSF). They countered with an "On-the-air operating event. . . between the terminals of the flight. . . by the E.T. Krenkel Central Radio Club and the Western Washington DX Club. . ."

We accepted and, despite poor propagation, W7FR (the WWDXC club station) worked about 400 stations in the USSR on two weekends in June and July 1987. In the political climate of the day, that seemed a good start.

By 1987 the word "glasnost" was on more and more lips. Our appetites whetted, WWDXC Vice President KD7IK tested the new "openness." He proposed, to five local Soviet clubs, a joint DXpedition. Three responded: Kiev, Kazan and Tashkent.

Suddenly, the RSF was letting local clubs make their own plans with foreigners!

On-the-air coordination (and agonizingly slow mail) produced a plan for a DXpedition to Soviet Armenia, UG6. Soviet spark plugs were Gene, UA4RZ (Kazan); Victor, UB5WE (Kiev in the Ukraine); and Karin, UG6GAT (in Yerevan, capital city of Armenia). These three—and many others—arranged funding, transportation, and logistics for 15 visiting Americans, as well as permission for them to sign UG6/(home calls). Target date: May 1989.

Everything was set when disaster struck, literally. The operation became a casualty of the December 1988 earthquake in Armenia. There was nothing we could do but regroup, but the groundwork had been laid.

Last February, UA4RZ, of the 40-member Zilan DX Club, proposed a consolation event. They alone couldn't host the large number of visitors earlier scheduled, but they did invite five WWDXC members for a joint operation in the 1989 IARU HF World Championship (July 8-9).

Of course, we accepted, and counted the days.

First stop for our team—K7UDG, WR7Q, K7RA, KE7V and K7ZR—was Moscow. After three days of visiting "Box 88" and some of the local DXers, we moved on to Kazan, capital of the Tatar Republic. There, Zilan DX Club members opened their homes to us, and in every way Russian hospitality exceeded its reputation.

In anticipation of our arrival, a first-class contest station had been set up at a campground on the Volga River near Kazan, and a special contest call sign awaited us: US4P. Arrangements also had been made for the visiting Americans to sign UA4/(home call) while operating from club stations in other cities along the Volga.

Side by side, we Soviet and American operators entered the contest. Using an IC-761 loaned by the factory and RA3AO-type homebrew transceivers and linears, we managed 1,996 contest QSOs and a score over one million points—despite the usual visits from Murphy!

The US4P team assembles for posterity. Author K7ZR is on the left, in the checked shirt. *(photo K7ZR)*

Before and after the 48-hour US4P authorization, we Americans worked the pileups signing portable from the Kazan club station. On the air comments about Americans operating in the USSR invariably were positive. . . "Good show," "Have a great time," "Welcome, enjoy your visit," and so on.

After a hydrofoil ride down the Volga to Ulyanovsk, 200 km south of Kazan, and some operating from UA4LWZ, K7UDG and WR7Q headed for home. The rest of us took an overnight train to Volgograd, inspired by an open invitation of the Peleng Radio Club that appeared in April 1989 *QST*.

Volgograd club stations were opened to us, as well as a summer youth camp (featuring a course in Amateur Radio), and the many museums and monuments to the battle of Stalingrad (later Volgograd).

During our time in their country, the Soviets supplied all our food, housing, recreation and in-country transportation. We met more people than anyone possibly could remember. But the Soviet amateurs most responsible for the success of this operation were UA4RZ and RA4PO in Kazan; UA3ABW and UA4PBX in Moscow; and Anatoly Tsilibin and UA4AAW in Volgograd.

Now the shoe is on the other foot. Given the usual anemic ham club's treasury, reciprocating the kind of hospitality and goodwill we experienced will be a real test of American "volunteerism." Because of currency restrictions, visiting Soviets will need food, housing and transportation. . . just as they are providing for visiting W/Ks.

And they will need official permission to operate on the ham bands such as the US4P team enjoyed in their country.

Given the snail's pace at which our respective bureaucracies move, time grows short; next summer Seattle will host the 1990 Goodwill Games. Amateur radio events are being planned with hopes for a 12-member Soviet team of "radio sportsmen."

Can we afford a "Glasnost Gap?"—*Jack Bock, K7ZR*

tons of them are hauled to city dumps or simply destroyed.

- Too little production of Amateur Radio equipment, poor quality of what is produced.
- Shortage of Amateur Radio literature.[3]

And getting licensed—or being an Elmer—in the Soviet Union isn't easy. Listen to this account by M. Yemel'yanov, RA9CQM, from *Radio*:

"A relatively short time before getting my call in 1981, I had no idea amateur radio existed. I couldn't find any literature on the subject in my village, or even in (larger cities nearby). Recently, it's true, the publication *Help for the Radio Amateur* and V. Polyakov's book *The Shortwave Primer* have become available.

"The next question was 'how to get licensed?' I went to the DOSAAF committee, but they hadn't heard anything about radio amateurs. They referred me to the town DOSAAF committee, where I met UA9CLZ, a radioamateur with many years of experience, who became my mentor.

"In 1986 I decided to establish a radio circle in my village. Thirty-two villagers

Breaking the Ice in the Soviet Arctic

Imagine being among the first Americans in a land as different from home as night from day, a land where your own country was once portrayed as an archenemy. Then picture yourself carting in a load of sophisticated communications gear. This sets the scene for US0SU, our joint Soviet-American DXpedition to the Soviet Arctic in April 1989.

In the very short history of such joint operations, the Soviets always have required an official purpose. In our case, it was to commemorate the 1934 rescue of a polar expedition, on the ship *Chelyuskin*, by Soviet and American aviators—the first such American-Soviet cooperation in a sea rescue.

The expedition took five of us American hams first to Moscow's Sheremetyevo Airport, where an assemblage of Soviet hams and other well-wishers helped us clear customs (no small feat) and took us to our waiting hosts.

Soon, we were inside the warm confines of a Moscow apartment, the home of the parents of one of our Soviet compatriots. This was my second trip to the Soviet Union in two years, and again I was astonished by the selflessness of our hosts, who all but relinquished their apartment to us.

Our time in Moscow coincided with the first election of the Congress of Peoples Deputies. With Sasha Burenkov, UA3DHF, we visited a polling place, and later we heard political poetry declaimed from a soapbox. All the while, we wondered with growing anticipation what awaited us at our final destination.

Weather reports from our Arctic island were cryptic—one day the temperature on Ayon Island was a balmy −15 °C. The next day it was −30. We knew that a real adventure lay ahead!

Aeroflot gave our group of six (five Americans, one Soviet) the first ten rows of airliner seats for the nine-hour, nine-time-zone, 4000-mile flight from Moscow to Pevek, the nearest coastal town to Ayon Island. Our first touchdown was halfway across the frozen wastes of the Soviet Arctic in the town of Norilsk, where I was completely unprepared for the temperature: −27 °C. No place for a windbreaker!

Early the following morning we arrived in Pevek (−23 °C), almost back to the same time zone I had left in California. A sizable delegation awaited us in Pevek, including the local government apparatus and the local DOSAAF chapter. Through the glare of bright television lights, I was asked to make a statement for our "delegation."

If Nominated I Will Serve

Someone had blown my "cover" by whispering "Tony speaks great Russian," so the DOSAAF secretary appointed me "leader" of our group! I mustered the best Slavic I could at that hour, to say how happy we all were to be there and how long we had awaited this opportunity to meet the people behind our radio contacts.

Wallace Kaufman, UØK/KC4EBX, operating from US0SU/1.

Still a couple days away from our helicopter airlift to Ayon Island, we passed the time in Pevek unpacking gear. Everything had made the trip undamaged, despite rumors that Soviet baggage handlers were all former testers for Samsonite. Mostly we prepared cables, PL-259 connectors and ¼-inch phone plugs being unknown in the USSR.

I had hoped to be the one to unpack the gear myself—especially the gift transceivers from Ten Tec and Kenwood. But, the Soviets couldn't wait for us to emerge from this or that breakfast or other meal, and they were less than careful about preserving the styrofoam packing. This would turn out to be the only annoyance, and a minor one at that, about our hosts' habits.

One of the many things we had not foreseen was that we were to go to a very special part of the Soviet Union—officially a "border zone," an area for which even Soviets

signed up—schoolchildren and adults. The village council allocated a room in the House of Culture. But only five or six came to classes. Why? For the simple reason that there wasn't anything in the classroom but desks and chairs.

"The first year we worked on theory only. The second year the Oblast DOSAAF Committee allocated a PURK-24 (for teaching Morse code), and we began to study CW. We received a call sign for a category II collective station—UW9CXR.

"Both the state farm and the trade union contributed money. We succeeded only in buying an old UW3DI transceiver and a 'Krot' [mole] receiver. We got on the air. Now three schoolchildren have SWL call signs.

"Why did the others leave? For the simple reason that it became uninteresting to come to an empty classroom and listen to lectures on radio technology. They need something alive—something to build or solder.

"We need measuring instruments and radio parts. Where can we get them? Mail order houses don't accept orders without a remittance, and there's nothing in the stores. We wrote to the plant that makes the Elektronika KR-01 kits, but it couldn't help.

"Now that everybody's interested in computer technology, I believe we could attract a lot of kids to our circle by offering familiarization with computers. But where can we get computers?

"In general, as before, everything that's new remains on paper, and in reality nothing changes. Including Amateur Radio

need special visas. We were, it turned out, the first Americans to visit, and were at once both celebrities and objects of uncertainty.

We broke our group of five Americans into two contingents. Ron, AA4VK, Terry, W6MKB, and I decided we would go to the island first to set up. We would return to Pevek some four days later while John, W4MQB, and Wallace, KC4EBX, helicoptered to the island. Operations from the mainland signed US0SU/1; the Ayon Island stations used US0SU (United States Zero Soviet Union).

Meeting us on Ayon Island were UA0ICC and UA0IDX, both Viktors, from Magadan, and UA0KBO, Sasha, from Beringovski, on the shores of the Bering Sea. Even in light of the relatively civilized Pevek, we still thought Ayon Island would be a totally wild place, with barely a building on it. Would we be camping at the station, in tents, or what? But again we underestimated our hosts, who put us up in a four-room flat with a kitchen and a full time cook (who fed us 'round the clock!).

Settling into a routine, we quickly learned one does not fool around with Arctic cold. The Soviets kept a very close watch on us, regularly checking our faces for the insidious frostbite.

Our operating building was a large freight container, under which a frame of pipes had been welded to form runners—a sled. Geologists had built the contraption for field work, this part of the Soviet Union having rich deposits of precious metals and crude oil. The sled had been dragged to our operating site by tractor, across 70 miles of "open" (frozen) ocean to just outside the village of Ayon.

We developed a cooperative work style using everyone's talents regardless of which "side" one was on. Putting up antennas, for example, was by consensus—deciding how, where and when.

We had not put the second TA-33 on the oil derrick by the end of the first operating day, which dawned a bone chilling −40 degrees before warming to −15. I felt we should take advantage of this heat wave, but several of my Soviet friends favored "manyana" or "zavtra." Just then we looked outside and saw several of the other Soviets plus two Americans marching toward the station, holding the assembled Mosley beam over their heads.

So much for zavtra.

We Get a TVI Complaint

Initially, we set up only in the sled. Interstation interference limited us to just one band at a time, and Terry and I wanted to set up another station in the hotel or elsewhere on the island. Added to this was a visit from Murphy: TVI! Two weak stations from some 70 miles away were the island's link to the outside, and we interfered royally with just about every TV set on the island.

Worse TVI from a site closer to town wouldn't matter, as the islanders stoically viewed the interference as a temporary problem and seemed to love our presence. We were offered an apartment that was temporarily empty for renovation. We set up a Kenwood transceiver and Henry amplifier there, and with a 20-meter sloping dipole we made over a thousand contacts.

Propagation varied from excellent to downright lousy, the principal headache being the Aurora Borealis. Often the night sky appeared filled with scattered masses of what I took to be high clouds, but was assured it was the aurora. One night, emerging from the sauna/shower we enjoyed twice that week, we saw the traditional curtain in the sky, but this one formed an elongated loop. The next day we paid for this beautiful sight—a nearly total HF wipeout.

Toward the end of our stay, we were invited to address the entire population of Ayon Island at their cultural center. It was standing room only, the Director saying more people braved the cold for this session than ever showed up for town meetings!

I was besieged by questions, most regarding our daily lives. "How big is your house?" "Does your wife work?" "What do your children do?" Despite the whirlwind nature of our visit, we definitely were the center of attention.

One woman suggested perhaps I liked their island too much, insisting I couldn't like everything. I said that I couldn't think of any complaints at the moment, but promised to let her know when I thought of something. She said she would stop me in the "street" to ask me later on.

She, in fact, did this on our parting day. All I could come up with were that people smoked too much and that we weren't used to the manner in which people provided hospitality (meaning the amount of alcohol that was occasionally consumed!).

Packing up seemed to go almost too easily. Our DOSAAF host, Sasha Lichachov, concerned an approaching typhoon might keep us from being helicoptered off the island, summoned a "vezdyekhod," a go-anywhere vehicle, to Ayon to stand by for us, just in case. The trip across 70 miles of ice three meters thick is a noisy, bumpy, treacherous affair: Occasionally the ice parts, and you can figure the rest.

Departure day was very emotional. We said our last good-byes, pledging to return, and offering our homes to visitors from Ayon. A large group of island resident accompanied the Soviet-American team to the helicopter "pad," the open area of snow near the village where the Aeroflot MI-8 landed.

Gifts were handed to us without regard for cost or future need, and there was not a dry eye on the chopper. As we lifted off on the first leg of our 11,000-mile, 20-time-zone trek back home, our thoughts turned to Amateur Radio—a hobby that would permit us to continue our friendships on the air.

We may even have found some possible candidates for ham radio on Ayon Island itself. There are many radio enthusiasts—several of them women—who might very well set up a ham station next to their weather radios. Like so many other things about the trip, it wouldn't surprise me!—*Tony Loeb, AB6Q*

and computer literacy."

A New Meaning to Code-Free

Even basic equipment for learning CW can be difficult to obtain. Here's S. Aslezov writing to the newspaper *Sovetskiy Patriot* on January 22, 1989:

"The SKM-88 Morse Code Self Teacher was designed in the Minsk Production combine, which makes Horizon television sets and Okean radio receivers. Its relatively low price—about 200 rubles (around US $300!—*Ed.*)—makes it attractive compared to the ADKM-85 (Automatic Morse Code Generator) put out by the Uzhgorod DOSAAF Production Combine at two and a half times this amount.

"There's reason to believe that no device such as the SKM-88 exists even abroad, so it could be exported.

"Where can it be obtained? Nowhere. Only experimental models exist. Since demand for the product can't be determined, industry won't take the risk, even though it would only take 15 workmen to make a batch of 5000.

"Those interested in buying an SKM-88 should write to the Horizon Production Combine."

It is often said that the Soviet Union is a First World country militarily and a Third World country economically. This is abundantly clear in their world of radiosport. You are unlikely to find a replacement IC at the local parts store.[4]

What you will find is Soviet hams struggling to advance, hungry for information of all kinds from the outside, and eager to make your visit as enjoyable as possible.

Yank Joins Finns, Soviets in International Operation

We are aboard the good ship *Veera*, a 35-foot riverboat. It chugs down the Saimaa Canal, between Finland and Soviet Russia, toward the Bay of Vyborg and Malyj Vysotskij (M-V) Island. It's May 23, 1989, and I am about to operate from Russian territory alongside Soviet and Finnish hams.

A scant month before, I was having breakfast at the International DX Convention in California, contemplating some ideas I had discussed with Martti Laine, OH2BH, and generally minding my own business. Then there's a tap on my shoulder. It's Martti himself, asking if I'd like to join him and nine other Finnish and Soviet operators on a DXpedition to M-V Island.

An American traveling to sensitive Soviet territory, with transmitting equipment, on a month's notice? The world sure has changed.

These were my thoughts on that cloudy morning as we sailed northwest of Leningrad. What was impossible just a couple of years ago was happening to this lucky ham, thanks to the magic of Amateur Radio and the new realities of glasnost.

Our expedition, in planning since the summer of 1988, was truly an international effort, designed to make M-V Island, a separate DXCC country, available on HF and VHF, including OSCAR. M-V Island had been on the air only once before, for four days in May 1988. [See "East Meets West—'M-V Island' is on the Air" in June 1989 *QST*.—*Ed.*]

Aside from the obvious fun factor, I was attracted to Martti's proposal by the prospect of field testing a new transceiver for my company, as well as by the insight I might gain in preparation for the 1990 Goodwill Games to be held in Seattle. There, Soviet athletes (and, it is hoped, Soviet radiosport champions) will vie with their American counterparts at the highest levels of sporting competition.

But I would need both a temporary Finnish license and a Soviet visa, since the "cruise" to M-V Island is through Soviet territorial waters. It was only through the quick work of OH2BH, OH2BU and UW3AX that all the arrangements were made in time.

I received my Soviet visa about 20 hours before departure from Los Angeles. OH2BH observed that FAX machines made this DXpedition possible!

My teammates included Martti, OH2BH (the elder statesman of the Finnish group); Jari, OH2BY (the organizer of the Finnish logistics); Ari, OH2EH (who with Alex, UA1ALZ, and me, operated multi-single in the WPX Contest); Mika, OH2JA (another rising star in Finnish contesting); and Jukka, OH6DD (the VHF stalwart who relinquished his post only when it was time for me to work OSCAR).

The Soviet contingent included Boris, UW3AX (leader of the Soviet group and deputy editor of *Radio* magazine, who personally walked much of my paperwork through the bureaucracy); Gene, UZ3AU (technical editor of *Radio* and a gifted engineer who kept generators running and antennas aloft); Enn, UR2AR (another veteran of the 1988 M-V Island operation); Alex, UA1ALZ (a radiosporting champion from Leningrad); and Walery, UA6HZ (a splendid operator and chef, with an excellent command of English; "UA6 Hot Ziggety"). (When last we heard from Walery, a rolling stone, he was on Svalbard, signing JW/UA6HZ—*Ed.*).

The group hit it off immediately, beginning with "generator glasnost"—the hauling of equipment from boat to operating positions—and ending with a late-night dinner with all operators toasting their newfound friends. As antennas flew into the air and tents were pitched to ward off mosquitoes, these friendships grew closer, with Amateur Radio the bond uniting us.

Flags of three nations fly under the 4J1FS tribander. *(photo K7JA)*

We logged 40,945 QSOs, including 668 on Fuji-OSCAR 12, two on EME, and over 4300 in the CQ CW WPX contest. The strong aurora which plagued HF propagation was a bonanza for the VHF fellows, who happily worked 4J1FS on 144 MHz and 432 MHz from all over Europe.

The week ended with many handshakes and embraces, as 11 weary DXpeditioners prepared to return to their normal lives. While none of us knew when we would meet again, I tried my best to to summarize our feelings:

"May our leaders, Mr Bush and Mr Gorbachev, get their ham licenses and go on a DXpedition like this. The world will be a safer place if they do."—*Charles "Chip" Margelli, K7JA*

I'm grateful to the many people who are assisting with this series of articles. Without their help, there would little to tell. Special thanks to K7ZR, AB6Q, and K7JA, who wrote their stories "on deadline" for me, and to those who are on deadline for subsequent articles.

Notes

[1]T. Atkins, VE3CDM, "USSR/Canada Polar Bridge Expedition," *QST*, June 1988, pp 62-63.

[2]Y. Richmond, *US-Soviet Cultural Exchanges, 1958-1986*, (Boulder, CO: Westview Press, 1987).

[3]Soviet amateurs spoke up at the All-Union Radioamateur Conference (held in Moscow in April 1988). Some of their complaints already have been addressed, but talk remains more prevalent than action.

[4]Vacuum tubes are a different story. It is believed they still are being used in Soviet spacecraft, for example. And audiophiles around the world have become accustomed to Soviet vacuum tubes, which are used in many esoteric hi-fi applications.

Loraine McCarthy, N6CIO, the New Voice of the *Tune in the World* Code Tapes

Now here's a teacher that believes in challenge and setting goals—no wonder she's a successful instructor.

By Rosalie White, WA1STO
ARRL Educational Activities Coordinator

What makes an 18-year-old woman from Kansas move to California upon graduating from high school?—adventure, challenge and the excitement of going to school on the West Coast. This opportunity motivated Loraine McCarthy, N6CIO, as she entered college in 1965.

Loraine's love of challenge has affected her whole life. While earning her BA in English and MA in clinical psychology from California State University, Los Angeles, she held a job in medical equipment manufacturing. After graduating, she began a career as a coordinator of a youth program, setting up and overseeing counseling groups in 37 public schools.

Loraine and her boss had a common interest in sailing. One day he invited her to an Amateur Radio class he had joined to complement his boating hobby. It was to become another challenge for her, but she didn't realize it at the time. Loraine will never forget her response: "What's ham radio and why would I want to do that?"

Curiosity got the best of Loraine. "I stopped by the class, and I knew I'd go back," she explained. "The subjects were intriguing, and the code sounded like fun." In 1979, Loraine became KA6IIR, and shortly thereafter, N6CIO. Recalling her first station, a 2-meter setup, she said, "I loved talking to people around LA."

Because she enjoyed code, she naturally passed the General license exam. Loraine liked CW so much that she began teaching it on weekends and nights after working days with the youth program. Eventually, teaching kept her too busy to stick with both, and Amateur Radio won out. Loraine soon earned her Advanced and Extra Class licenses.

Loraine, now something of an authority on Morse code-learning problems, teaches code and theory programs in the Southern California Community Colleges and in her weekend classes. She's taught up to 150 students at a time, but enjoys both large and small classes. She emphasizes hands-on equipment demonstrations in the classroom. "I have a lot of equipment just for class demos. It's hard to maintain a permanent setup at home." She doesn't complain though, as she notes she doesn't lose students.

Her favorite CW-learning problem to tackle is assisting students in reading and analyzing their copy. She shows them they have always accomplished something, even though they may not have perfect copy. She explains that the bits and pieces they see will soon make words. She supports a positive attitude and works with the students to help them build on what they have copied. She helps students set realistic goals and evaluates progress in a realistic light. She offers them advice and practice that fit the problem, and stresses practice tests.

Loraine McCarthy, N6CIO

She also has written a paper on her code-teaching theory entitled "Assisting Students in Passing the 5, 13, and 20 WPM VEC Code Exams." The paper points out that a student can learn from an unsuccessful test session if he/she takes the time to evaluate what skills need to be improved. She notes that instructors should encourage students to remember that only a student who does not receive a passing score and *does not* return to take the exam will not achieve the desired license level. The paper was published in a compendium of educational topics—*Proceedings of the ARRL National Educational Workshop*, available from ARRL.

In preparation for the new *Tune in the World* tapes, the League looked for someone who had educational experience, was at ease with the code and possessed an easy-listening voice. Loraine filled the bill—and more.

Loraine truly likes people and enjoys being their ham radio mentor. She finds it fascinating to discover their interests, backgrounds and what led them to Amateur Radio.

In what little spare time Loraine allows herself, she pursues bike riding in the desert, sailing and, of course, getting on the air. Her goals? Hold more classes and help license more people.

Happenings

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Editor

FCC Denies Petitions for Reconsideration in 87-14; Reaffirms Reallocation

The FCC has reaffirmed the action taken in the August 4, 1988 Report and Order in General Docket 87-14 reallocating 220-222 MHz to the land mobile service. In a Memorandum Opinion and Order adopted June 15, 1989 and released August 17, 1989, the FCC denied petitions for reconsideration filed by the ARRL, the National Communications System (NCS), TV Answer, Inc and more than 700 amateurs.

In the Memorandum Opinion and Order, the FCC said, "The Commission considered a variety of factors in reaching the decisions in the first Report and Order. Among these factors were the need to provide for narrowband land mobile operations, the impact of existing amateur use, the potential for interference to TV broadcasting and the actions of the 1979 WARC. The Commission concluded that the public interest would be best served by providing dedicated spectrum for the development of narrowband, spectrum efficient land mobile technologies." The FCC said it was sensitive to the needs of amateurs, but that the remaining spectrum (222-225 MHz) "should continue to provide adequately for this service."

The ARRL and many other amateurs noted that there was no need for additional spectrum for the land mobile service according the the FCC Field Operations Bureau (FOB) 1985-86 studies. According to the FCC, "It is not necessary...to resolve issues pertaining to this study. We are focusing on long term and not immediate requirements." The ARRL proposed alternatives to 220-222 MHz such as 30-50 MHz and 216-220 MHz. The FCC stated, "...such reallotment would entail severe costs to...users...such as the police and fire service." Amateurs fault the FCC in failing to collect meaningful data on usage of 220 and for using *The ARRL Repeater Directory* as a barometer of usage, since it is not a complete listing of users of this band. The ARRL noted that there are at least 773 fixed stations and 1106 weak-signal users of 220-222 MHz. The ARRL comments noted that FCC averaged the numbers throughout the US when, in fact, use is concentrated in metropolitan areas. The FCC said that "the principal use of 220-225 MHz is for repeater operations" and that the *Repeater Directory* is a "reasonably accurate" reflection of usage.

According to the FCC, operations in 220-222 MHz could be relocated to 222-225 MHz even though amateurs have said, particularly in California, they would find this difficult and costly. The FCC said that while it may be difficult to relocate some control links, it could be done through frequency sharing "at little or no cost." Amateurs have said that packet radio is a new technology, and it requires the same consideration as do new technologies in the land mobile service. The FCC noted that there were provisions for packet radio in the band plans of other amateur bands such as 420-450 and 902-928 MHz, and that packet radio could be accommodated there. The ARRL and other individual amateurs have said that the loss of 220-222 MHz will impair amateurs' ability to provide emergency communications, and the NCS said that the reallocation runs against national security interests. "...NCS has made no showing that amateur spectrum is inadequate," according to the FCC. According to the FCC Order, "A number of amateurs, including the ARRL, claim that there were procedural irregularities in this docket. They argue that the irregularities caused serious damage to the quality, fairness and accuracy of this proceeding. Specifically, they claim that the comment period was short...[and] that, in light of overwhelming opposition by amateurs, the Commission's decision is not supported by the public record." The FCC went on to say, "The Commission followed the normal procedure for rule making proceedings..." Concerning the argument that the decision is not supported by the public record, the FCC said that it "must base its decision on the merits of the issues and not the number of comments filed in favor of a particular point of view." Additionally, amateur interests have asserted that the FCC violated its own rules in accepting the late filed comments of the United Parcel Service (UPS), there was little or no support for the proposal within the land mobile community and the outcome was predetermined. The FCC said that they accepted the late filed comments of UPS in order to create as complete a record as possible, and this was in accordance with Section 1.415(d) of the Commission's rules.

The release of the order clears the way for ARRL's petition to the US Court of Appeals for the DC Circuit, which will request the review of the FCC decision.

1989 FAR SCHOLARSHIP WINNERS ANNOUNCED

The Foundation for Amateur Radio (FAR) is pleased to announce the winners of the 31 scholarships it administers:

John W. Gore Memorial Scholarship—$1000
Douglas S. Claprood, KA2KWB,

Richard G. Chichester Memorial Scholarship—$900
David M. Hulka, KD9UA

Edwin S. Van Deusen Memorial Scholarship—$750
James D. Weldon, N1DFQ

QCWA Memorial Scholarships—$750 each
Christopher Galassie, AD9Q,
Rebecca Beth Knoll, N4JST,
Robert M. Popella, KA3HIE,
Colin J. Smith, KB5BSH,
Diane E. Willemin, KE8DJ,

QCWA Leo Meyerson Family Living Scholarship—$750
Laurie A. Sandell, N2FSO

QCWA Robert S. Cresap Memorial Scholarship—$750
William H. Sands, IV, KA3FXX

Radio Club of America Scholarship—$750
William T. Baggett, AA5DF,

Radio Club of America Scholarships —$500 each
William J. Hulka, NU9K,
Michael L. Sensor, KD3LR,

Edmund B. Redington Memorial Scholarship—$500
Nathan S. Willingham, KAØUFO,

Young Ladies Radio League Scholarship—$750
Victoria L. Gruen, KA2VHR

Amateur Radio News Service Scholarships—$600 each
Ross D. Lepiane, WG7I,
Jack R. Porter, KCØVX

Columbia Amateur Radio Association Scholarship—$750
Amos D. Faux-Burhans, KS3O,

Baltimore Amateur Radio Club Scholarships—$1000 each
Barry Bell, KA3PRE,
Maurice De Vidts, NE3S,
David S. Katz, N3DKV,
Kurt W. Rupprecht, N3EOI,

Dade Radio Club Tropical Hamboree Scholarships—$1000 each
Steven A. Stewart, KB4LUJ,
Nathaniel Tarbox, KC4AOI,

Rose Ellen Bills Memorial Scholarship—$2000
Richard M. Kordick, KEØAS,

Victor C. Clark Memorial Scholarship (Sponsored by the Vienna Wireless Society) —$1000
William T. Free, KC3YO

Frederick Amateur Radio Club Scholarship —$1000
Douglas M. Benish, N3CXB

10-10 International Net Scholarships —$750 each

Patrick W. Jungwirth, WG6L
Lesley D. Walker, N4FTJ

WARAC Memorial Scholarships—$500 each (Sponsored by the West Allis Radio Amateur Club)
Douglass Kleemann, KA9LWN
David C. Wright, WB9VOZ

These scholarships were open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. The Foundation for Amateur Radio (not to be confused with the ARRL Foundation, Inc) is a nonprofit organization representing 50 clubs in Maryland, Northern Virginia and the District of Columbia. It is devoted exclusively to the scientific, literary and educational pursuits which will advance the Amateur Radio Service. Amateurs may inquire about the 1990 awards at the following address: FAR Scholarships, 6903 Rhode Island Ave, College Park, MD 20740

NEW JERSEY BILLS MAY REPEAL PROHIBITION OF MOBILE SCANNERS

The New Jersey Senate and Assembly have a bill before them which would repeal the state law prohibiting the mobile use of scanners. Both NJ Assembly Bill 4557 and NJ Senate Bill 3593 would repeal the provision of NJS 2A:127-4, which prohibits the mobile use of radios capable of receiving police and fire transmissions. Some amateur rigs fall into that category, and amateurs have encountered problems with law enforcement officials. Several other states have similar laws. The bills are in the NJ Senate and Assembly Transportation and Communication Committees.

K2BSA IN OPERATION AT SCOUT JAMBOREE

Supported by a staff of 35, K2BSA was in constant operation at the National Boy Scout Jamboree at Fort A. P. Hill in Virginia August 2-8. ARRL HQ staffer Rus Healy, NJ2L, was on hand to provide assistance with the demonstration station. The station operators and participants made several thousand QSOs, worked all states and contacted 150 countries. Over 2000 messages were originated and sent from the Jamboree.

Approximately 400 licensed Scouts and Scouters signed the K2BSA guest registry. Use of the on-site linked 2-meter and 220-MHz FM repeaters was heavy. There were several occasions when K2BSA staff operators and others used the repeaters to relay information that helped in emergencies and with the ingress and egress of Scouts during the opening and closing days.

Eleven Scouts earned their Novice licenses at the Jamboree, 74 earned the Radio Merit Badge and over 350 completed parts of Radio Merit Badge. Among those scouts upgrading at the Jamboree was Greg Beaver, KB8GPC, a 12-year-old from Lansing, Michigan, who upgraded to Extra at the Jamboree. Greg received his Novice in March.

RETALIATORY TARIFFS CALLED OFF

The US Trade Representative determined that certain practices of Japan with respect to radio and cellular telephone products and services were not in compliance with Japan's commitments under the Market Oriented Sector Specific (MOSS) Agreements on April 28, 1989. A public hearing was held on May 24 to determine what measures should be taken against Japan (which could have included imposition of 100% tariffs on some radio equipment to be imported from that country).

ARRL Counsel Chris Imlay, N3AKD, filed comments for that hearing, pointing out that the measures proposed were so broad as to present a hardship on radio amateurs. The action was delayed by order on May 28, and negotiations with Japan were held from June 19 to June 28. Agreements were reached and, as a result, the Trade Representative terminated the proceeding by notice published in the *Federal Register*.

MICROSAT LAUNCH DATE DRAWS NEAR

Being touted as inaugurating "a new era in Amateur Radio communications," an Ariane IV rocket is scheduled to carry six Amateur Radio satellites into orbit on November 10 from the spaceport of the European Space Agency located in Kourou, French Guiana. With this launch, AMSAT will once again demonstrate what can be done with the help of volunteers, donations and the creative energies spawned by the devotion of Amateur Radio enthusiasts.

Four of these six satellites have been dubbed Microsats because of their unusually small cubed shaped size measuring nine inches on a side. The design and construction of these Microsats has been coordinated and organized through the efforts of the Radio Amateur Satellite Corporation (AMSAT) in collaboration with the ARRL and Tucson Area Packet Radio (TAPR). These are all nonprofit organizations dedicated to the furthering of the state-of-the-art in Amateur Radio communications. AMSAT has been responsible for the design and construction of numerous Orbiting Satellites Carrying Amateur Radio (OSCAR) over the past 20 years.

The Microsats represent a departure from the trend of OSCARs being heavier and larger than their predecessors for a good reason. The Shuttle *Challenger* accident more than three years ago caused fewer launch opportunities, and AMSAT found it necessary to turn to smaller satellites requiring only modest launch support services. Microsats can fit in places on the launch vehicle normally reserved for lead ballast. In a time when large aerospace companies employ the talents of thousands of engineers, technicians and super computers and command almost unlimited budgets, AMSAT, working with the ARRL, TAPR and other members of the Amateur Radio community, prove that state-of-the-art design in Amateur Radio is not only alive and well, but is still exciting and quite possible.

Individuals seeking more information regarding membership, programs or other information should contact AMSAT, PO Box 27, Washington, DC 20044, tel 301-589-6061.

WESTLINK 1989 YOUNG HAM OF THE YEAR

Westlink Report and Yaesu USA announced on August 9 that 18-year-old Erin McGinnis, KAØWTE, of Topeka, Kansas, had been named the *Westlink Report* Young Ham of the Year. Erin was chosen to receive the award for her ongoing dedication to public-service activities, disaster preparedness work and publicizing of Amateur Radio.

To help publicize and expand Amateur Radio in her community, Erin has organized press releases and on-site television interviews for the local and national press, and assisted in the development and preparation of a city resolution declaring Field Day week to be "Kaw Valley Amateur Radio Club Week" in Topeka. She also organizes and teaches in the club's fall Novice training program.

She received the award at the ARRL Southwestern Division Convention Grand Banquet in Los Angeles, California.

FCC ACTS IN PR DOCKET 88-507

The Federal Communications Commission has amended its Maritime Services rules restricting front panel frequency selection capability of VHF maritime radio station transmitters to maritime frequencies only. There will be a one-year phase out period ending on August 1, 1990 for the manufacture and importation of such transmitters and two-year phase out period for their installation. Equipment installed to the cut off date will be "grandfathered" for use at the same maritime station.

The FCC stated that some VHF transceivers being manufactured for maritime service are capable of being programmed to operate on frequencies other than the maritime channels. This has resulted in an increase in harmful interference caused by operation of maritime stations on unauthorized frequencies.

Addressing a similar problem in the private land mobile radio services, the Commission adopted rules that restrict the manufacture and use of private land mobile transceivers that employ programming schemes permitting station operators to alter the frequencies that can be selected for transmission.

ROSS BEVILLE, W3GGW, "FATHER OF FM STEREO," SK

Ross H. Beville, 78, died on June 18 in Amarillo, Texas. Beville had been a radio amateur since the 1920s. He was vice chairman of an industry panel that set FM broadcasting stereo standards and was the area FCC/CONELRAD industry coordinator in the 1950s. Beville was a member of the Association of Federal Communications Consulting Engineers and the Washington Executive Broadcast Engineers. He was named "Father of FM Stereo" by the National Association of Broadcasters in October 1976.

PRB-1 WORKS FOR MESA AMATEURS

The Mesa, Arizona City Council unanimously approved a zoning amendment that will now

allow radio amateurs in that city to install 75-foot antennas and towers. Prior to the new ordinance, Mesa amateurs were limited to towers no higher than 30 feet.

The vote came on July 10 following an earlier vote of approval by Mesa's Planning and Zoning Commission. Just before the vote, Mesa Mayor Margaret Rubach expressed her appreciation to the several hams in the audience for their years of public service to Mesa.

The vote concluded six months of negotiations between Mesa City staff and the Superstition Amateur Radio Club, headed by Bill Glaze, KA7SUF. Giving legal guidance to the process was ARRL Volunteer Counsel Neil V. Wake, KV7O, an experienced land use and corporate litigation attorney. Additional assistance came in the form of letters of support from Senator Barry Goldwater, K7UGA, the American Red Cross, Maricopa County Arizona Civil Defense and Emergency Services, US Army MARS, the American Graduate School of International Management, the Consular Corps of Arizona and many more, all of whom stressed the importance of Amateur Radio in the area of public service.

KB5AQV: ARRL'S 1988 HPM MEMORIAL AWARD RECIPIENT

Kevin D. Biekert, KB5AQV, of Clear Lake City, Texas, won the 1988 Hiram Percy Maxim Memorial Award. This is the highest award given by the ARRL to a young person for participation in Amateur Radio.

The Hiram Percy Maxim Memorial Award is given annually by the ARRL to the person under the age of 21 who best exemplifies the ideals of Amateur Radio: service, communication and experimentation. First licensed in 1987, Kevin is 17 years old and holds an Extra Class ticket.

Among the accomplishments that brought Kevin the award were his role in founding the Clear Lake Amateur Radio Club (CLARC), serving as a club officer, working with Novice classes, his DXing and frequent schedules with amateurs in the Soviet Union. Kevin will be visiting amateurs in the Soviet Union in the near future. He is truly a goodwill ambassador for Amateur Radio.

FCC PROPOSES CHANGE TO PART 15 SPREAD-SPECTRUM SYSTEMS

Over the past several years, the FCC has received many inquiries concerning the spreading code length a direct-sequence system must use to qualify as a spread-spectrum system under the Part 15 rules. In General Docket 89-354, the Commission proposed that the minimum length for the spreading code of direct-sequence spread-spectrum systems be 127 bits.

The current rules limit Part 15 frequency hopping spread-spectrum systems to a hopping channel bandwidth of 25 kHz. The FCC states that this standard was chosen to provide for conventional FM voice communications and has proven too restrictive for certain other uses, such as high capacity (250 kilobit per second (or kbit/s) and higher) data transmissions. In light of this, FCC has proposed to widen the allowable bandwidth to 500 kHz.

FCC-ISSUED CALL SIGN UPDATE

The following is a list of the FCC's most recently issued call signs as of August 1.

District	*Group "A" Extra*	*Group "B" Advanced*	*Group "C" Tech/Gen*	*Group "D" Novice*
Ø	WVØJ	KFØEH	NØKXB	KBØFAC
1	NY1A	KC1PV	N1GVQ	KA1UHJ
2	WR2W	KE2OQ	N2JTE	KB2IKI
3	NV3W	KD3OC	N3HJO	KA3VAK
4	AB4PR	KM4VZ	N4WMM	KC4LWT
5	AA5MY	KG5WW	N5OZJ	KB5KGD
6	AA6PT	KJ6YA	N6VYC	KC6FBI
7	AA7BI	KF7VQ	N7NHY	KB7IKE
8	WU8M	KF8AO	N8LDL	KB8HYR
9	WJ9W	KE9RQ	N9ITN	KB9DFG
Guam	KH2K	AH2CE	KH2DX	WH2AMF
Hawaii	**	AH6JV	NH6TY	WH6CEQ
Alaska	**	AL7LI	NL7SM	WL7BVL
USVI	NP2F	KP2BQ	NP2DH	WP2AGY
Puerto Rico	**	KP4QF	WP4WE	WP4IMB

**indicates all 2 × 1 calls have been issued in these areas.

FCC AFFIRMS DECISION ON 17-METER PRIVILEGES

The FCC has denied a request by Dennis Murphy, KB6LZW, to allow access to the 18-MHz band by Novice and Technician Class operators. FCC stated that Murphy failed to present any facts or arguments not previously considered in its Report and Order. The Commission went on to say that "Novice and Technician Class operators should be excluded from the 17 meter band in view of the enhanced privileges that they had recently received and because of the band's small size..." The ARRL supported the FCC action.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, San Diego, South Dakota, Louisiana, North Carolina, Virginia, and Pacific sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

A petition, to be valid, must contain the signatures of five or more Full ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. It is advisable to have a few more than five signatures on each petition.

Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. The following is suggested:

(Place and date)
Field Services Manager, ARRL,
225 Main Street, Newington, CT 06111

We, the undersigned Full members of the...ARRL Section of the...Division, hereby nominate...as candidate for Section Manager for this Section for the next two-year term of office.
(Signature...Call...City...ZIP).

Any candidate for the office of Section Manager must be a resident of the Section, a licensed amateur of Technician class or higher, and a Full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 4:00 PM Eastern Standard Time December 8, 1989. Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 1990. Returns will be counted February 20, 1990. SMs elected as a result of the above procedure will take office April 1, 1990.

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, 1990.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in April 1990 *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by the Field Services Manager.

You are urged to take the initiative and file a nomination petition immediately.

Richard K. Palm, K1CE
Field Services Manager

SECTION MANAGER ELECTION RESULTS

Balloting results: In the Colorado Section, Edith Sheffield, KAØMQA, received 469 votes. Timothy Armagost, WBØTUB, received 351 votes.

In the Sacramento Valley Section: Jettie Hill, W6RFF, received 411 votes. Jack LaFlesh, KF6KJ, received 311 votes.

In the Western Washington Section, Mary Lewis, W7QGP, received 1027 votes. Edward Holloway, KA7INX, received 604 votes. The above Section Managers will begin a two-year term of office starting October 1, 1989.

How's DX?

Conducted By Ellen White, W1YL/4
19620 SW 234 St, Homestead, FL 33031

The Operators: W3BES-W3GRF

About six months ago, Chas., W6UM, reminisced with your editor about the quality of operators that made the hams in the '30s so very special. Special indeed, when we find some of them still in there winning contests and chasing DX, 50+ years later! Chas. remembered a joint Potomac Valley Radio Club-Frankford Radio Club meeting back in the '50s, with a contest for copying *weak* CW signals in heavy QRM. Gerry Mathes, W3BES (now W3GM), won that particular contest and has been winning them on a regular basis ever since. Len Chertok, W3GRF, built one of the very first super stations, and was a moving force in the PVRC in that era. His material and personal assistance improved the lot of many a DXer. Your editor remembers years of poring over impressive log entries in the ARRL International DX Competition and November Sweepstakes, with incredible scores by these two for their respective clubs. They truly are *the* operators.

Len Chertok, W3GRF

Len Chertok, W3GRF, is a modest ham with a wide variety of technical expertise, not the least of which is evident in his long-standing reputation as "antenna and tower man" of the Washington, DC, area. In 1934, Len learned the code in the Boy Scouts, joined his high school radio club and wound up as W4KXN. His abilities were evident at an early age: Len qualified for a commercial First Class Radiotelephone ticket by the time he was 15! Radio really became his life, and he wanted to be a shipboard operator. Instead, he served in the Army in World War II. Len took early retirement from his government job in 1974, but evolved into the ham tower/antenna business after about six years (a natural evolution of his basic talents and interest!).

Quite often now you'll hear the W3GRF station put through its contest paces by Scott Redd, KØDQ. The "muscle" station uses TS-940S and Triton transceivers, along with Henry 3K, Drake L4 and Dentron amplifiers. The impressive radiators include: a 70-ft tower with two 20-m elements, three 15-m elements and five 10-m elements on a 36-ft boom (all directors are driven elements); a 125-ft tower with a 6-el 15-m Yagi on a 48-ft boom; a 140-ft tower with a 7-el 20-m Yagi on a 75-ft boom; a 100-ft tower with a 4-el 40-m Yagi on a 75-ft boom; and a 100-ft tower with a 5-el 20-m Yagi on a 40-ft boom. Four 80-m slopers, Beverages for top band, and a 160-m inverted V with the apex at 120 feet round out the hardware.

W3GRF's unique friendship with the legendary Vic Clark, W4KFC, gave a particular flavor to contesting, club camaraderie, and indeed Amateur Radio itself, post-World War II. Many of us are lucky to have shared in this era.

Gerry Mathes, W3GM (ex W3BES)

Gerry Mathes, W3GM, says it is anybody's guess whether his early childhood spent about a half wavelength from the Telefunken complex at Tuckerton, New Jersey, figured in his affinity for radio! In his formative years, from 9 to 17 years of age, Gerry was confined to a sanatorium, where he worked on donated radios. The financial godfather of the place saw his work and assisted him in obtaining work upon discharge. The job turned out to be in a radio store where the owner was a former "sparks" on a vessel, and the serviceman was W3HS. (Gerry notes that there was very little difficulty in inoculating him with the ham virus!)

In 1930, Gerry received the call W3BES, and he was soon on 40 meters with a 210 Hartley right out of the *ARRL Handbook*. His receiver was a Pilot Super Wasp kit. The president of the Frankford Radio Club lived just a few blocks away, and he invited Gerry to join. Gerry notes that this was pretty fast company, which helped him progress rapidly into contesting.

Gerry's big break came in 1967, when he secured several acres of a super radio location on a hill in the beautiful Pennsylvania Dutch country. Over the years, antenna growth has led to the current crop. 160 m: 3-el groundplane (GP); 80 m: 4-el GP; 40 m: 3-el @ 100 ft; 20 m: 5-el @ 100 ft, 4-el at 50 ft (stackable); 15 m: 5-el @ 100 ft, 4-el @ 50 ft; 10 m: 5-el @ 100 ft, 5-el @ 60 ft, 4 el @ 30 ft. Various slopers and Beverages round out the picture.

The shack itself holds four operating positions, with separate stations for 40 and 20 meters, one for 10 and 80 meters, and one for 15 and 160 meters. For net operation there is FM on 147.270 and packet on 144.950. In the front part of the shack is a shop, parts department and a cot for use during multi-multi contest. Gerry notes that the saving grace of multi-multi operation is the lack of interstation QRM, effected by much gadgetry dreamed up by K3ND and the wide use of toroids.

In use during contests are three Kenwood TS-930S transceivers, a CX7A and a back-up transmitter and receiver. In addition to major score contributions to the FRC, W3GM has become a training station. More than 200 operators have passed through, some evolving to world-class operator status.

Gerry admits that maintenance is a large chore (even for a young agile guy), so all of the towers have electrically operated winches that allow adjustments to be made with his feet safely planted on terra firma. The verticals lay over by using a portable gin-pole system.

DXPLOITS

Have you friends who wonder if DXing is a "useless" part of Amateur Radio? Remind them of the good will, training and equipment left on Revilla Gigedo by the recent XF4L DXpedition. The expedition also led to the licensing of Fernando, XF4F. Recently, two lives were saved as a result of Fernando's newly found ability to communicate via Amateur Radio when "official" communications failed. In addition to making close to 50,000 contacts, the XF4L group and numerous contributors achieved a "first" by establishing ham radio permanently on this Mexican archipelago. *(Thanks OH2BN)*

***DX Cycle:** The anticipation, the anxiety, the chase, the capture, the wait, the receipt, the credit, the publicity, the satisfaction. The anticipation...(Thanks K3BEQ)*

HZ1HZ

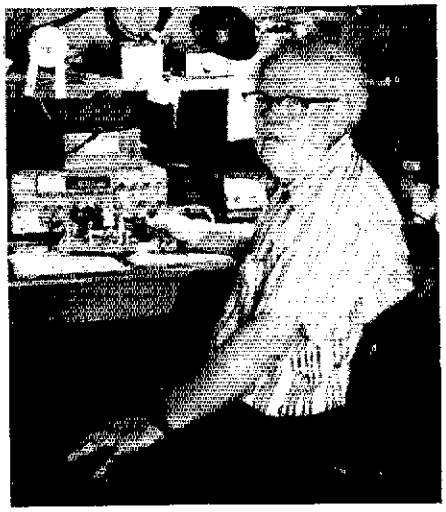
W5OG relates a story worth sharing: "I just worked Ahmed, HZ1HZ, first contaced in 1947 when I was KP6AB on Palmyra Island. A radio operator for the Saudi government, he was then running 6 watts using a long-wire antenna on 20 meters. Eventually, Ahmed rose to be Minister of Communications and was raised to the honorary rank of Sheikh Ahmed Zaidan. Ahmed is now retired and a very active ham. As we grow older, and who doesn't, we value these special contacts even more."

JOHNSTON ISLAND

Pete Grillo, KNØE, has been portable KH3 since March, and he expects to be QRV through September 1990. Pete's schedule has him on the island for 12 weeks, then two weeks on rotation, usually back to the US. He may pop up at DXotic locales from time to time! Pete (ex W6RTT, N6CJ, W9LVT, W5LZG, etc) reports that four of the eight licensed hams on Johnston are active. A Novice program has started, and five new hams may be QRV shortly. The club station, KJ6BZ, is being upgraded, and plans are in the works for a 4-element 40-meter beam on a 70-foot telephone pole. The station presently features a 5-element tribander on a 60-foot pole and dipoles for the lower bands. If you work Pete, remember his QSL manager: For contacts after April 30, 1989, QSL via K9UIY. This CW op hangs out 10 and 30 kHz inside the bands.

THE CIRCUIT

☐ **TJ1MW:** Mike is operating in Yaounde, Cameroon, for two more years. QSL via his home call, N4MUJ.



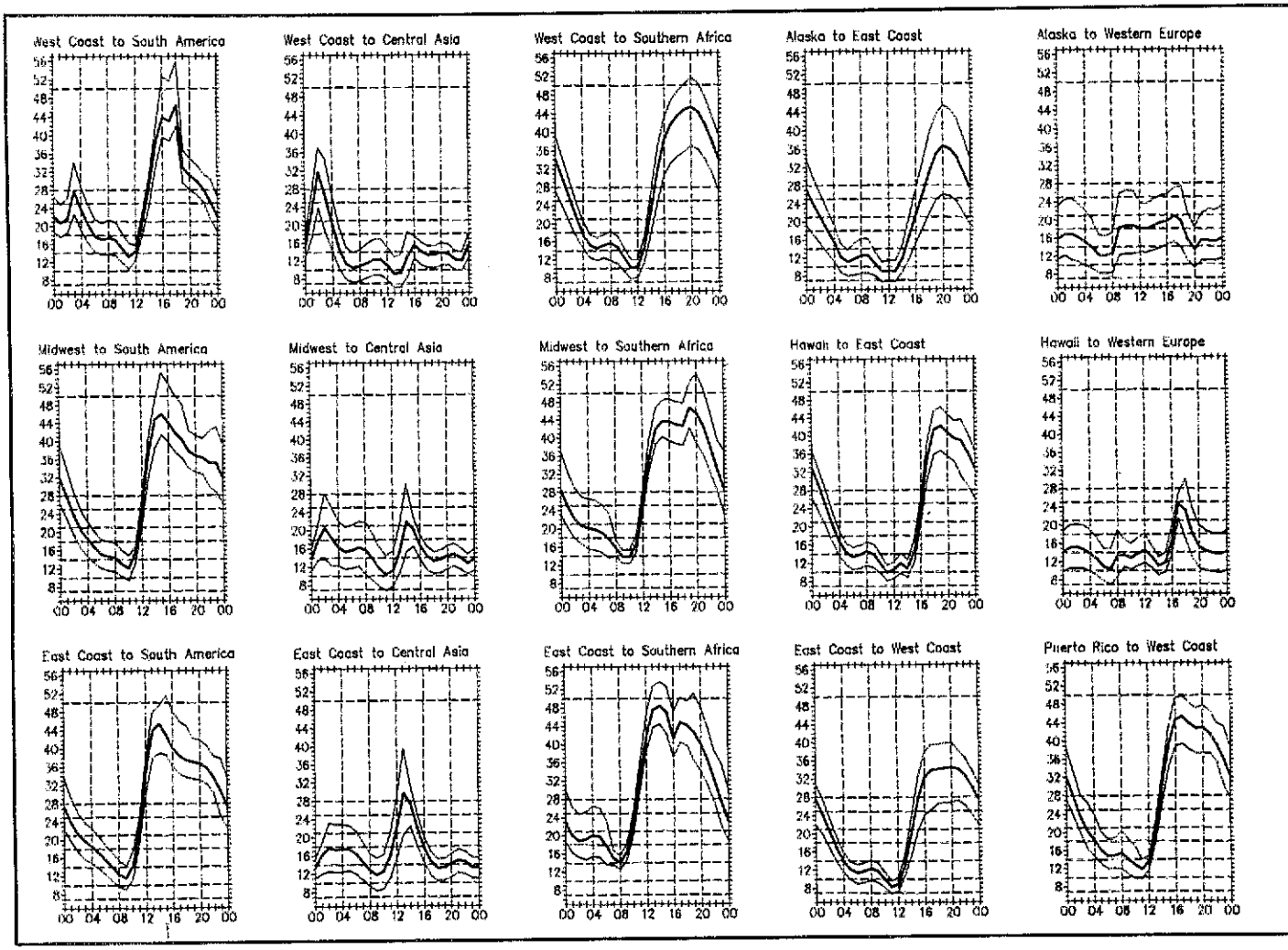
Here's Gerry Mathes, W3GM, at one of the operating positions in his shack. *(photo N2EA)*

☐ **KH8AG:** Mike, a recent ham living in Pago Pago, is looking for recent copies of the *Callbook*. Mike Homsany, Yacht *Steppenwolf*. General Delivery, Pago Pago, American Samoa 96799.

☐ **Routings:** 5R8ZX via W5NZ. CT3FN goes only via HB9CRV, as do OD5PL and OD5VT. UA4WGR at home and at UW2F via Alexej Djupin, 58-18 Bummashevskaja St, Izhevsk 426050, USSR.

☐ **C9MKT:** Thanks to all who wrote via QSL Manager SM5KDM, expressing appreciation to the Mozambiquan authorities to permit operation. Hopefully, this will ensure operation for the coming year.

☐ **ZP6XDW:** Doug no longer has to sign ZP5XDW/6 and is averaging about a thousand contacts a month, many with 10-meter JAs around midnight, his local time. Confirmations go directly to him now, at Box 73, Caacupe, Paraguay. (Thanks to his



When are the bands open? These charts predict this month's average propagation predictions for high-frequency circuits between the US and various overseas points. One chart showing 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 lowest curve (optimum traffic frequency, or FOT). The horizontal axis shows Coordinated

former manager N4DW, Doug can computer-generate his own QSLs.)

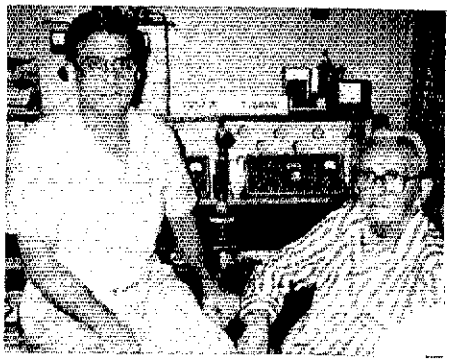
☐ **9Y4VU:** This inveterate low-band code op surprised the 50-MHz faithful with his foray into 6-meter CW. As of early summer, Frank had amassed 36 countries, 29 states and 5 continents.

☐ **Feedback:** Correcting a previous listing, VP5V 1989 (only) contacts via Julio Ripoll, WD4JNS, 14855 SW 67 Ln, Miami, FL 33193; 1988 (only) via Lee Bergren, WØAR, 808 E 108 St, Kansas City, MO 64131. Julio says if you've already sent cards for 1989 via WØAR, not to worry. Lee will forward them on to WD4JNS. Please remember SASE or IRCs as appropriate. WB8TPM (not WB8TMP) should be noted for the interesting 17-meter Antarctica QSO (June issue).

QSL Corner

Administered by Joanna Hushin, KA1IFO

Here is some QSL information for recently active stations. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.



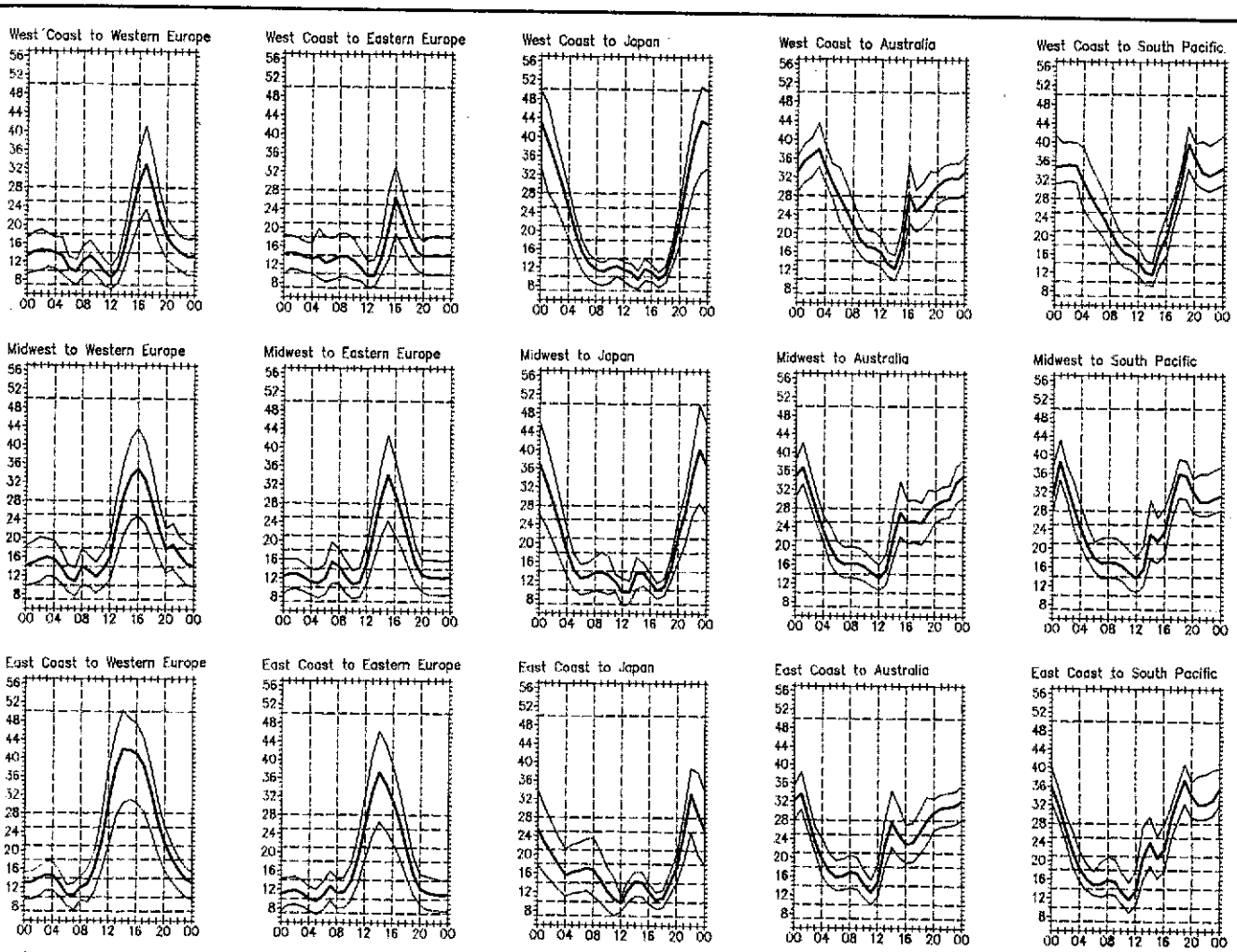
Son and father team YV5AJK and YV5AXQ are ardent DXers: Both are on the Honor Roll!

KA2IJ	(KB1BE)	V44KAC	(WB2LCH)
KA2PF	(KB1BE)	V44KAR	(WB2LCH)
VK9AE	(KD2EU)	V44KG	(WB2LCH)
VK9LV	(K1JB)	V47KLC	(WB2LCH)
VP2M	(WB2LCH)	V44KQ	(WB2LCH)
VP2MCH	(WB2LCH)	V44KW	(WB2LCH)
VP2MLD	(WB2LCH)	ZK1XL	(KF6ZB)
VP2MN	(WB2LCH)	7J1ADJ	(KB1BE)
VP2MO	(WB2LCH)	7P8EG	(KØJZM)

SPECIAL NOTES

- VK5 QSL Bureau, PO Box 10092, Gouger St, Adelaide 5000, Australia
- SARL, PO Box 2327, Johannesburg 2000, Rep of South Africa
- NZART QSL Bureau, Box 35-046, Naenae, Lower Hutt, New Zealand
- Liberia Radio Amateur Assn, PO Box 10-1477, 1000 Monrovia 10, Liberia

☐ QSL Corner, June 1989 *QST*, page 72, contains information and addresses for the ARRL Incoming Bureau. QSL Corner, March 1989 *QST*, page 68, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.



Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more-detailed explanation. The 3rd edition of *The ARRL Operating Manual* contains similar charts for a range of sunspot numbers and times of the year. Sunspot data is derived from *Solar Indices Bulletin*, National Geophysical Data Center smoothed (E/GC2), Boulder, Colorado. Curves are generated using IONCAP. These predictions, for October 16 to November 15, 1989, assume a smoothed sunspot number of 186, which corresponds to a smoothed 2800-MHz solar flux of 230.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official DXCC Countries List. You may endorse your award in 25-country increments through 250, 10-country increments through 300, and 5-country increments above 300. The Satellite, 160 Meter, and 80 Meter DXCC awards are endorsable in 10-country increments through 200, and 5-country increments above 200. The totals shown below are exact credits given to DXCC members from May 30 to June 19, 1989. An SASE will bring you the rules and applications forms for participation in the DXCC program. Send $1.00 to request the ARRL DXCC Countries List.

NEW MEMBERS

Mixed

DF7YV/117
DL6NW/110
FD1LMJ/153
G0FUS/101
HB9CSY/110
I7PQD/108
IK7JWX/118
I8JOQ/120
JA1AVV/108
JK1GIS/249
JR3GBC/105
JA4RMX/129
JA6STS/235
JA7TQK/217
KG4JO/101
LZ2CC/309
SM6CDN/103
UL7NW/313
VE1CCB/110
VE4ACY/105
K1DOX/125
K1SVI/107
KA1DIG/102
NO1I/133
W1BYH/181
WA1DPI/137
WA1TRE/105
NX2Y/150
WC2C/114
WB3IHQ/158
K4WJV/109
KM4KJ/105
N4PYD/225
WA4QYP/102
WB4OMM/115
WB4TGB/109
AB5X/125
KA5RNH/287
NT5L/108
W5LJJ/299
K6ONE/101
KA6A/262
N6KZY/102
WB6ZYA/106
WD6CVC/108
K7ENA/142
K7OWJ/105
KA7SKE/111
KL7KGI/7132
WU7F/103
K8IKE/240
K8TDJ/125
KC8FS/110
WD8MZH/108
K9HI/104
KA9HVB/101
WA9YMI/101
KE0A/100
N0ENI/118

Phone

DF6IC/108
DL1RBW/200
EA7EYX/122
IK0DIS/112
JI1PGO/110
JK1GIS/197
JA4RMX/129
JA6STS/215
JA7TQK/194
LZ2CC/271
ON7LX/245
SV1ADG/316
YC6KOS/103
YC7UNZ/108
ZL2AKI/101
6W7OG/176
K1SVI/107
N1EDN/102
W1BYH/141
W1HLF/101
WB1CGJ/101
KE2JR/116
N2HYD/141
WC2C/113
K4TXJ/278
KJ4VV/104
KK4IQ/110
KK4LP/126
N4ODI/105
N5JED/104
W5LJI/294
KG6MY/127
KI6NB/121
KJ6HC/104
KA7SKE/111
WI7R/103
W9GXR/109
WD9GGA/107
N0ENI/113

CW

CT3FN/107
EA7CIW/111
FD1LMJ/105
I1XKN/125
JK1GIS/191
JS1LPK/115
JA7TQK/137
LZ2CC/209
PU2SCR/104
SV1JA/238
SV2UF/100
W1BYH/112
WA2YMX/142
K4TXJ/162
KA5HWH/107
W5BKK/139
K6FM/102
KI6NB/114
W9GXR/108
WA9VGY/126
W0LR/226

RTTY

JA1BWA/136
K9KA/104
N9US/108

160 Meters

SM5EDX/114
UC2WO/102
VE3EK/104
NX0I/101

80 Meters

JA1SJV/101
JA7TQK/103
K3JGJ/103
WB4TDH/105
WA8YTM/126

10 Meters

DL2XN/119
JA1SJV/165
JI1PGO/110
JA2TK/197
JA7TQK/114
SV1ADG/312
W1HLF/101
WB1ATZ/103
K3JGJ/114
K4TXJ/146
KA5TTQ/103
W5LJI/154
WB5ZKR/180
KB7GAP/102
N7OT/110
KB8CQX/100
KB8CUS/108
K9UXC/106
WD9GNF/104
WB0WAO/100

5BDXCC

K3JGJ
JA8KSD
WA4FFW
YB5QZ
JA1SJV
WB9SAU
W9MWD
I2DMK
JA2TK
RB5FF
I8UWG
RB5GW
UA2FO
UA9YE
JA8KSF
IK1HJS
W9TX
JA7TQK
JA2EZA
YU2WV
SV1JA
KS3F
JA0SU

NEW HONOR ROLL MEMBERS

Mixed

314

W3YT/326

313

JA2THS/316
OH2VZ/339

312

JF1KKV/317
JA4DND/322
W1TSP/319
W2MPI/316
W5EFA/322
K7NO/324

Phone

317

W7MB/342

316

SV1ADG/316

313

N5FW/318
W5DJ/330

312

JA2THS/315
W2MPU/316
NE4R/319
W5EFA/322

CW

308

SM5DQC/308
K1RH/311
W3EVW/312
K5YY/311

ENDORSEMENTS

Mixed

DF3UB/248
DF5WA/130
DJ4LK/329
DJ5GG/301
DJ6TK/337
DJ7EE/156
DL3RK/363
DL6KG/338
DL9OH/357
EA3GF/203
F2QD/228
F3AT/357
F6CLH/205
F9RM/355
G3MXJ/330
G3NKC/165
G4CP/367
G4EDG/301
HB9AOF/178
HB9BOS/225
HB9DDW/201
HB9DX/352
HB9MO/355
HB9MX/356
I2QMU/306
I2RGV/248
I2VDX/324
IN3DEI/321
I8AAJ/343
IT9AUA/331
IS0MVE/230
JE1CTA/209
JG1TSF/302
JH1LMG/251
JI1PGO/179
JA2BL/340
JA3EMU/330
JA4DEN/239
JA4GXS/310
JA4ZA/347
JH4JNG/255
JA5BSQ/316
JA5KT/316
JA7AQR/313
JA7ARD/325
JA7MFL/266
JA8ADQ/343
JA8CAQ/269
JA8XJF/325
JH9AUB/305
KH6CD/365
KP4L/308
LA5HE/355
LA8PF/291
LU4DMG/360
OK3MM/360
OZ6MI/339
PA0TAU/345
PY1HX/358
SM5BBC/341
SM7BIP/335
SM8MIW/192
SP5DRH/303
SV1ADG/318
TA1AZ/151
UB5UAT/320
VE3BTQ/192
VE6EJ/250
YU1HA/346
YU2LA/221
YU2PM/247
YU3WZ/210
ZL1AV/346
ZL1HY/368
ZL4BO/352
4Z4BS/281
K1BW/333
K1KOB/308
K1RH/311
K1RM/340
K1ZZI/269
KA1EJ/250
KA1RRL/228
W1AM/327
W1BIH/368
W1DK/363
W1ECH/310
W1GKK/372
W1IKB/330
W1MIJ/352
W1NU/360
W1UU/352
W1ZE/332
W1ZGP/159
WA1TRO/125
WA1WTP/310
K2BK/360
K2IQK/280
K2JF/305
K2LWR/360
K2OLG/305
K2QEY/300
K2QIL/315
K2TQC/353
KC2OL/139
KM2V/333
NN2F/308
W2AG/366
W2AGW/370
W2FB/305
W2GW/364
W2IRV/356
W2JVU/367
W2LZX/324
W2MJ/355
W2PN/346
W2QHH/364
W2VP/305
WA2DIG/355
WA2NPD/299
WA2OJK/137
WA2YMX/282
WB2LNR/160
AD3Z/326
AF3E/332
AJ3H/305
K3AV/349
K3BEQ/315
K3LVO/150
K3UA/325
K3YGU/272
KN3P/302
KV3J/262
KZ3H/282
N3CRN/151
N3TO/311
NR3Y/263
W3EVW/366
W3GG/336
W3HER/253
W3HOR/200
WB3JRU/303
AA4AM/301
AA4DO/292
K4BBF/338
K4CEB/340
K4CIA/345
K4DJ/343
K4EZ/352
K4FJ/347
K4JAG/300
K4MPE/341
K4MZU/346
K4OQK/302
K4PDV/363
K4SE/320
KC4ZH/281
KE4VU/300
KF4ZR/225
N4AH/324
N4JQQ/153
N4LZL/228
N4NTQ/212
N4SU/367
NE4R/326
W4AIT/369
W4DHZ/350
W4DJT/230
W4EX/370
W4FQT/220
W4FX/356
W4HY/319
W4IB/136
W4JVN/299
W4KA/325
W4OTX/335
W4XT/182
W4YV/338
W4ZWZ/316
WA4UCI/175
WA4UUP/162
WA4WIP/344
WD4KMW/176
WM4Z/261
AB5G/280
AK5B/311
K5ABW/305
K5AQ/151
K5BDX/304
K5GH/332
K5GO/331
K5GOE/307
K5HTF/206
K5JG/324
K5JM/328
K5KO/332
K5PG/238
K5PZ/233
K5SSB/306
K5UC/366
K5WA/236
K5XK/198
K5YY/344
KA5SWC/231
KA5V/318
KA6W/317
KB5DQ/307
KC5DX/266
KC5P/286
KD5MD/302
KE5PO/253
KE5TF/303
KF5DX/288
KF5MY/302
N5AR/347
N5AW/309
N5DC/322
N5FW/324
N5XX/315
NA5U/290
NA5Z/232
NT5V/253
NX5B/306
NY5F/354
W5BKK/170
W5CWQ/322
W5DJ/338
W5EU/272
W5FS/295
W5GEL/356
W5IO/364
W5JC/343
W5JLU/326
W5LFK/331
W5NF/304
W5REA/304
W5TO/343
W5UC/286
W5XJ/335
W5YM/201
WA5CMI/166
WA5SKY/176
WA5YKO/149
WB5MTV/261
WC5P/299
WD5F/282
WD5N/284
WF5E/352
WF5T/263
WI5A/314
WK5I/290
AF6S/312
AG6Q/312
K6BAG/281
K6BUU/277
K6IR/332
K6PU/347
K6RO/357
K6UFT/330
K6WR/351
K6ZH/227
KD6GC/204
KG6JW/226
KI6BU/272
KI6GI/231
N6DW/257
N6IXX/154
N6UC/337
NG6W/301
W6BSY/361
W6CSI/283
W6ERS/349
W6EUF/345
W6FW/350
W6JRY/334
W6KH/358
W6KNH/341
W6LQC/334
W6MI/343
W6OB/337
W6RFF/300
W6RJ/349
W6SN/357
W6VD/313
W6YA/351
W6ZM/356
WA6AJB/201
WA6BIL/131
WA6DHA/200
WA6GFE/344
K7EG/322
K7RLS/326
K7ZBV/318
KO7V/165
N7OT/310
W7BGH/352
W7FP/321
W7HR/322
W7KSG/334
W7KSK/271
W7MCU/308
W7MI/339
W7OF/363
W7QK/359
W7SFF/290
W7ZU/311
WE7E/153
AC8K/331
AD8J/290
K8CS/285
K8EJ/344
K8IP/341
K8MC/309
KC8MK/280
KG8V/332
KJ8M/300
N8AC/276
N8BLZ/283
W8CT/348
W8DA/353
W8GIO/316
W8LKH/365
W8NPF/329
W8QBA/312
W8RSW/347
WB8K/310
WB8YFE/175
K9GPN/305
K9HQM/320
K9JF/336
KJ9I/306
KO9Y/266
KR9F/297
N9EJL/273
N9RF/321
N9ZN/350
NB9F/295
NF9V/281
W9DE/333
W9FKC/364
W9JOP/252
W9NQ/202
W9NTU/269
W9NYW/288
W9RCJ/358
W9SS/331
W9WY/336
AI8O/305
K8BFR/283
K8CVD/312
K8RW/203
K8VZR/300
KA8BKR/260
KA8IQR/300
KC8Q/311
KE8KB/201
W8BA/306
W8CM/363
W8GAX/313
W8LR/279
W8PAH/338

Phone

CP6PX/223
DJ6VM/332
DJ9ZB/332
DL6KG/336
DL9OH/357
F3DJ/350
F9RM/355
G3VOF/314
G3ZBA/334
HB9AOF/174
HB9DDW/200
HK4DHR/313
I2QMU/306
IK2AEQ/155
IN3DEI/321
I8AAJ/343
I8JN/330
I8KNT/322
I8ZTE/274
I8ZV/352
JI1HWV/290
JE3FCT/156
JA4DND/313
JA4GXS/287
JA4ZA/343
JA5KT/260
JA7AQR/311
JA7ARD/323
JA8ADQ/338
JA8XJF/325
JH8GWW/303
LU1JDL/259
LU4DMG/360
OD5VT/139
OZ1HLZ/156
OZ1LRT/218
PA0LEG/317
PP2ZDD/273
PY3BXW/338
PY4IL/260
SM0MIW/192
TI2LTA/281
VE3BTQ/181
VE4AT/311
VE4JK/315
VE6EJ/222
VK6LK/332
YB5NOF/230
YV2EMR/184
ZL1AV/334
ZL1HY/367
ZL3NS/344
ZL4BO/331
ZS4NS/128
K1KOB/292
N1API/296
N1CIX/261
W1BIH/347
W1MQK/182
W1TSP/298
K2BK/328
K2IQK/269
K2OLG/304
K2TQC/331
KB2XS/311
KC2OL/139
KG2U/313
KM2V/332
NN2F/291
W2BIE/303
W2HXF/316
W2LZX/321
W2VP/302
WA2BGE/300
AJ3H/269
K3BEQ/315
K3UA/320
K3YGU/234
KN3P/291
KZ3H/262
N3CDA/154
N3EHD/267
N3TO/298
W3EVW/351
W3FDP/327
W3FWD/344
W3GG/334
W3ICQ/314
WB3IHQ/155
WB3JRU/284
WB3KBZ/VP9/253
AA4AM/293
AA4DO/280
K4BBF/338
K4DJ/328
K4PDV/348
K4SE/319
KC4ZH/281
KE4VU/300
KI4UJ/217
KJ4JM/152
N4NTQ/212
N4PYD/224
W4EBO/324
W4JVN/291
W4OTX/335
WA4UUP/155
WA4WIP/344
WD4KXB/306
WZ4I/313
AE5E/300
K5ANB/312
K5GE/315
K5GH/331
K5GOE/297
K5OVC/335
K5SSB/300
K5TGE/291
K5UC/360
K5UR/335
K5YY/342
KA5RNH/286
KA5SWC/230
KA5V/315
KA5W/317
KB5DQ/297
KB5RF/293
KC5DX/154
KC5P/281
KD5DR/278
KE5PO/253
KF5DX/284
N5AJW/319
N5AW/230
N5CTK/125
N5JEB/128
NA5W/307
NT5V/228
NY5F/345
W5BWA/226
W5EU/324
W5IO/363
W5LFK/315
W5UAW/341
WA5SKY/175
WB5NDN/248
WF5T/255
WK5I/275
WQ5Y/265
AG6Q/280
K6BAG/225
K6IIS/154
K6IR/332
K6PU/331
K6WR/351
KI6BU/271
KI6GI/230
N6JQL/154
N6UC/337
NG6W/290
W6ARJ/337
W6AXH/328
W6BAF/355
W6BSY/355
W6EUF/344
W6FAH/286
W6FW/348
W6GTL/327
W6IEG/207
W6KNH/341
W6LQC/334
W6NTX/327
W6OB/282
W6ZM/351
WA6AJB/137
WA6PRS/229
WR6O/175
K7DS/315
K7EG/297
K7NO/290
K7RLS/309
K7ZBV/318
N7OT/274
W7FP/321
W7LZG/257
W7QK/341
WW7D/125
K8CFU/352
K8EX/281
K8IP/286
K8YVI/270
KC8MK/270
N8AC/236
N8FUM/177
W8GIO/316
W8JRW/280
WD8EOL/150
WE8Q/200
K9HQM/316
K9JF/297
KO9Y/214
KR9F/281
KS9R/310
W9BEK/347
W9DE/316
W9MWD/311
W9SS/331
W9WHM/363
WA9BDX/225
WA9EZY/211
K0BFR/273
K0VZR/297
KU0Y/290
N0IGU/150
W0BA/306
W0CM/363
W0GAX/295
W0SFU/344
W0WJ/228
WB0YEA/125

CW

DF5WA/130
DJ3BE/176
DL3RK/296
F3AT/318
G4EDG/290
HB9BIN/140
HB9BOS/185
I2QMU/278
IS0MVE/201
JF1KKV/300
JG1TSF/263
JA2TK/290
JA4DEN/221
JA4IYL/156
JH4JNG/175
JA5JGV/203
JH7ARV/277
JA8CAQ/288
PY2KP/251
SM5ODI/150
SP5DRH/199
VE6EJ/185
AI1N/227
K1KOB/207
W1TSP/272
W1WAJ/262
W1YY/305
K2BK/280
K2JF/284
K2OVS/204
K2TQC/321
W2LZX/310
AJ3H/281
K3UA/313
K3YGU/225
KV3J/211
N3CRN/131
W3GG/293
WB3JRU/289
AA4AM/194
K4CEB/312
K4FJ/304
K4SE/313
NE4R/152
AK5B/261
K5BDX/289
K5UR/320
K5XK/183
KA5W/301
N5AW/277
N5FW/309
W5FS/272
W5JLU/291
WD5F/248
WD5N/207
WF5T/197
WK5I/159
AF6S/301
K6YT/161
KA6A/251
KI6T/226
N6DW/249
NG6W/273
K7NO/278
K7TED/140
K7ZBV/280
KO7V/157
K5YP/251
WE7E/134
K8IP/274
W8DA/292
W8RSW/314
KR9F/248
W9DE/255
AI0O/292
K0CVD/306
KC0Q/301
W0GAX/281
W0HBH/265

RTTY

G0ATX/161
KE0KB/173
W0HAH/226

160 Meters

K5UR/228

80 Meters

W1YY/192
K3ND/140
K3UA/208
KZ3H/142
K5UR/283
W8AH/285

10 Meters

DL1PM/296
F3AT/250
N1CIX/184
W1YY/271
K2ARO/305
K2OLG/305
K3BEQ/305
KZ3H/193
W3GG/251
N4ONI/210
K5UC/214
K5UR/291
W5LLU/236
WE6H/184
K7NW/153
W8AH/265
W9WHM/271
W9YSX/276

Moved and Seconded...

LIFE MEMBERS ELECTED 4/1/89

James G. Amidei, N9ABF; David W. Anderson, KB9AI; Rose Marie Bagioni, N1DSP; E. Marcus Barnes, W5CN; Leopoldo Barrios, WNØB; Winfried E. Bender, N6AHW; Roy S. Blackshear, KH6BAI: William B. Blanton, WC5N; John L. Born, WB2TII; Frank C. Calabria, KA1QQO; Peter J. Calabria, KA1TDO; Clinton E. Campbell, KB4OLM; James D. Cebula, NI2T; H. L. Cham, 9M2YB; N. G. Cominos, WB9JKO; David R. Cox, NB5N; Darryl Del Grosso, WA1WYN; Terry Dettmann; KB7GIT; Carol A. Duncan, WA3CQU; Michael T. Evanko, KB6RNO; John A. Facella K9FJ; Erland Freij, DJØXL; Stan Gantz, WB5TGL; Carlos Dale Hamm, WB4ATX; Cynthia S. Hamm, KA3TLF; Edward W. Hutchinson, N1FMP; Jeanna S. Inks; KG5QV; Mickie R. Inks, K5IOJ; Anna K. Kreps, KC4HDQ; Cal B. Leibovitz, KB9BHV; Cathy I. Leibovitz, KA9ZWZ; Rachel L. Leibovitz, KA9ZXA; Frank A. Lombardi, Jr, WB2HMG; Craig L. Martin, WAØYOS; Donald R. Mazierz, WB2WVG; Loren T. McCoy, WA9DOL; Sheree C. McKeithan, N4TFA; Wilson Mewborn, N4JCC; Charles D. Miller, WD5EEH; Glen Mills, N6ESG; John W. Morris, K5OTI; John W. Mulvihill, NR8K; Shoichi Nishi, JH6NBW; Joseph Oden, NØEKW; Harold C. Olson, KD8YR; Tim Palange, KD4WZ; William Parsons, KV3U; Jerry Perkins, N7HAL; William C. Rogers, KB2CYN; Bertha A. Roylance, K7CHA; Richard A. Ruhl, WD5GLD; James E. Ruper, N3EOV; Robert Rush, NQ1A; Edward N. Schneider, Jr, N8HYO; Peter Z. Simpson, KA1AXY; James F. Sullivan, NG8T; Matthew A. Tamberino, KA1QQN; Rob Thompson, KD3CI; Jules Towers, KA2YHR; Kristin M. Traughber, NØJHL; Hendrik C. Van Putten, PAØXVP; Bruce Warren, N1EQG; Robert L. Whatley, WB5TFL; James M. Wilcox, K4JAP.

LIFE MEMBERS ELECTED 6/24/89

Gary L. Archard, WBØMNA; Paul J. Bedoian, Sr. W1HRJ; Manuel Blumkin, K5JEB; Ralph D. Campbell, KB6FCM; George Cooley, N3CJD; Dave Culver, KC3WS; Paul K. Dean; WB9HQZ; Joe Edom, WB9KVI; Judy C. Flanagen, WD5JHK; Phyllis Fleming, NØJMR; Tom Gallagher, N4IOZ; Ronald Hashiro, KH6JCA; Seymour I. Hersh, WA9KJE; Michael E. Hofe, WB3DVY; Charles Hynson, KD3IM; Albert Jackson Jr, NK2O; Ronald C. Jarosz, KB1ND; Patricia Johnston, N4TFP; William J. Knish, WBØKEK: Rex A. Leiner, Sr, KA8USE; Philip C. Levbarg, KN2O; Jeff R. Marthia, Kenneth R. McGlaughn, KM4JD; Lester McGlaughn, WB4IDB; Gary Meyers, KYØB; Daniel Mignogna, WB3IPX; James W. Milburn, WB5BYK; Robert E. Morre, KAØRMH; Carl T. Owens, WBØCPR; Richard S. Penc, WK2A; Frank Philpot, KE8MM; Dana G. Reed, KA1JEQ; Donald W. Ritchie, K6PGT; Janet S. Ritchie, N6USE; Corwin A. Roberts, WI6L; Joseph Romanosky, K3KN; Thomas H. Rozenbroek; KB2BCG; Thomas H. Sears, WE9A; Kazuhito Shimada, JK1PZZ, KG2O; Samuel H. Slayden, N4BRI; Neal E. Starkey, Jr, NU4D; David Swanson, WB9K; Neal H. Swenor, KA1SAW; C. Wallace Greer, KL7HKS; William R. Ward, K3QWO; Pres Waterman, WA2ORS; W. M. Watts, III, KB4DIT, HL9DI; Danville S. Webber, W1PCD.

New Frontier

(continued from page 64)

One other factor that contributes to antenna noise is attributable to atmospheric absorption. At frequencies below 10 GHz and for antenna elevations greater than 15 degrees, the effect is small. If the antenna is pointed straight up, this effect amounts to only an additional 4 K at 10 GHz (0.5 K at 1296 MHz). At 17 degrees elevation, this increases to 10 K at 10 GHz (5 K at 1296 MHz). Above 10 GHz, the effect can be large: Even when the antenna is pointed straight up, the atmosphere adds 25 K to the antenna temperature at 24 GHz. At 17 degrees elevation, this increases to 70 K.

The performance of a microwave system can be evaluated using the antenna temperature determined as described earlier, in conjunction with the information given in the earlier-referenced New Frontier columns.

Unfortunately, there isn't room for more. I have enjoyed writing this column over the last nine years. Some months it was difficult and some months it was easy, but it was always interesting. I have learned a lot and I've tried to pass some of that knowledge on to you. I appreciate the fact that many readers have taken the time to write to me, and I apologize for any letters I have failed to answer in a timely fashion. There is still a microwave frontier waiting to be explored; I hope I will meet some of you there. 73 to all.

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in *italics* for each band listing. Numbers listed after calls refer to endorsements. The totals shown are current as of July 24, 1989. An SASE will bring you the rules and application forms.

Compiled by Tom Vesci, WB1CRH

50 MHz

100	
359	KD9OT
360	KXØO
361	WA5JCI
362	AA5AM
363	WD5K
364	KA9QLP
365	KA9RQC
366	AJ9C
367	WA9PWP
368	JN1BPM
369	NW7O
370	WA3FYJ
371	K3ZO
372	K2MP
373	CX8BE
374	WA2FUZ
375	KC8IM
376	VE5LY
377	WB5IGF
378	WAØGOZ

W1JR	325
KA1MVB	275
WA1OUB	475
KU2A	150
W2CNS	225
N2DXP	250
KA2GOJ	275
K3ZO	250
WD4AFY	150
KB4CRT	325
KF4FL	200
W4OO	350
AA5AM	275
N5EPA	250
W5FF	525
WD5K	300
WA5OLT	200
W5OZI	375
K6BEM	125
WA6BYA	450
K6EID	250
KC7IJ	250
WA7OEU	150
K8GQB	250
WB8TGY	200
K8WKZ	500
KD9IV	250
KA9LDS	225
WBØCQO	200
WAØDYU	250
WBØHYV	200
KAØJGH	350
KAØKUY	150
WBØWAO/8	225
VE3LNX	225
VE4CW	175
VE5LY	225

144 MHz

100	
289	G4RRA
290	AA5AM
291	K3ZO
293	KC4YO
294	W2CNS
295	K3HZO

KB4CRT	125
W4ZD	325
KB5RF	150
K5YY	350
WB8CPW	125
K9MRI	325
G4RRA	250
G4UXC	150
G6IJM	150
GM4ILS	125

220 MHz

50	
48	WA4NJP
WB9MSV	60

432 MHz

50	
153	KA5ULI
154	G4XOL
155	WØKJY
156	WA3FYJ

K1FO	240
W4NJP	60
K5YY	130
WB9MSV	100
G4XOL	100

1296 MHz

25	
66	WØYPT
67	G4RGK
68	WB9MSV

KF5PE	30
G4NBS	50

10 GHz

5	
34	W6HCC
35	G8LSD
36	NW7O
37	WA7JUO
W6HCC	10

Strays

HAMS FOR CHRISTIAN MISSIONARIES

In conjunction with several large church missionary and school organizations, Hams for Christian Missionaries is organizing a curriculum to teach Amateur Radio to missionaries as part of their studies before departing for their mission field. Also planned is a West Coast net in the phone portion of 10 and 20 meters. If your or your organization has suggestions and would like to be part of this effort, please contact Mark Goodley, N5RMM, 3120 Ryan Dr, Escondido, CA 92025, tel 619-480-4477.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Editor

OBSERVATIONS ON NOVICE CW

☐ There was one requirement for the ARRL Diamond Jubilee Award rules which struck me as being very useful for the encouragement of newly licensed amateurs: the rule that, in making 75 contacts with Novice or Technician licensees, we should try and give them a chance to practice. This gave me the idea of making only CW QSOs and staying with the contact as long as the Novice/Technician station wished. It was a rewarding experience to me as well as to them. I connected my old US Navy straight key to my rig and really enjoyed each and every contact, some very slow and others at considerably faster than 5 WPM.

The youngest Novice worked was 11 years old and the oldest was 93. Among the more than 75 contacts I made, there were very few Novices or Technicians who did not intend to upgrade their licenses. In addition to the 93-year-old, there were a number of amateurs in their 40s, 50s, and 60s whose fists, although steady and easy to read, were in need of practice.

Our CW mode is alive and well. I also noted that the Novice bands are a happy hunting ground for the foreign DX hunters, many of whom are also in the beginning CW ranks. From this pleasant and rewarding experience, I would predict that we will have a nice harvest of amateurs soon to upgrade.—*Harry A. "Jock" Maclaren, W5FGO, Gretna, Louisiana*

REFLECTIONS OF "THE GOLDEN YEARS"

☐ Recently, while waiting for some candidates to finish taking their Amateur Radio tests, I could not help but think how easy it is to become a radio amateur compared to the old days. Books, cassette tapes and other information are available from the ARRL. Many clubs have radio classes and thousands of Volunteer Examiners hold exam sessions where the candidates can take the tests whenever they are ready.

My thoughts went back to the early 1930s to a small town in central New Jersey called Helmetta. It was at the height of the Great Depression. Being 18 years old and out of work, I used to visit the shack of the only ham in town. His name was Henry "Dutch" Yahnel, and his call was W2SN. (Henry Yahnel, W2SN is a Silent Key now. The call W2SN now belongs to a ham in Amityville, New York.) Dutch was also the second district DX QSL Manager. Being the only policeman in town and working nights, he took care of the cards during the day. The cards and his radio equipment were in an honest-to-goodness shack in the backyard.

After listening to code for a while, the bug bit, and I was hooked on Amateur Radio. Before long, I was ready to go to New York City to take the exam. It was only 40 miles to the big city, but with very little money and no transportation, traveling was a problem. Finally, one day in April 1934, I thumbed rides to New York City on the day before the exams were scheduled.

I arrived before noon at the Federal Radio Commission Building at the corner of Washington and Christopher Streets. The Commission's name was later changed to the Federal Communications Commission. My problem was what to do until the next morning. New York, in April, can be very cold when you walk the streets and sit on park benches all day. During the night, I managed to keep warm for a few hours at a construction site where some homeless men built a fire.

Dawn finally came, and as soon as the doors opened in the Federal Building, I went in to take the exam. After a couple of nervous hours, the exam was finished and I started hitchhiking home. It was a rough experience, but a few weeks later a letter arrived from the Federal Radio Commission. In it was an operator's license and a station license. The call was W2HEN. —*Stanley J. Krenzel, W2HEN, South River, New Jersey*

"IS THIS FREKWENSEE BISEY?"

☐ I couldn't resist sending you a copy of the above effort by my seven-year-old grandson who is visiting me now.

Robert is totally fascinated by the radio and has spent many an hour sitting with me while I make and receive calls. I noticed he was busy one afternoon writing the following: "is this frekwensee bisey calling CQ CQ CQ KB2AUR." His spelling may be lousy, but his phonics are quite good. Perhaps a budding ham in our midst! —*Miriam Lamb, KB2AUR, Highland Falls, New York*

PART 15: AMATEUR RADIO'S DEMISE?

☐ I've heard the ultimate demise of Amateur Radio as we know it today predicted recently, and it makes sense. The end will come when the public is totally inundated with cheap, poorly engineered electronic gadgetry, which is virtually incapable of rejecting unwanted RF. Radio amateurs will be so lacking in numbers and in political clout that we will be abolished as a line of least resistance and least cost toward resolving the problem.

This past Father's Day, I was talking with one of our sons on our cordless telephone, when he asked me if I was in the shack. I wasn't, but both of us had noticed an SSB signal in the background under our conversation. We paused, and I identified a WB2 signing over to a W6 in a QSO. I felt sure it was 6 meters. I went out to the shack, and sure enough, 6 meters was open to the second call area. If one of the better cordless phones can pick up sporadic-E openings, what chance do I have as a ham right in the same house of staying out of the cordless phone?

There is already today a proliferation of electronic gear available to the general public, obviously designed with no regard whatsoever to the fact that it needs to exist in a world where other devices also exist, some of which are supposed to radiate RF. I fervently hope a more intelligent approach is taken before it costs us all our hobby.—*Dick Sisson, W5ONL, Richardson, Texas*

DON'T BE A "TUNER-UPPER"

☐ There must be some way we can get the word to the hams that come on the air without checking to determine if the frequency is in use. Most hams are courteous and thoughtful, but a few perform extensive tune-ups and tests without consideration for others. Some start operating without asking if the frequency is in use. What is particularly galling is the "tuner-upper" who persists for several minutes with an S9 signal, completely oblivious of a QSO in progress. During the course of an hour-long QSO, I have heard as many as four or five hams tuning up and interfering on the same frequency, and on occasion two and even three will simultaneously tune up. It is a rare day that this does not occur.

Let's keep the ham fraternity on a high intellectual and courteous level.—*Glenn Miller, W6JSK, Pueblo, Colorado*

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Red River of the North—Spring 1989 Flooding

By Gurnee Bridgman, W9NT

"The river's rising and is expected to crest almost 28 feet over flood stage!" was the call that alerted the Red River Radio Amateur Club (RRRA), made up of members from the Fargo, North Dakota/Moorhead, Minnesota area, that their emergency communications expertise would be needed.

Already 50 miles to the south, the actual flooding had been the worst of the century with the area suffering millions of dollars in damage. The river's crest was moving north and would hit the Fargo/Moorhead area in a few days. The club has long recognized potential flood problems, as the Red River of the North flows north to Winnipeg and then on to Hudson Bay. Ice jams in the frozen north block the water moving up from the south and can cause serious flooding when warm days to the south result in fast thawing.

The RRRA Club has long participated in planning for possible emergencies, such as holding SKYWARN seminars presented by the National Weather Service covering the topic of summer storms. Although this real flood was different from simulated tornado disasters and covered a different time of the year, the principles and benefits of good advance planning are similar for both situations.

Prior to this specific flooding, the club's Emergency Communications Coordinator had met with the Disaster Services Managers of the two area counties to determine what specific communication activities and services might be needed and how the club's station at the EOC could be used. Anticipating future needs, the club maintains a permanent 2-meter and HF station set up at the EOC ready to go at a moment's notice. As a result, the club does not have to use valuable time setting up when an emergency occurs and fast communications support is needed. As a plus, having the station at the EOC means there is immediate access by the club hams to all the other emergency services, so the club can alert those services to our immediate communication capabilities. Over this flooding period, the RRRA's 2-meter station provided communications assistance to a number of the other emergency services groups which have their headquarters in the same location, including EVAC (a local emergency evacuation group), the Army Corps of Engineers, the Red Cross and the two County Emergency Coordinators from the affected flood area.

The first step of this emergency was to assign volunteer club members as Net Control Stations so the station would be ready to lend assistance at all times. NCS personnel were assigned six-hour shifts and manned the station over the entire flooding period. They opened on Friday morning and stayed on the air until the following Monday when the station was closed at 5 PM.

The next step was contacting all those other volunteer hams who, in advance, had expressed a willingness to help when needed. This also included student hams from the Amateur Radio club of North Dakota State University in Fargo. After determining which hams were available to help during the flood, individual hams from both clubs were assigned to particular flooding locations and given instructions on what to look out for and do. For example, dikes were patrolled to monitor leaks to see where more sandbags might be needed. In some cases, it was simply to call for a hot cup of coffee, a very welcome sight to those working on the dikes throughout the cold nights.

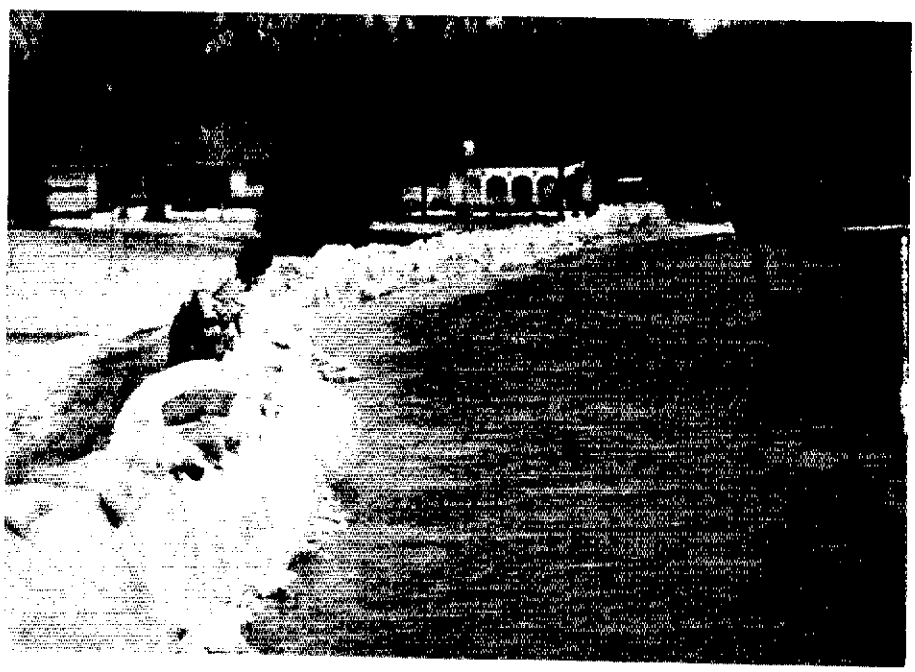
WQ0M relays information to critical areas from the Emergency Operations Center. *(photos WD0AKO)*

Hams also walked the river banks, contacting residents to point out where there might be potential problems, and what could be done to avert them. Two-meter hand-helds were the key to the solving of immediate communications problems. Most of the participating hams also had backup batteries to ensure continued operation over the long hours they were monitoring the situation. In some cases, mobile rigs were used if their cars were parked close to their assigned locations.

When one dike started leaking at the bottom and was undermining the sandbags, Amateur Radio was utilized to call in the Army Corps of Engineers who reviewed the situation and lent expert guidance.

The home of one member of RRRA was close to the rising river. Over 250,000 pounds of sand, 3500 sandbags and countless hours of assistance by a number of hams and other local residents helped to save his home, its furnishings and his ham gear. This was after it had been determined that the home could not be saved.

Probably the most important lesson to be learned from the situation was that good advance planning and training are both necessary and productive. Also that proper assess-



A volunteer watches for leaks in a temporary dike in Fargo, North Dakota.

ment of the available resources, both in terms of equipment and the personnel to use those resources effectively, represents the groundwork for effective Amateur Radio support when the real emergency does arise. No doubt, mistakes are and will continue to be made in those emergency "what do we do right now?" situations. However, such errors can usually be minimized or eliminated through advance trial runs of simulated emergencies and knowing what resources are available and at what location.

The RRRA has had an Emergency Communications Coordinator who meets and works with the local governmental emergency and disaster personnel. Since those governmental personnel work with the ECC who represents the local club, and details its capabilities before the emergency occurs, this amateur is not looked on as a stranger when the real emergency occurs, but rather as a skilled and valuable communications resource, adjunct to all the other services that are activated.

Another plus—when a club provides service to the community, its activities often result in excellent public relations. In this flooding situation, the club's activities were featured as the lead and main feature on a local TV news program during the first evening of the actual flood. In this video feature, hams were shown at the NCS headquarters station and monitoring dikes. They were interviewed about their assistance in in communications activities. The club also received public thanks in the local newspaper after the flood situation had eased. Using these types of publicity can be productive when conducting fund-raising efforts or contacting local government for updated equipment and antennas.

Thirty RRRA and North Dakota State University hams contributed about 325 man-hours of support in this emergency situation. When the operation was wrapped up, every participating ham indicated that they would volunteer and participate again. So another benefit was the real emergency situation training that every amateur will put to use when the next emergency occurs, or perhaps something as simple as support of a bikeathon. The RRRA certainly doesn't want another flood like this to occur, but recognizes that good advance training paid off, and the club is now even better prepared for the next emergency.

Field Organization Reports July 1989

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	767	24.70	.807	91.4	
CAN	31	632	20.39	.453	100.0	
PAN*	62	395	6.81	.545	93.5	
Region Nets						
1RN	62	440	7.10	.437	89.0	
2RN	59	233	4.00	.331	90.2	90.3
3RN	31	95	3.06	.320	83.1	100.0
4RN	62	306	4.93	.260	77.0	93.6
RN5	62	478	7.71	.405	89.0	100.0
RN6	59	106	1.79	.227		93.5
RN7						96.7
8RN	62	349	5.63	.325	95.1	100.0
9RN	62	366	5.90	.384	94.0	100.0
TEN	62	575	9.27	.410	83.0	100.0
TWN	62	278	4.48	.433	77.1	90.3
ECN						64.5
Cycle Three						
Area Net						
EAN	31	189	6.10	.440	77.4	
Region Net						
1RN	31	80	2.58	.240	94.9	90.3
2RN	31	110	3.60	.320	100.0	83.8
3RN						90.3
4RN						64.5
8RN						100.0
ECN						64.5
Cycle Four						
Area Nets						
EAN	31	962	31.03	1.072	97.2	
CAN	31	819	26.42	.952	100.0	
PAN	29	512	17.65	.815	97.3	
Region Nets						
1RN	62	455	7.34	.537	98.2	100.0
2RN	53	182	3.43	.348	83.5	100.0
3RN						100.0
4RN	62	399	6.44	.301	96.7	90.3
RN5	62	355	5.73	.460	86.7	100.0
RN6	62	192	3.10	.386	99.2	98.3
RN7	62	253	4.08	.441	86.0	100.0
8RN	59	242	4.10	.305	87.0	100.0
9RN	62	265	4.27	.360		100.0
TEN	62	306	4.94	.455	66.1	100.0
TWN	57	225	3.95	.340	76.6	93.5
ECN						96.7
ARN	31	61	1.967	.058	93.5	

*PAN operates both cycles one and two.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	106	85.50	370	787
TCC Central				
TCC Pacific	103	83.06	358	687
Summary	209	84.28	728	1474
Cycle Three				
TCC Eastern	62	100.00	32	64
Cycle Four				
TCC Eastern	109	87.90	420	851
TCC Central	76	81.70	220	547
TCC Pacific	105	84.68	369	697
Summary	290	84.76	1009	2095

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

The Brass Pounders League Medallion is available to individual operators who achieve BPL and are listed in the BPL column for the third time. This medallion is a one-time-only award, ie, it is not issued more than once. It is not necessary that the three months involved be consecutive. Any three months will qualify an operator. Stations that qualify for the BPL medallion, upon written notification of the qualifying months to the ARRL Public Service Branch, will be awarded the call sign-engraved BPL medallion.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	784	831	1361	80	3056
W1PEX	0	634	1500	36	2170
WB9YPY	0	1212	131	770	2113
WA2SPL	57	634	561	37	1289
K1UGM	0	523	523	0	1046
N4HOG	0	473	473	0	946
KB4N	0	478	479	0	957
W3VR	292	222	391	31	936
W3IWI	0	438	426	0	864
KC9CJ	21	465	84	289	859
KA1IFC	10	324	302	12	648
KT1Q	0	328	316	2	646
WI4PL	4	313	317	0	634
WA4JDH	0	283	337	0	623
N4GHI	8	316	249	25	598
WF6O	9	268	288	14	579
WB1BTJ/T	67	126	361	0	554
WD4KBW					540
K4DOR	28	228	248	8	512
WG9J	3	276	200	23	504

BPL for 100 or more originations plus deliveries:

KE0GP	177
KA8OQF	122
W0FIR	115
KF5BL	103

The following stations qualified for BPL during the month of June, but were not listed in the appropriate column: KC9CJ, WG9J, WB9YPY, WA9W. May BPL: W1PEX, KB4N.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

439
KC9CJ

169
KF5BL

149
WT0G

147
WB2OWO

143
KA8BBY

138
WA2SPL

131
N4GHI
WD8V
W2MTA

125
K0BXF

123
W7TVA

121
W9YCV

120
W1PEX

117
WA4QXT
K5MXQ
WB4DVZ

116
WB7WOW
W2QNL

115
WG9J

113
WA4PFK

112
WI2G
KA3DLY
N2E1A

111
WB2ZJF

110
KJ4VT
WF6O
K4IWW

109
W4JLS
WB4ZTR
KI4YV
N5MEA

108
KD7ME
WA0HTN

107
KA1GEP
WA1TBY
WB6DOB

106
N9BDL
WA9W
K4NLK
N3EMD

105
KA0KPY
WB1HIH

104
WB4VMX
K5UPN
W9CBE
KC4BHX

103
KT1Q
KD8HB
WA9VLC
W7VSE
KA1RVN/T

102
WT8J
KW1U

101
K9CNP
ND2S

100
WB4WII
N1FLO
KA7AID
N0FOO

99
K5CXP
NM1K
WA9VND
WT8L
K2YAI

98
WB4KSG
WY7U
W4ANK
N1CPX
KA1GWE
N2XJ

97
AA4ZV
W2RRX

96
WA2JBO
K0ERM
KQ3T
WA2JBO
WB2VUK
KT9I

95
W3FA
WD4LOO

94
N5NZH
K8TVG
KJ3E
W6VOM
WD0GUF

93
KB9LT
WD5GKH
W4QAT
WA4EIC

92
W9DM
W7GHT
WA2ERT

91
N4MEJ
KA2VZX
KC9Y
KA1NIX
KB1AF

90
N4EXQ
W4CKS
KC4GCK

89
WB4WQL
WT7A
K2VX
N0HWD

87
NR9K

86
KA1JXH
N3AZW
WX7A

85
W7LBK
KA1S
WE2G

84
W5CTZ
KB7LX
WB4HRR
W7LNE
W1KX

83
K4MTX
W1KX

82
KA9FVX
K3RXK
W1KK

81
WS8A
W1ALE
KA1IFC

80
W5YQZ
N8EFB
W9HBI
W0OYH
KJ9J

79
WB1BTJ/T
WB2EAG
N2GPA

78
N2IYA

77
WA5MWD
WD8KQC
K3JL
N7BGW
WA0TFC
KA8ZGY
NJ3V

76
WA1JVV
NZ5J

75
K8COF
N2IMP
NC3V

74
WB5J
NO3M
WB2EPU
KG2D
WA2FJJ

73
WA3UNX
KA8WNO

72
N1DHT
N8FPN
NR3Q
WA4RUE
KJ4NK
N6NLW
KA2INE
KC2HJ

71
N5KCL
WB7WVD
KA6UEO
K1GGS
WA4LLE

70
N5NAV
W6RE
KA4FZI

69
N9HWB
KA4HHE
ND0N
WS7U

68
KD8KU
K3GHH
N3DRM

67
KK4FV
W3YVQ

66
KB5BNU

65
WB8YPG
W6SX
NC9T
N4ORZ

64
KB4OPR
KA6TND/T
WD4KBW
W9UMH
KD0YL
KA7EEE
KE2JX
KA0ARP

63
W4TZC
KI4W
WB5CPY
WA8DHB
N8FWA

62
WB5YDD
N8HSC
WB8R
KA8CPS
WB0ZNY
NB2D
WA4YYQ
WB2FTX
N7MAL
KA2QOO
W0OUD

61
WB8KWC
WA2GYY
WT0E
N2HLZ
N1FNN
W1TC
WA2GYY
N2DXP
KA2KJF

60
NY8W
K8JDI
KA9QXI
KA9CTW/T
K2TWZ
WA2UKM
AI0D
W2FR

58
WA2PAC/T

55
KA2ZNZ/T
N2IKR/T

53
KA1QFV/T

51
KA9TVU/T

50
N4VHU

48
N4LST
N2EVG/T

47
KA2JMA/T
KA1HPO/T

44
KA2UIU/T

43
N2DIY/T

41
KA6HJK/T

The following stations qualified for PSHR during the month of June, but were not listed in last months's column: N2GPA, N9BDL, W9CBE, KC9CJ, KA9FVX, AG9G, WG9J, NS9Q, WA9W, W9YCV.

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

Ham Radio Software That Won't Break Your Piggy Bank

Good software does not have to be expensive software. In fact, expensive software sometimes turns out to be no-good software. The following Amateur Radio software is both good and inexpensive—some of it is so inexpensive that it is almost free! So, do some browsing, because the price is right.

Apple® II/IBM® PC

Antenna Trap Designing

W1HUE has written a BASIC program for designing antenna traps using coaxial cable. It is available in Apple II and IBM PC versions. You can obtain a copy of the program by sending a self-addressed, postage-paid disk mailer and a blank, formatted 5¼- or 3½-inch disk for Apple ProDOS, IBM high- or low-density formats, or a 5¼-inch disk for Apple DOS 3.3 format, to Larry East, W1HUE, 119-7 Buckland St, Plantsville, CT 06479.

Apple Macintosh®

Field Day Logger

It is never too early to prepare for the next Field Day, and WAØSVR has provided a new tool to give you an edge in next June's number-one Amateur Radio event. *FDlog!* is a contest-logging and -duping program with a built-in CW memory keyer that will transmit any one of ten programmable messages at the click of a mouse. The call sign of the station being worked and a sequentially generated serial number can be inserted in any message. The program will keep you on your toes, as it provides updated statistics concerning your rate for the whole contest, the last hour, the last half hour and the last 15 minutes. A "smart log" function automatically "fills in the blanks" of the log if a station has been previously worked on another band or mode. The program is available for $29.95 from Bill Gausman, WAØSVR, System One Control, 3900 85th Ave N, Suite 200, Brooklyn Park, MN 55443. The CW memory keyer hardware is also $29.95.

PK-232 Controller

MacRATT is a powerful terminal program for AEA's PK-232 multimode controller. The program uses the Macintosh's graphic user interface to allow you to easily use all of the features of the PK-232, including facsimile. Features include scrollable windows for entering text, displaying received data, and logging transmitted text (in packet-radio applications, there are enough windows to support multiple connections). Facsimile images can be printed without changing cables. Ten macro keys are available for quicker text entry. One character-at-a-time sending is available for RTTY, AMTOR and CW. If you have used *Macket* by Steve Fine, WD8PUH, you will notice a similarity between it and *MacRATT*. That's because Steve also wrote *MacRATT*; it includes all of the capabilities of *Macket* plus many more features. The program is available from Advanced Electronic Applications, Inc (AEA), PO Box C-2160, Lynnwood, WA 98036.

Commodore C-64™

Logging Pennsylvania—An Update

Back in April, I wrote about KM3D's Pennsylvania QSO Party contest program and, in response to that write-up, Harry Bump wrote to inform me that the program has been improved. Among the improvements are increased QSO capacity (from a maximum of 650 contacts total to a maximum of 650 contacts per band and mode), the ability to adapt the program for use in any state QSO party, the addition of a CW keyboard with memory (it requires a simple six-component interface) and the addition of more flexible contest-report printing. Send $20 for a copy of the program (or $3 if you are updating a previously purchased copy) to Harry Bump, KM3D, PO Box 392, Richland, PA 17087.

IBM PC

Contest Logger

KBØZP's contest-logging program will log and dupe 4000 contest QSOs in 2.5 seconds or less after each log entry. This single-operator contest logger updates your contact information and score after each contact, and a built-in "hurry-up timer" warns you if your QSO rate is deteriorating. Extensive help screens are provided and the scoring mechanism may be changed to fit almost any contest requirements. To obtain a copy of *KBØZP Contest Log*, send a self-addressed, postage-paid disk mailer and a blank formatted disk to Larry Kebel, KBØZP, PO Box 2010, Sparks, NV 89432. The program is shareware; ie, if you like the program and intend to use it, the author asks that you send him a registration fee.

Message Handler

Message Handler automates Amateur Radio message generation. A small word processor is included for creating the text of a message and provisions are made for automatic message numbering and automated "book" message creation. Help screens provide third-party traffic information and post office abbreviations. The program is shareware and is available from KBØZP (see *Contest Logger* above).

N3EQF Logger

N3EQF's logging program provides for entering information in any order as it is received during a QSO; viewing entries sequentially; searching entries according to patterns in call sign, date, frequency, location, QSL or remark entries; printing the entire logbook or the results of any search operation; printing QSL labels from entries; automatic logging of time from the computer's clock; and editing or deleting of any entry. If the program is used with a computer that is connected to a Kenwood transceiver via an IF-232C interface, the operating frequency and mode is logged automatically and both may be controlled from the program. You may obtain a copy of *LOG-EQF* by sending a self-addressed, postage-paid disk mailer and a blank, formatted disk to Tom Dandrea, N3EQF, 396 Sautter Dr, Coraopolis, PA 15108. The program is shareware.

QSL Managers Database

EA1QF has assembled a data base of 14,000 DX stations, their QSL managers (if any) and QSL managers' addresses. The program allows you to display, add, edit and delete entries. To obtain a copy of *Managers*, write to QUFO Software/Padin, PO Box 351, 26080 Logrono, Spain.

Resistor Color Coding

Do you need help with resistor color coding? Well, W6QZU has a tool for you that will do the job. You can obtain his *Resistor Color Code* program on disk by sending $2 to Merdin Criddle, W6QZU, 1720 Pleasant Valley Rd, Aptos, CA 95003.

Radio Shack EC-4023

Antenna Bearing and Distance

W4NLG has programmed his Radio Shack EC-4023 programmable scientific calculator to compute antenna bearings and distances. The one-page listing of the program is available by sending an SASE with one enclosed 25-cent stamp (to cover copying costs) to B. O. Lowery, W4NLG, 1809 Brickell Ave, Miami, FL 33129.

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to HCR 5 PO Box 574-334,
Tierra Linda Ranch, Kerrville, TX 78028
or call 512-257-1296 to record late-breaking information.

Six-Meter DX Window Poll: The Results

The July column carried a series of ten questions, intended to determine the feelings of 6-meter operators with respect to establishing a "DX window." The DX window idea was originally offered by a group of south Florida operators 8 to 10 years ago. Although mentioned briefly in this column, at that time it did not attract wide acceptance. The concept was revived in early 1988 following the urging of many 6-meter operators unhappy with the way DX stations were being stepped on, especially during VHF contests. Not wanting to appear to dictate operating norms, but rather, let band occupants decide for themselves and then provide them a forum for their opinions, I proposed a one year test of a DX window, using the same frequency limits originally suggested by the south Florida group. Thus the May 1988 column recommended that we try, for a year, a DX window from 50.100 to 50.125 MHz. With the one year trial period up, the poll was published in last July's column.

Thanks to the nearly 200 who took the trouble to submit responses. Their responses provide a reasonable expression of opinion among active 6-meter operators. I am sure that there are many on both sides of the question who didn't get around to sending cards expressing their opinions, so a greater response would probably not have made a substantial difference in the result. With that out of the way, on to the results.

Question 1 asked if the respondent believes that a portion of the 6-meter band should be used by US and southern-tier Canadian stations only for working, or attempting to work, stations outside of the 48 contiguous US states and VE1 through VE7. Those supporting the establishment of such a DX window numbered 175, while only 20 expressed opposition.

Question 2 asked those who answered Yes to Question 1 if they believe that a DX window should apply at all times, or only when an individual operator thinks that the band might be open for DX. Of those answering Yes to Question 1, 154 thought that the window should apply at all times while 20 opted for the other alternative.

Question 3 addressed various frequency limits which had been proposed for a DX window, with the results as follows:

50.100 to 50.125 MHz (Calling frequency 50.125 MHz)	108
50.100 to 50.120 MHz (Calling frequency 50.120 MHz)	34
50.100 to 50.150 MHz (Calling frequency 50.150 MHz)	14
50.080 to 50.100 MHz (Calling Frequency 50.110 MHz)	5
50.200 to 50.250 MHz (Calling frequency 50.110 or 50.200 MHz)	10

Although not included as one of the choices, three respondents expressed the opinion that 50.100 to 50.110 MHz is sufficient space for a DX window. One of these thought that it should apply only when an individual operator believes that DX is possible.

Question 4 asked if the respondent will honor a DX window, if supported by a majority of 6-meter operators, by refraining from engaging in QSOs with US and lower-tier Canadian stations, whether or not he or she thinks that propagation to DX areas is possible at the time. Of those in favor of a DX window, 168 said that they would so honor the window, while eight indicated that they would not. Of those not in favor of the window, seven indicated that they will honor it if instituted.

Question 5 asked respondents if they would assist in implementing a DX window by courteously informing others of its existence and purpose. Of those in favor of the window, 147 said that they would try to help. Those that would not aid in informing others numbered 21, some citing an aversion to assuming the role of "policeman." Surprisingly, four of those opposed to the window said that they would help to persuade others to observe it if implemented.

Question 6 was designed as a screen to determine if the respondent is currently on 6 meters. Only three replies were rejected as a result of not being on the band. One, who is in favor of the window, said he hopes to be on soon. One against the proposal, said that he sold his 6-meter gear a year ago. The third, wrote a letter complaining about DXers grabbing the "best part" of the band but didn't respond to any of the questions, including this one.

The response to Question 7, asking how long the respondent has been on the band elicited no clear correlation between 6-meter operating experience and support (or non support) of a DX window. Those in favor averaged 17.5 years, while those opposed averaged 15.8 years.

A similar situation applies to the number of countries worked, as asked in Question 8. Those in favor averaged 30.5, while those opposed averaged 23.9. Incidentally, of the 16 opposed answering this question, two said they didn't know how many countries they have, and two more said they have zero countries. I gave them credit for one country in calculating the averages. In the considerably larger pro-DX window group, five said they did not know how many countries they have and seven responded with zero. Also on the pro side, 18 (more than 10 percent) indicated two or fewer countries worked. It seems clear that it's not just the big guns who are in favor of a DX window.

Although Question 9 was phrased ambiguously, most respondents tried to help by providing the information obviously sought. For those in favor of a DX window, 137 said it should apply to both US and lower-tier Canadian stations, while 26 expressed the opinion that it should be for US stations only. Only six VEs responded to the poll, with four opting for including the Canadians. One thought that they should be treated as DX, and one didn't answer the question.

The run-down by call area goes like this: (For/Against) W1 15/0, W2 9/0, W3 14/0, W4 35/4, W5 17/2, W6 12/0, W7 7/3, W8 16/2, W9 18/4, WØ 19/3, VEs 6/0 and DX 3/1.

So there you have it. It appears that a DX window between 50.100 and 50.125 MHz has a great deal of support among 6-meter operators. In addition, most agree that the window should apply to lower-tier Canadian stations (VE1 through VE7) as well as US stations located in the contiguous 48 states. There is also strong support for observing the window at all times, not merely when one believes that DX is possible. Obviously, observation of the DX window is entirely voluntary. There is no FCC rule or edict from any organization that requires compliance. Nevertheless, most civilized societies have standards of conduct which, though not established as laws, are followed by the majority of their inhabitants simply because they make sense and afford a happier life for everyone. The DX window may well belong in this category.

If the DX window is to work, most operators must be convinced that it is intended to benefit everyone, not just the "big guns." The big DXers must not use the window as their private preserve to talk to their friends, even if the subject of the conversation is DX. If more than a 30-second QSO appears likely, use the time to name a frequency above 50.125 MHz, preferably as high in the band as practical. If the average 6-meter operator perceives that the big DXers are using the window as their private QSO pasture, they are certain to jump in with both feet and do the same. That will signal the demise of the window.

Those who may not be in favor of the DX window or, disagree with some of its specific provisions are asked to give it a try anyway. I believe that the biggest hurdle is getting over the mind-set that everything happens on 50.110 MHz. For example, a few voted for 50.100 to 50.125 MHz but urged that 50.110 MHz remain as the calling frequency. I fail to understand how this could be accomplished while maintaining the DX window as intended. Furthermore, I believe that it will not be long before the use of 50.125 MHz as the principal calling frequency will become widely accepted. One respondent suggested 50.130 MHz as the calling frequency. However, I believe that this would not be supported by many. Another recommended that the DX window extend from .100 to .150, and no calls be initiated by US and lower-tier Canadians between .100 and .125, only responses to calls from DX stations. Personally, I would favor this approach, but feel that it would be too difficult to gain widespread acceptance. The .100 to .125 DX window seems to be the right compromise and did receive the majority of the votes. By the way, let's treat 50.125 MHz as we should any calling frequency by moving off once contact is established.

The coming months should be very produc-

Microwave Standings

Listings are call, state, US states worked, call areas worked, grids worked and best terrestrial DX worked in miles. Call areas are the 10 US call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. To ensure that the stations listed possess a true capability to work meaningful distances, a minimum showing of 5 grids or the minimum DX listed for each band is required. In order to make the standings a true reflection of stations currently active on the bands above 902 MHz, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states or grids in order to remain in the standings or be reinstated, merely an indication of continued activity and interest. Compiled August 5, 1989. Deadline for next update is January 15, 1990. (Note change in date, this time only.)

902 MHz (33 cm)

Minimum best terrestrial DX 150 Miles

W1JR	MA	10	5	27	394
W1RIL	MA	9	4	20	230
AF1T	NH	9	3	—	320
W1EJ	NH	6	2	—	—
WC2K	NJ	16	6	33	609
KD5RO/2*	NY	10	7	31	300
W2PGC	NY	7	6	12	478
N2WK	NY	7	5	24	328
KU2A	NY	3	3	5	200
N3CX	PA	13	6	26	405
WA3AXV	PA	11	6	25	326
WS4F	GA	6	2	6	628
N4MW	TN	4	4	15	460
W4WSR	FL	1	1	1	1072
WB5LUA	TX	10	4	22	627
WA5VJB	TX	4	3	10	462
W6CPL	CA	1	2	14	513
K6LMN	CA	1	2	—	599
N6XQ	CA	1	1	1	185
WB8BKC	MI	8	5	35	550
NI8O	OH	6	5	8	293
KXØO	CO	3	2	3	615
VE3LNX		9	6	36	498
XE2GXQ		1	1	3	599

1240 MHz (23 cm)

Minimum best terrestrial DX 150 Miles

K1FO	CT	15	7	21	468
W1JR*	MA	13	10	35	655
K1PXE	CT	13	5	—	448
WA1OUB	NH	12	7	30	496
W1RIL	MA	12	6	24	450
AF1T	NH	10	4	—	350
K1LPS	VT	8	5	17	288
W1EJ	NH	8	4	—	—
W1QXX	MA	6	3	—	260
K2UYH*	NJ	25	32	—	770
WC2K	NJ	19	8	50	756
WA2LTM*	NJ	17	6	—	770
W2VC	NJ	16	6	37	537
KD5RO/2*	NY	15	13	42	360
W2PGC	NY	14	8	25	960
N2BJ	NY	13	5	22	—
K2YCO	NY	11	8	—	—
N2WK	NY	11	6	29	584
K2EVJ	NY	10	6	—	426
WA2FUZ	NY	6	3	3	245
WB2YZV	NY	5	3	8	—
KU2A	NY	6	3	3	200
K2OVS	NY	3	2	5	—
K2LME	NJ	3	—	4	—
WA3AXV	PA	17	8	37	698
WA3JUF	PA	14	5	20	300
W3IP	MD	13	7	22	369
K3HZO	MD	13	6	25	—
KB3QM	DE	7	—	7	—
W3RUE	PA	6	3	11	—
K4QIF*	VA	22	25	—	790
WB4NXY	KY	17	7	29	730
WS4F	GA	9	5	18	627
WB4SLM	TN	9	3	21	728
N4MW	TN	8	5	15	460
W3IY/4	VA	7	5	—	481
WA4OFS*	FL	7	2	17	1042
W4WSR	FL	3	2	9	1112
WB5LUA*	TX	30	28	119	1280
WD5AGO*	OK	16	26	70	600
W5HN	TX	14	5	50	1155
W5RCI	MS	14	4	42	—
W5DFU	OK	13	6	38	1031
K5UR	AR	12	4	41	654
WB5AFY	TX	12	3	50	685
WA5ASH	TX	10	6	33	1425
K5SW	OK	10	5	30	984
WA5VJB	TX	10	5	—	1140
WA5TKU	TX	5	3	18	1112
WA5HNK	TX	5	2	15	740
WØRRY/5	OK	5	2	11	285
W5NZS	OK	5	—	20	—
W5HPT	TX	4	1	—	571
N5AMA	LA	3	2	11	675
WB5LBT	LA	3	2	—	—
N5BBO	TX	2	2	14	1042
WA5DBY	TX	2	1	—	—
WA5TBE	TX	1	1	—	571
W5GVE	TX	1	1	—	366
N6CA*	CA	8	11	43	2472
W6CPL	CA	3	4	23	2476
N6XQ	CA	3	3	19	2519
NN6W	CA	2	3	6	595
K6QXY	CA	2	2	—	2358
K6LMN	CA	1	2	—	599
WBØHLC/6	CA	1	1	7	479
K6LMN/6	CA	1	1	1	230
W7RV	AZ	6	3	19	405
W7YOZ	WA	2	1	7	230
WB8BKC	MI	23	9	66	950
W8YIO	MI	20	12	45	950
WA8TXT	OH	18	9	25	820
NI8O	OH	18	8	48	982
WB8PAT	OH	10	5	16	836
W9ZIH	IL	24	9	—	790
WB9SNR	IL	14	8	27	760
WØUC/9	WI	5	3	12	520
K9VGE	WI	5	3	6	350
WBØDRL*	KS	27	18	115	1100
WØRAP*	IA	16	13	65	648
WAØTKJ	KS	13	5	40	1100
WØOHU	MN	13	5	28	814
KØTLM	MO	13	4	35	—
KØIFL	MO	11	5	18	428
KCØQR	NE	10	3	38	430
KØRZ	CO	7	3	31	407
WØKJY	CO	6	3	25	430
KXØO	CO	6	3	17	615
KH6HME		2	2	—	2472
VE3LNX		12	6	39	498
VE4MA*		14	22	22	800
SMØPYP*		7	—	—	—
XE2GXQ	(1)	2	2	7	2580

2300 MHz (13 cm)

Minimum best terrestrial DX 150 miles

W1JR	MA	9	4	11	257
W1RIL	MA	8	3	13	230
WC2K	NJ	11	5	20	556
KD5RO/2	NY	6	7	22	250
W2PGC	NY	6	6	8	478
N2WK	NY	4	5	10	584
WA3AXV	PA	13	6	22	671
N3CX	PA	8	4	13	325
W4HHK*	TN	10	11	16	582
N4MW	TN	5	4	9	420
WB4NXY	KY	4	4	6	360
WS4F	GA	4	1	4	147
WB5LUA*	TX	12	5	36	933
W5RCI	MS	5	3	7	—
W5DFU	OK	4	2	11	235
W5HN	TX	4	2	11	623
WA5VJB	TX	4	1	14	410
W5ASH	TX	2	1	11	225
W6CPL	CA	1	2	6	316
WA3RMX/7	OR	1	1	8	115
WB7UNU/7	OR	1	1	—	115
W8YIO	MI	10	8	22	940
WB8BKC	MI	5	4	14	275
WA8TXT	OH	4	4	5	291
WB8TGY/8	MI	2	3	11	152
NI8O	OH	2	1	3	127
KXØO	CO	3	2	10	454
KØRZ	CO	2	2	11	143
WØKJY	CO	2	2	7	130
KØUJA	IA	1	1	2	208
VE3LNX		5	5	18	296
VE4MA*		2	8	—	150
SMØPYP*		1	—	—	—
XE2BXQ	(1)	1	1	1	316

3300 MHz (9 cm)

Minimum best terrestrial DX 100 miles

W7CNK/5	OK	4	2	6	187
W5UGO	OK	3	2	3	215
WB5LUA	TX	3	1	11	165
WB5AFY	TX	3	1	10	285
WA5VJB	TX	3	1	9	180
WB5LUA/5	AR	3	1	6	288
N6SNA/6 (2)	CA	1	2	11	613
N6CA/6 (2)	CA	1	2	11	613
W6OYJ	CA	1	1	2	214
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
KXØO	CO	2	2	6	454
KØRZ	CO	2	2	6	70
WØKJY	CO	2	2	5	135
WBØDRL	KS	1	1	1	215
KDØGT	KS	1	1	1	170
XE2GXQ		1	1	1	613

5650 MHz (5 cm)

Minimum best terrestrial DX 100 Miles

K5PJR	OK	7	2	35	332
WA5ICW/5	OK	6	2	29	287
W5UGO	OK	6	2	24	377
WD5AGO	OK	3	2	5	96
N5JJZ/5	OK	3	1	4	404
WB5LUA	TX	2	1	10	215
WD5AGO/5	TX	1	1	1	224
W6OYJ	CA	1	1	2	214
N6CA/6	CA	1	1	1	613
N6SNA/6	CA	1	1	1	613
WA3RMX/7	OR	1	1	6	115
WB7UNU/7	OR	1	1	—	115
KØRZ	CO	2	2	5	75
XE2GXQ		1	1	1	613

10 GHz (3 cm)

Minimum best terrestrial DX 100 Miles

W2VC	NJ	5	2	7	227
W2TTM	NJ	4	3	8	227
WA5VJB*	TX	2	2	33	—
WB5LUA	TX	2	1	6	208
WA6EXV/6	CA	3	3	11	219
N6CA/6	CA	1	2	14	255
N6CA	CA	1	2	11	522
W6CPL	CA	1	2	9	317
N6XQ	CA	1	2	7	358
K6KKO	CA	1	2	7	402
NN6W	CA	1	2	6	595
N6SNA/6	CA	1	1	8	184
WA6QYR	CA	1	1	7	103
W6OYJ/6	CA	1	1	5	404
K6HLH	CA	1	1	5	125
W6SFH/6	CA	1	1	4	414
WA6MHZ	CA	1	1	4	104
WB6BKR	CA	1	1	4	168
N6GN/6	CA	1	1	3	414
WD6FWE	CA	1	1	1	174
WBØHLC/6	CA	1	1	1	479
WB7ABP/6		1	1	1	479
KB7CI	AZ	1	1	12	147
K2DNR/7	AZ	1	1	12	147
WA3RMX/7	OR	1	1	8	115
WB7UNU/7	OR	1	1	—	115
KØRZ	CO	2	2	6	78
KXØO	CO	1	1	2	165
XE2GXQ	(1)	1	1	5	595

24 GHz (1.25 cm)

Minimum best terrestrial DX 50 Miles

W6CPL	CA	1	1	4	68
N6XQ	CA	1	1	4	68
WA3RMX/7	OR	1	1	5	115
WB7UNU/7	OR	1	1	—	115
KXØO	CO	1	1	1	74

48 GHz (0.6 cm)

Minimum best terrestrial DX 10 Miles

WA3RMX/7	OR	1	1	2	65

* Some stations worked via EME.
— Information not supplied.

Notes

[1]Includes operations from several grids in Baja, California.
[2]Includes operation from DM04 and CM94.

tive for F2 DX. Let's hope that with the 50.100 to 50.125 MHz DX window in place, more 6-meter enthusiasts will benefit from the superb conditions which should be upon us before many more weeks.

RECORDS FALL LIKE DOMINOES

World records for 70 cm, 23 cm, 5 cm and 0.6 cm have all fallen the past few months. All but the last are the result of the duct that frequently extends along the West Coast of this country and Mexico and sometimes into the Pacific at least as far as Hawaii.

For the record-breaking contacts on 70 and 23 cm, N6XQ journeyed down the Mexican Baja Peninsula where he signs XE2GXQ. On July 13, his first stop DL28vq, Jack worked KH6HME at the 8000-foot level on Moana Loa on the Big Island of Hawaii on 2-meter SSB—a distance of 2662.7-miles. Signals ran 51 to 53. Jack was also able to QSO KH6FOO and KH6IAA in Hilo, while KH6HME contacted XE2UZL, N6CW, W6CPL and others. Two days later, from DL29cx, XE2GXQ worked KH6HME on 1¼-meters FM, 70-cm SSB and 23-cm SSB. The distance from this site calculates to 2579.7 miles and represents new world records for 70 cm and 23 cm. The 1¼-meter world record is still held by KP4EOR and LU7DJZ. In addition to KH6HME, KH6FOO was worked on 70 CM.

The 2-meter gear at XE2GXQ consisted of a 4-wavelength Yagi and a 160-W amplifier, while KH6HME was using 80-W to a pair of stacked Yagis. On 1¼-FM, both stations used 25-W IC-37A transceivers. At KH6HME, the antenna was a 5-element, Yagi while XE2GXQ used a 14-element Yagi. Both were horizontal. On 70 cm, both stations ran about 100 W. At KH6HME the antenna was stacked beams, while XE2GXQ had a 4.5-wavelength Yagi. KH6HME's 23-cm setup consisted of 30 W to 4 stacked 6-foot long Yagis, while XE2GXQ had 10 W to a single 12-foot long Yagi.

The next week, N6XQ was back down in Mexico again. This time Jack carried equipment for 9 and 5 cm plus a 2-meter liaison rig and an HF transceiver. Getting to a likely promontory was not easy as it involved 20 hours of driving over rough Baja roads. Finally set up at DL37ck, XE2GXQ was ready for the attempt to work N6CA and N6SNA both set up at CM94xm west of Santa Barbara. Liaison on 2 meters was finally established after first having to take a circuitous route from N6CA to XE2UZL (W6UZL) on 1 ¼-meter FM to KH6HME on 28.885 MHz and thence to XE2GXQ. At 0046Z July 23, the first contact was established on 3456-MHz SSB over the 613.4-mile path. They did it again at 0157Z, this time on 5760-MHz SSB. Signals were reported to be 20-30 dB out of the noise with QSB, Q5 almost all of the time. Interestingly, signals on 23-cm SSB were only 1-3 dB above the noise with 10 W and 20-dB gain antennas at both ends. The 9-cm contact apparently constitutes a new North American DX record. For 5 cm, the distance represents a new world record, slightly besting the former mark of 610.3 miles set by G3ZEZ and SM6HYG in July, 1983.

WA3RMX apparently has a new 47-GHz record of 65.37 miles. This betters the old mark of 33 miles set in 1984 by HB9AMH and HB9MIN. Tom accomplished this feat with K7AVO during last year's UHF contest.

ON THE BANDS

No space this month for a detailed account of what was worked during the last half of July through early August. Suffice it to say that E_s propagation continues well on 6 meters but with the normal drop off of multi-hop propagation. A few openings continued on 2 meters. More next month.

Conducted By Bob Atkins, KA1GT
103 Division Ave, Millington, NJ 07946

Sun Noise—and a Final Farewell

In this column, I'll present some of the basic principles of sun-noise measurements. I wrote this article to be published in two parts; regrettably, this is the last New Frontier column scheduled to appear in *QST*, so I've had to leave out some of the items I would have liked to cover, and some of the explanations I would like to have given. I hope the remaining information proves useful.

Two previous New Frontier columns are recommended background reading. The July 1984 column dealt with the use of noise measurements in determining microwave-system performance; the July 1985 column covered the contribution of atmospheric attenuation to sky noise.

Sun noise is a measure of the noise delivered to a receiving system by an antenna that is pointed at the sun. The noise delivered to a receiving system by an antenna is a function of the *antenna temperature*. Antenna temperature is determined by the effective temperature of the object at which the antenna is pointed. If the object fills the main lobe of the antenna (and we neglect sidelobes), the antenna temperature is the same as that of the object. Thus, if the antenna is pointed at the ground (which is at a temperature of 298 K [25 °C]), the antenna temperature will be 298 K and the power delivered to the receiver can be calculated (see Eq 2). If the object at which the antenna is pointed is smaller than the main lobe of the antenna (as is usually the case when an antenna is pointed at the sun), the noise temperature of the antenna is a function of the noise temperature of the sun, the noise temperature of the sky around the sun, the angular diameter of the sun and the beamwidth of the antenna. The relationship is:

$$T_a = (T_{sun} \times \Omega 1) + (T_{sky} \times \Omega 2) \quad \text{(Eq 1)}$$

where T_a is the antenna temperature, $\Omega 1$ is the fraction of the antenna's main lobe that is occupied by the sun, and $\Omega 2$ is the fraction of the main lobe occupied by the sky.

An alternative method of determining antenna temperature is by the use of solar-flux data. This is the system commonly used in radio astronomy. One reason this method is useful is that solar flux data at 10.7 cm is measured daily using a radio telescope in Ottawa, Ontario, and flux data is broadcast over WWV 18 minutes after each hour and WWVH at 45 minutes after each hour.

From this data, solar flux at other microwave frequencies can be extrapolated (see Fig 1). The extrapolated flux values are best regarded as those that are most probable for a given 10.7-cm flux, but there is no fundamental, fixed relationship between flux values at different frequencies. The graph shown in Fig 1 gives flux data for the amateur microwave bands. Note that isolated noise outbursts—with a duration of minutes to hours—can also occur. These bursts can increase the flux values tremendously. Maximum burst values can reach 900 solar flux units (sfu) at 10 GHz and 4500 sfu at 1296 MHz!

Flux is basically a measure of the energy density reaching an antenna from an external source or sources. It is expressed in units of energy per unit area per second per Hz. By definition, one flux unit (fu) = 1×10^{-23} erg cm^{-2} sec^{-1} Hz^{-1} = 1×10^{-26} W m^2 sec^{-1} Hz^{-1} and

1 sfu = 10^4 fu

The flux density of a source is related to the source temperature and angular size by the relationship:

$$S = ([2 \times h \times v^3] \div c^2) \times (1 \div \exp[h \times v + k \times T] - 1) \times \omega \quad \text{(Eq 2)}$$

where

S = flux density (units of 10^{-22} W m^2 Hz^{-1})
h = Planck's constant (1.0546×10^{-27} erg sec)
v = frequency (Hz)
c = velocity of light (2.9979×10^{10} cm sec^{-1})
k = Boltzmann's constant (1.38×10^{-16} erg K^{-1})
T = source temperature (K)
ω = solid angle subtended by source (steradians)

This relationship can be approximated for the sun as:

$$\text{flux} = (0.0000161\ v^3) \times 1 \div (\exp(0.0771\ v \div T) - 1) \quad \text{(Eq 3)}$$

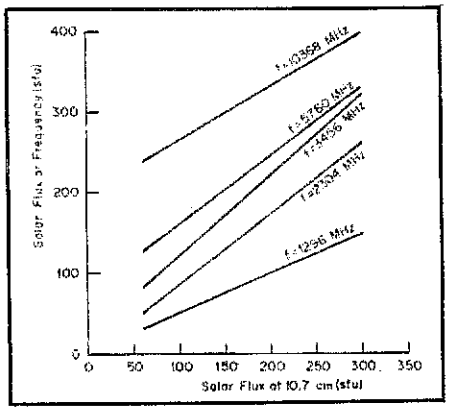


Fig 1—Solar flux at microwave frequencies can be extrapolated from that at 10.7 cm, which is measured periodically and broadcast on WWV and WWVH. The graph shows the relationships between 10.7-cm flux and that in the Amateur Radio microwave bands from 1.2 through 10 GHz.

or

$$\text{temperature} = 7.71\ v \div (\ln[(0.0016\ v^3) \div \text{flux}] + 1) \quad \text{(Eq 4)}$$

where

v = frequency in GHz
T = solar temperature (K)
flux is given in units of 10^{-22} W m^2 Hz^{-1}

From this it is easy to calculate the power received by an antenna. An antenna is considered to capture energy that falls in its capture area, which is directly related to the antenna gain, via the relationship

$$\text{gain} = (4\ \pi\ A) \div \lambda^2 \quad \text{(Eq 5)}$$

or

$$A = (G\ \lambda^2) \div 4\ \pi \quad \text{(Eq 6)}$$

where

A = capture area of the antenna
G = antenna gain (expressed as a ratio [20 dB = 100])
λ = wavelength in use

Thus, the received power is

$$P = S\ A \quad \text{(Eq 7)}$$

where

P = received power
S = incident flux
A = capture area of the antenna

Substituting for A (= $G \times \lambda^2$) and for P (= $k \times T$) and solving for T, the effective antenna-noise temperature is

$$T_a\ (K) = (S \times G \times \lambda^2) \div (2 \times 4 \times \text{pi} \times k) \quad \text{(Eq 8)}$$

$$= (S \times G \times \lambda^2)/3.468 \quad \text{(Eq 9)}$$

where

T_a = antenna temperature
S (solar flux) is expressed in units of 10^{-22} W m^{-2} Hz^{-1}
λ is expressed in meters
G (antenna gain) is expressed as a ratio

A factor of 2 is included in the denominator of Eq 8 because the antenna receives signals of only one polarization mode (horizontal, vertical, left circular, right circular, etc) but the noise received by the antenna is, for the most part, randomly polarized.

Note that Eq 8 is only valid if the angular diameter of the noise source is less than the beamwidth of the antenna (eg, at 10 GHz, dish diameter must be less than about 15 feet). This is almost always the case in Amateur Radio work. Also, an estimate of cold-sky noise contribution should be added to the antenna temperature. This is 25 K × the fraction of the antenna beamwidth seeing the sky, not the noise source, and is usually a small correction.

(continued on page 57)

A Salute to the Courage HANDI-HAM System!

With continued service for more than 20 years, this Minnesota-based group helps disabled persons enjoy many facets of Amateur Radio—and you can help them in their mission.

By Mary E. Schetgen, N7IAL
Secretary
The ARRL Foundation

If you've been a ham for any length of time, you've probably heard of the Courage Center of Golden Valley, Minnesota, that conducts the Courage HANDI-HAM System—a network of member volunteers who help the disabled become Amateur Radio operators. Through the HANDI-HAM System, study guides and materials, tutoring, and loan-of-equipment are made available to Novice hopefuls and their volunteer Elmers, usually nondisabled individuals who join the program for the express purpose of helping others.

Earlier this year, the HANDI-HAM System faced a reduction in services with their popular Equipment Loan Program. Bruce Humphrys, KØHR, Director of Rehabilitation Technology, contacted the Foundation with a request for assistance in the form of a grant. In January, our Foundation Board of Directors approved a three-year, $10,000 grant and disbursed the first check in May. We're pleased to report that your support through the Foundation and the support by other group and individual contributors has helped keep the program intact. The Equipment Loan Program is unique for many reasons. In many cases, modifications have been made to loaned equipment to enable those with various disabilities to operate regardless of their physical limitations.

The ARRL Foundation has had a long and enjoyable association with the program and supports the aims of this group of dedicated volunteers. If you would like to learn more about the Courage HANDI-HAM System or would like to make a contribution to their Equipment Loan Program, please write to: Courage HANDI-HAM System, 3915 Golden Valley Road, Golden Valley, MN 55422.

A NOTE FROM PRESIDENT PAUL GRAUER, WØFIR:

"On behalf of the Officers and Directors of the ARRL Foundation, I'd like to personally extend our congratulations to Sister Alverna O. Laughlin, WAØSGJ, of the Courage HANDI-HAM System, our 1988 ARRL International Humanitarian Award recipient, and to all ARRL Members on the occasion of our parent organization's 75th Anniversary Diamond Jubilee."

MY CLUB, INC.

The ARRL Foundation is a not-for-profit, tax-exempt, 501 (c)(3) corporation. As such, any contributions made to it are tax deductible to the extent permitted by the IRS. We provide this information on every contribution acknowledgment we send out, so that you are reminded of this happy fact.

We often get questions from clubs wishing to get tax-exempt status of their own, so that they might initiate major fund-raising activities to benefit their clubs. Unfortunately, current IRS regulations are discouraging and make it costly for individual clubs now seeking their own tax-exempt status—we share your concern. We'll keep you informed of any changes that will benefit clubs seeking this status. In the meantime, if your club is thinking of incorporating for tax purposes, give the toll-free IRS Infoline a call. Their helpful folks will send along the information you need on tax-exempt status and matters pertinent to incorporation. They can be reached at: 1-800-424-1040.

YOU'LL LIKE THE CHANGE

If you're the type who hates sifting through mountains of informational sheets and applications, you'll like our new, streamlined scholarship package. Use one (1) form only, to apply for any or all of our scholarships. Information about each scholarship is contained in a small, easy-to-read booklet included with every package. We want to make it as easy for you to apply as possible. To request our free package, send your QSL or postcard to: The ARRL Foundation, 225 Main St, Newington, CT 06111.

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Jesse Bieberman Meritorious Membership Fund
Paul S. Vydareny, WB2VUK

The Victor C. Clark Youth Incentive Program Fund
Robert York Chapman, W1QV

The PHD Scholarship Fund
Chuck Miller, WAØKUH

The New England FEMARA Scholarship Fund
Robert York Chapman, W1QV
in memory of A. William Welles, W1KYW

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Edmond A. Metzger, W9PRN

The Edmond A. Metzger Scholarship Fund
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James H. Van Horn, N4TFJ
Ralph L. Vasa, N4ETK
Mark Grant, W8MG
in memory of Arthur W. Grant, N8AET
Bruce L. Meyer, WØHZR
in memory of Joseph R. Pavek, WØOEP

As received and acknowledged during the month of **July**

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.

Arizona (Tucson)—October 15. *Sponsor:* Old Pueblo RC *Time:* 7 AM-1 PM. *Place:* DeAnza Drive-in, 22nd St and Alvernon. *Features:* ARCA meetings, repeater owners' meetings. *Talk-in:* 146.52, 146.22/82, 146.28/88. *Admission:* buyers $1, sellers $4 per space. *Contact:* John Borden, 4245 E Lee, Tucson, AZ 85712.

Connecticut (Uncasville)—October 28. *Sponsor: Tri-City ARC. Time:* setup 9 AM, public 10 AM. *Place:* Uncasville VFW (off Rte 32, behind Wonderbread Bakery). *Talk-in:* 146.13/73. *Admission:* Free. *Contact:* Thomas Scott, WA2RYV, 203-464-6555.

†**Florida (West Palm Beach)—October 14-15.** *Sponsor:* Palm Beach Repeater Assn. *Time:* Saturday 9 AM-5 PM, Sunday 9 AM-3 PM. *Place:* take the West Palm Beach exit off the Florida Turnpike, or the Southern Blvd exit off I-95 and follow the Fairgrounds signs. *Talk-in:* 147.765/165. *Admission:* advance $4, door $5. *Contact:* Hamfest, PO Box 461, Lake Worth, FL 33460.

†**Georgia (Atlanta)—September 29-October 1.** *Sponsor:* Southeastern DX Club. *Time:* Friday evening through noon Sunday. *Place:* Lanier Plaza, I-85. *Features:* banquet Saturday evening. *Talk-in:* 147.500 simplex. *Admission:* advance $55, door $65. *Contact:* Ann Streible, 3101 Lassiter Rd NE, Marietta, GA 30062, 404-993-1767.

†**Georgia (Warner Robins)—October 21-22.** *Sponsor:* Central Georgia ARC. *Time:* Saturday 8 AM-6 PM, Sunday 8 AM-4 PM. *Features:* refreshments, packet by Buck Rogers. *Talk-in:* 146.25/85. *Admission:* advance $2, door $3. *Contact:* Jesse Kirkham, WB4KQA, 110 Brown Dr, Warner Robins, GA 31093, (D) 912-926-3389, (N) 912-953-3922.

†**Illinois (Shelbyville)—October 7-8.** *Sponsor:* Breakfast Club. *Place:* Forest Park at the north edge of Shelbyville. *Features:* flea market, refreshments, free parking. *Talk-in:* 147.99/39. *Admission:* free. *Contact:* Pete Wehrheim, K9TFB, PO Box 126, Baldwin, IL 62217.

†**Maryland (West Friendship)—October 15.** *Sponsor:* Columbia ARA. *Time:* 8 AM-3:30 PM. *Place:* Howard Co Fairgrounds, I-70 to MD 32, south on 32 1/8 mile to MD 144, right 1/4 mile to Fairgrounds entrance. *Features:* VE exams (reservations desirable but not required), refreshments, radio check out (station monitor). *Talk-in:* 147.735/135, 222.32/3.92, 146.52. *Admission:* $4. *Contact:* Cam Whetstone, WA3YOH, 211 Clarendon Ave, Baltimore, MD 21208, (D) 301-379-3395, (N) 301-486-2609.

†**Massachusetts (Framingham)—October 15.** *Sponsor:* Framingham ARA. *Time:* setup 8 AM, doors open 9 AM to early bird buyers and 10 AM to all buyers. *Place:* Framingham Civic League Bldg, 214 Concord St, (Rte 126) downtown. *Features:* flea market, VE exams. *Talk-in:* 147.75/15. *Admission:* $5 to early bird buyers and $2 to all buyers. *Tables:* $12 which includes one free admission (preregistration required for tables and exams). *Contact:* for tables Jon Weiner, K1VVC, 52 Overlook Dr, Framingham, MA 01701, 508-877-7166, for exams send completed Form 610, copy of ham license, and check for $4.75 payable to ARRL/VEC to FARA, PO Box 3005, Framingham, MA 01701, (N) 508-877-0563.

†**Michigan (Kalamazoo)—October 22.** *Sponsor:* Southwest Michigan AR Team & Kalamazoo ARC. *Time:* setup 6 AM, public 8 AM. *Place:* Central High School, 2431 N Drake Rd, US 131 to M-43 east to Drake Rd, then north to the school. *Features:* free parking, forums, walk-in VE exams at 9 AM. *Talk-in:* 147.64/04 SMART repeater. *Admission:* advance $2, door $3. *Tables:* 75 cents/ft. *Contact:* send requests, and checks made payable to Kalamazoo Hamfest with an SASE before October 1 to Gary Hazelton, KB8PL, 67332 32nd St, Lawton, MI 49065, 616-624-1110.

†**Michigan (Southfield)—November 5.** *Sponsor:* Oak Park ARC. *Time:* 8 AM-4 PM. *Place:* Southfield Pavilion Ctr, Evergreen Rd, between 10 and 11 Mile Rds. *Features:* ARRL Michigan Section Manager program, ARRL forum, refreshments, Traffic Net forum, VE exams (11 AM). *Talk-in:* 146.52, 146.04/64, 222.76/4.36. *Admission:* no advance, door $4, children under 12 free. *Tables:* 8-ft tables $10 each, reservations are required, tables the day of the swap are $25 each if available, electricity available for all tables. *Contact:* OPARC, PO Box 1422, Royal Oak, MI 48068, for VE exams contact Don, WA8ZVC, 313-294-4766.

†**Minnesota (Brooklyn Park)—October 28.** *Sponsor:* Twin Cities FM Club. *Time:* 7:30 AM-3 PM. *Place:* Hennepin Technical College, 9000 Brooklyn Blvd, just north of I-694 on Hwy 169 (old Cty Rd 18), take the Brooklyn Park/77th Ave N exit off Hwy 169. *Features:* VE exams, CW contest, seminars, refreshments, flea market, top amateur and computer retailers, parking, guest speakers such as James Young, WB6FNI, famous Jet Propulsion Laboratory astronomer speaking about the solar influence on radio communications; and Don Search, W3AZD. *Talk-in:* 146.16/76. *Admission:* advance $4, door $5. *Contact:* send SASE to Hamfest Minnesota & Computer Expo, PO Box 5598, Hopkins, MN 55343, 612-474-1529.

†**Missouri (Grandview)—October 28.** *Sponsor:* Southside ARC. *Time:* 8 AM-4 PM. *Place:* MO Hwy-71 to Grandview exit at Main St, west 1/4 mile to Grandview Jr High School at 10th Main. *Features:* VE exams, flea market at 9:30 AM, forums, refreshments, tailgaters. *Talk-in:* 147.72/12. *Admission:* free. *Tables:* $10 each, includes ticket paid in advance. *Contact:* Edward Conrad, N0CKT, 608 Cedar, Belton, MO 64012-2652, 816-331-4085.

New Jersey (Paramus)—October 8. *Sponsor:* Bergen Co ARA. *Time:* 8 AM-3 PM, rain or shine. *Place:* Bergen Community College, 400 Paramus Rd, *Features:* VE exams, walk-ins only from 8 AM-11 AM, refreshments, free parking. *Talk-in:* 146.19/79. *Admission:* buyers free, sellers $5 per space. *Contact:* Jim Joyce, K2ZO, 286 Ridgewood Blvd N, Westwood, NJ 07675, tel 201-664-6725, for VE exam info contact Pete Adely, K2MHP, 13-30 Edward St, Fairlawn, NJ 07410, 201-796-6622.

†**New Jersey (Wall Township)—October 15.** *Sponsor:* Jersey Shore ARCs. *Time:* sellers 6 AM, public 8 AM-3 PM. *Place:* Allaire Airport, Rte 34. *Features:* VE exams, refreshments, free parking, seminars. *Talk-in:* 144.51/5.11 (fly-in frequency), 146.52, 123.0 UNICOM. *Admission:* advance $4, door $5. *Tables:* $20, tailgate $8. *Contact:* Al Jackson, NK2O, PO Box 635, Eatontown, NJ 07724, (N) 201-922-8121.

†**New York (Centereach Long Island)—October 8.** *Sponsor:* Suffolk Co RC. *Time:* 9 AM-3 PM. *Place:* Centereach Bingo Hall, Middle Country Rd and Holbrook Rd. *Features:* refreshments. *Talk-in:* 144.61/5.21, 223.08/4.68. *Admission:* $4. *Contact:* Jim Heacock, KA2LCC, 18 Newport Dr, Port Jeff Station, NY 11776, 516-473-7529.

†**New York (Syracuse)—October 14.** *Sponsor:* Radio Amateurs of Greater Syracuse. *Time:* outdoor flea market 7:30 AM, exhibitors, displays and indoor flea market 9 AM-5 PM. *Place:* Art & Home Ctr Bldg. *Features:* ARRL forums, nonham programs, refreshments, VE exams held at 1 PM, must preregister, deadline is October 7, send for Form 610 and exam instructions to: Exams, Box 144, Syracuse, NY 13215. *Talk-in:* 147.90/30, 146.31/91. *Admission:* no advance, door $4. *Tables:* indoor tables. *Contact:* RAGS Hamfest, Box 88, Liverpool, NY 13088, or Viv Douglas, WA2PUU, 315-469-0590.

†**New York (Queens)—October 15.** *Sponsor:* Hall of Science ARC. *Time:* setup after 7:30 AM, public 9 AM. *Place:* New York Hall of Science Museum parking lot, Flushing Meadow Park, 47-01-111 St. *Features:* Amateur Radio exhibit station WB2JSM, VE exams, films, ARRL information, tune-up clinic, free parking, refreshments, commercial dealers. *Talk-in:* 144.300 simplex link 223.600, 445.225. *Admission:* buyers $3, sellers $5 per space. *Contact:* call at night only Steve Greenbaum, WB2KDG, 718-898-5599, or Phil Kubert, N2HYE, 212-777-8648, for VE information contact Anne Fanelli, W12G, 718-847-0155.

North Carolina (Concord)—November 12. *Sponsor:* Cabarrus ARS. *Time:* 9 AM. *Place:* New National Guard Armory, 800 Hwy 49. *Talk-in:* 146.055/655. *Contact:* write PO Box 1290, Concord, NC 28025.

†**North Carolina (Selma)—October 21.** *Sponsor:* Triangle East ARA. *Time:* setup 6:45 AM, public 8:30 AM-3:30 PM. *Place:* Smithfield Moose Lodge, at exit 97 (I-95) and US 70-A. *Features:* antenna forum at 11 AM with W2AC, antenna design engineers, VE exams (preregistration required). *Talk-in:* 146.28/88. *Admission:* $4, children under 12 free. *Tables:* inside table and two chairs $6, outside flea market space $3. *Contact:* Andy Singer, WK2F, 10 Berkshire Pl, Smithfield, NC 27577, 919-934-7979 after 5 PM, or Kirk Ellis, KK4YP, 18 Foxfire, Selma, NC 27576, 919-965-9577 after 5:15 PM.

North Dakota (Grand Forks)—October 14. *Sponsor:* FORX ARC. *Time:* 8 AM-3:30 PM. *Place:* Grand Forks Civic Auditorium. *Features:* VE exams, refreshments, planned fast-scan, packet demos and Dakota Division Forum. *Talk-in:* 146.34/94. *Admission:* no advance, door $3. *Contact:* Rod Klug, 701-780-9478, or Foy Cox, 701-772-0951.

†**Ohio (Lima)—October 15.** *Sponsor:* Northwest Ohio ARC. Note the date has been changed from October 8 to October 15. See last month's column for more information.

(continued on page 84)

†ARRL Hamfest

Coming Conventions

MISSISSIPPI STATE CONVENTION

October 7-8, 1989, Biloxi

The Mississippi State Convention is sponsored by the Mississippi Coast Amateur Radio Association. It will be held at the Point Cadet Plaza on US 90 at the foot of the Biloxi-Ocean Springs Bridge. The doors will be open from 8 AM-5 PM on Saturday and 8 AM-2 PM on Sunday. Admission is free. Talk-in is on 146.13/73. For more information contact Edward L. Byrd, KA5VFU, 18316 Landon Rd, Gulfport, MS 39503, 601-832-3249.

September 30-October 1
Kansas State, Wichita

October 6-8
Pacific Division, San Jose, CA

November 3-5
Texas State, Houston,

November 18-19
Southern Florida Section, Tampa,

ARRL NATIONAL CONVENTIONS

June 8-10, 1990—Kansas City, Missouri
August 23-25, 1991—Saginaw, Michigan

Silent Keys

Administered by Nancy A. Slipski

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

N1BME, Eugene H. Burgess, Vinalhaven, ME
WB1GAV, Franklin H. Gardner, East Dennis, MA
W1KYW, A. William Welles, Mystic, CT
W1LGQ, Harold H. Starr, Boston, MA
WA1NQH, Ellery F. Martin, W Warwick, RI
W1THA, William F. Lange, Colorado Springs, CO
*W1WHQ, Wilfred S. Lamb, Ledyard, CT
*W1ZD, John M. Wells, Southbridge, MA
WA2BCC, Thomas J. Flood, Unadilla, NY
*K2EL, Eugene F. Locke, Sea Cliff, NY
K2GTI, John W. Ploch, Livingston, NJ
W2KIE, Maurice J. Pirrone, Bricktown, NJ
WA2MPQ, Peter B. Curry, Holmes, NY
*WB2OLS, John Rebhan, Little Ferry, NJ
W2PEN, Walter D. McAllister, Runnemede, NJ
W2PN, Nathan Schnoll, Upper Saddle River, NJ
W2RPJ, Peter J. Savasta, Hudson Falls, NY
WA2VGA, Joseph J. Mahar, Sr, Bolingbrook, IL
WA2ZWL, Frank J. Micklas, Clifton Park, NY
N3ALE, Russell A. Terry, Lansdowne, PA
K3CTI, Peter J. Denti, Pittsburgh, PA
K3EGP, Ralph A. Blakemore, Sr, Quakertown, PA
W3GGW, Ross H. Beville, Bethesda, MD
W3IXF, Albert E. Snyder, Street, MD
KA3JJN, George D. Obenheim, Whiteford, MD
W3KCD, Harry D. Lentz, Newtown Square, PA
W3LAT, Ralph P. Adelman, Mars, PA
W3NY, Homer J. Berg, North Huntingdon, PA
W4AIZ, Charles L. Smart, Dothan, AL
WB4AOG, Felix Karpinski, Zephyrhills, FL
WA4AOZ, W. R. Johnston, Marietta, GA
WA4BFT, H. J. Prout, Durham, NC
KC4BGX, Charles F. Terry, Rome, GA
*W4CYL, George W. Dowd, Sr, Medon, TN
KB4FYR, Holmes Branson, III, Lancaster, VA
WA4HZN, Connie O'Donald, Jr, Charleston, SC
K4IDC, Mark J. Devaney, Fort Lauderdale, FL
K4JRY, Frederic H. Cherepow, Orlando, FL
*K4LC, Fred E. Coates, Mosqueiro, Brazil
W4MZM, Henry L. Pennock, Macon, GA
WB4RDU, Russell J. Browning, Springfield, TN
N4SA, D. A. Contini, Orlando, FL
KB4TKB, Thomas W. Wolfe, Falls Church, VA
K4TS, Charles J. Hinkle, Fredericksburg, VA
W4UDB, Robert P. Haller, Lakeland, FL
KB4UXL, Alford J. Evatt, Augusta, GA
N5AYI, Clarence Brown, Harlingen, TX
W5BAV, Milton C. Bardwell, Hammond, LA
W5BED, John H. Cartwright, Siloam Springs, AR
KA5BUX, Conrad Schreiner, Tryon, OK
K5GDX, James W. Stokes, Harlington, TX
W5DCM, Edward L. Kenyon, Amarillo, TX
W5JDD, Oscar S. McCullough, Baytown, TX
W5NC, H. A. Sears, Houston, TX
W5NNI, Carlton D. Smith, Greenville, TX
W5QJZ, Garlena B. Powell, Wichita Falls, TX
W5TRT, Elmer E. Asher, McAllen, TX
WB6BPA, William O. Sturmey, Millbrae, CA
W6CUZ, William F. Erdman, San Anselmo, CA
W6EE, Warren H. Davis, Pasadena, CA
KJ6QX, Allen J. Edwards, Palm Desert, CA
W6KCX, Fred R. Eaton, Long Beach, CA
K6LNK, Daniel F. Jordan, Hemet, CA
W6OJJ, George E. Olson, Hayward, CA
*WA6OJT, Richard H. Webster, Lafayette, CA
KE6PF, Glenn A. Axtell, Alameda, CA
K6PIE, Woodrow I. Higbee, San Dimas, CA
W6RLS, Woodworth B. Clum, Belvedere, CA
WT6V, Jerome Bransome, Sonoma, CA
WA6ZFH, Joan E. Clark, Miwuk Village, CA
W7AUK, Herbert G. Auckland, Seattle, WA
AL7BE, Harold B. Lie, Kotzebue, AK
KF7CH, Donald C. Smith, Sparks, NV
N7DSN, John York, Marrleeville, CA
*W7FRG, Joseph M. Costa, Phoenix, AZ
KA7KKX, Joe Baudoin, Vernonia, OR
KE7KV, Michael A. MacKay, Tucson, AZ
KC7KY, Robert G. Fuhrman, Apache Junction, AZ
W7VZJ, Paul M. Johnson, Fountain Hills, AZ
WA7YGU, Thomas M. Ashton, Winlock, WA
WA8AEI, Joseph O. Guthrie, Edmonton, KY
W8AGN, William C. McNamara, Avon Lake, OH
K8AHK, J. W. Waldron Newman, Tiffin, OH
KA8BSW, Theodore T. Von Kamecke, Columbus, OH
W8CEM, Charles A. Perry, North Olmsted, OH
KA8DTS, John H. Ernest, Morgantown, WV
W8EDS, Francis L. Daly, Salem, OH
N8EMZ, Edward W. Sexton, Washington Court House, OH
W8ERI, B. S. Norkus, Utica, MI
K8EZS, James E. Nally, Toledo, OH
WB8FEY, Roy L. Torr, North Branch, MI
W8GMD, Paul P. Vrobel, Westover, WV
W8GWA, Cecil R. Funk, Wixom, MI
W8HYY, Robert F. Dawson, Canebrake, WV
WB8IUR, Vernon E. Seeley, Ravenna, OH
WA8KLP, Bill Williams, Avon Lake, OH
WD8ONO, Glenn Pierce, Leesburg, FL
*K8PJ, Paul M. Jurewich, Brighton, MI
*WB8QJL, James O. Billings, Jr, St Joseph, MI
W8VTL, Robert C. Holland, Bowling Green, OH
W9ATJ, Ralph H. Gullett, Maquon, IL
*W9FNN, William D. Adams, Chicago, IL
*AJ9G, Florien Kamin, Hampshire, IL
W9GE, Earl I. Anderson, Delray Beach, FL
K9HQC, Laurence Van Someren, Baldwin, WI
*W9LZP, Thomas C. McCain, Delphi, IN
WA9PEE, Philip R. Haase, Madison, WI
KCØCB, Lee C. McManus, Duluth, MN
WØDOF, Lynn J. Briley, Sioux City, IA
WØOEP, Joseph R. Pavek, Hopkins, MN
WØPNZ, Lowell J. Rogers, Grand Island, NE
*WØQN, Frederick V. Collins, Aurora, CO
KØVQC, G. Paul Kirby, Shell Knob, MO

*Life Member, ARRL

Notes: 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*.

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are 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. Canadian reports should be sent to the CRRL HQ address on page 9.

Many hams have remembered a Silent Key with a memorial contribution to the ARRL Foundation. Should you wish to make a contribution in a friend or relative's memory, you might designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund or for the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111.

50 Years Ago

October, 1939

☐ New! *The A.R.R.L. Antenna Book*, eighteen chapters of comprehensive and reliable information on all kinds of antenna and lines, is now off the press. Price 50 cents, postpaid.

☐ After a decade of sterling service to the amateur fraternity, the League's Standard Frequency Service is discontinuing, its job of providing accurate 100-kc. marker signals in major bands pretty much having fulfilled its purpose in days when most of us were unsure of our frequency—and crystal control now becoming the norm.

☐ War in Europe has resulted in the shutdown of about 70% of the world's amateurs. The Editor stresses the importance of our neutrality on the air; otherwise, we too could be off the air.

☐ W1BZR has improved Jim Lamb's noise silencer with a new series-valve circuit, which is simple yet highly effective in chopping noise peaks from auto ignition and similar sources.

☐ W1JPE outlines several advantages of the "infinite impedance" detector circuit over the usual diode hookup, principally that it will handle higher percentages of modulation without distortion, and it will not load the i.f. transformer.

☐ We're finding the oscilloscope more and more useful in monitoring voice sigs, but not without some problems such as interaction between measured signal and sweep source; W1LJI provides us a troubleshooting short course.

☐ A highly directional antenna loses much of its effectiveness if we don't know exact compass points from our location. W6JPQ, an old Navy hand, draws on his experience to show us how to use major stars and simple astronomy for precise directions.

☐ W3CHE made top score of 178,200 in the 1939 DX contest, with neighbor W3EMM right behind in second place nationally. XE2N was worldwide champ. W9TJ worked the most countries—85!

☐ Although the war has curtailed amateur operation in most of Europe, when there is a reopening amateurs there will lose even shared privileges in the 7200-7300 kc. segment, which the broadcasters won (except for North and South America) at the Cairo conference last year.

25 Years Ago

October, 1964

☐ V.h.f. areas are getting crowded with commercial and military users, making it important that we both stay within our bands and take care not to emit spurious signals. W1HDQ recommends use of a coaxial tank filter, which is both simple to make and low cost.

☐ W1ICP is usually bombarded with questions after one of his transmatch articles appears; this month he takes the most-often-asked queries, dealing with specific antenna situations, and tries to answer them in a manner useful to all readers.

☐ W3GRF took top score of some 733,000 in the 1964 DX contest, but his Potomac Valley R.C. score still ran second to Frankford's. HP1IE was highest outside-U.S. scorer.

☐ Sky temperature behind the moon? Not at all fantasy, as W3WCP points out—there are several days each month when the moon is passing directly across the center of the Milky Way, and thus moon-bouncers have little chance of success with such high noise temperatures.

☐ What value is that capacitor with the blurred markings in our junk box? W1KLK's "picometer" is a simple gadget which will give direct reading of unknown components.

☐ VR tubes are great for regulation, but can be erratic in operation if proper design is not followed; W6UGA outlines the behavior of VR tubes and how we can best put them to work.

☐ The special historical section this month highlights regulatory hassles in the early 50s—splinter "organizations" (one pro-voice, one c.w.) attacking the League's middle-of-the-road approach to phone-c.w. suballocations; then the FCC, after originally proposing voice-use exam standards tougher than any of the rest of us, suddenly switched its view and ordered all bands equally open to General, Advanced and Extra Class.

☐ The National Convention in New York City in August was a humdinger, highlighted by a banquet speech from the Hon. Barry Goldwater, K7UGA, currently also the Republican party's nominee for President of the United States.

☐ DXCC trivia: the number of cards submitted for credit and processed by Hq., postwar, would make a stack 25% higher than the Empire State Building.

☐ Even experienced message-handling hams can get some good pointers from W1NJM's step-by-step analysis of the proper way to handle a hamgram.

☐ Six divisions (Dakota, New England, Rocky Mt., Hudson, Canada and Pacific) have exceeded their quotas in the Building Fund drive, with others close behind.—*W1RW*.

Results, 1989 ARRL International DX Contest

Conditions were simply incredible—K3ZO

By Billy Lunt, KR1R
Contest Manager

and

Mark R. Burke, KA1MIS
Contest Assistant

This year's contest was fantastic! Conditions were superb—the best ARRL International DX Contest in many years! In fact, it may go down in the record books as the best year ever. W9HE believes that "this contest provided the most fun I ever remember having in a DX contest! Conditions were great, and I had no trouble working almost everyone I could hear." Twenty meters never closed, forty opened in the early afternoon and ten and fifteen were just simply hot! Everywhere you looked, the bands were jam-packed with stations to work. KDØEE summed it up with, "What a difference a few sunspots make!" Great conditions translate into high scores and a scan through the score boxes will show how great the conditions were. N4ZR boasts, "I doubled my best previous score; conditions seemed wonderful!" In the same tone, KQ3V reports, "It was nice to see that the sunspots are back. I increased my score better than 80% over last year with essentially the same station."

The conditions were so good that it was hard to decide what band you should be on. N4OGW found that "ten meters was so good this year, I stayed there for the entire contest!" W9GXR reports, "I was really excited to once again hear the band open around the clock with much activity, but it's grueling to ops over 50 years old!"

This was a good year for QRP. NU4B claims, "I worked 53 different countries QRP and probably could have done better." W5TB also tried QRP and "completed WAC/QRP in 17 minutes!"

A total of 3889 logs were received—an increase of 495 log entries over last year's DX contest. Logs received from DX stations totaled 1156 CW and 643 phone; W/VE logs received totaled 914 CW and 918 phone. A special thanks to the 258 ops who submitted checklogs.

W/VE Highlights

The East Coast dominance was prevalent again this year in the battle for the top single-op spots on both CW and phone. Bob, KQ2M, operated KM1H to the tune of 3.3 meg to win the first-place CW plaque. N2LT scored 2.9 meg to edge out K3ZO for second place with 2.8 meg.

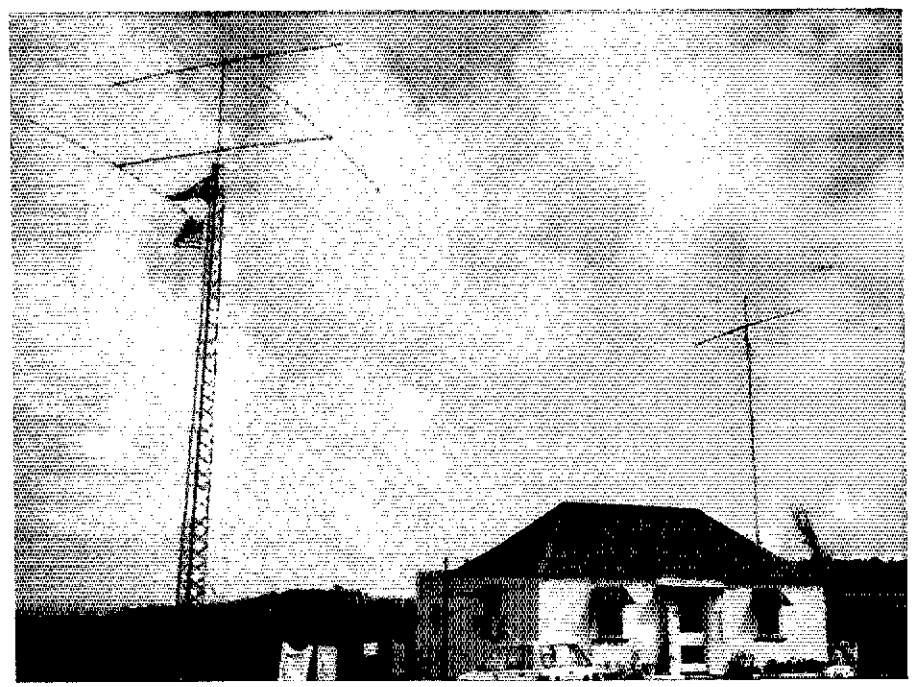
Tim, K3LR, guest operating at K3TUP amassed 3.5 million points for a repeat of last year's first-place phone win. Bob, KQ2M, put in another good effort on phone at KM1H scoring 3.2 million points to finish second. Fred, K3ZO, secured third place with an impressive 2.8 meg score.

VO1MP has done it again! This is the fifth year in a row that Gus has won first-place, low-power CW (<150 W). What are you doing with all those plaques, Gus? W1PH put in a good effort of 1.5 million points for the second place spot, and KZ2S finished third with 1.4 meg.

W2HPF didn't quite reach 1 meg, but his 890k points won the W/VE low-power phone plaque. W1PH didn't cut him much slack, scoring 870k points for a close second-place finish. K6SIK scored 729k points for third.

Doug, KR2Q, tried his luck at QRP (<5 W) and came out with a double-header win taking the W/VE QRP plaque on both modes. On CW he secured the plaque with 570k points and on phone he scored 391k points. Last year's QRP CW-plaque winner, W8VSK scored 389k points for an impressive second-place finish. N4JF finished third on QRP CW with 328k points and second-place QRP phone with 348k points. KA2AJT was close behind for third-place QRP phone with 338k points.

The single-band categories were as popular as ever. One can concentrate on QSOs and multipliers without the headaches of when and where to make those band changes. In the single-band 160-meter-category, veteran K1ZM took first-place honors on both modes. Great going Jeff! The 80-meter W/VE CW plaque went to W1FV scoring 115k. K4HJJ finished first place 80-meter phone with 27k. KBØG won the 40-meter single-band CW plaque with a score of 229k. The 40-meter phone winner was KVØQ. Gene,



A shot of the antennas that helped 8P9X (K4FJ, op) achieve third-place world in the CW contest.

Top Ten Single Operator—W/VE CW

Call	Score	160	80	40	20	15	10
KM1H (KQ2M,op)	3,313,218	20/19	121/52	366/62	762/73	709/90	936/83
N2LT	2,956,224	13/13	94/37	397/64	868/73	672/78	804/81
K3ZO	2,878,050	13/13	116/47	416/67	613/70	702/72	881/81
K1ZZ	2,797,167	15/13	109/42	353/60	659/71	665/75	886/86
N5AU (WN4KKN,op)	2,795,688	14/14	71/40	391/58	843/82	587/76	803/74
K1BW	2,709,357	15/14	87/37	415/59	861/80	691/77	564/76
K1RU	2,598,186	14/14	82/42	425/54	646/68	601/74	815/82
N4RJ (KM9P,op)	2,591,730	10/10	102/45	339/56	838/72	630/71	691/77
W9RE	2,449,890	15/14	61/38	323/59	700/68	691/72	715/75
N2IC/Ø	2,407,680	11/10	47/25	303/52	632/68	712/82	803/83

Top Ten Single Operator—W/VE Phone

Call	Score	160	80	40	20	15	10
K3TUP (K3LR,op)	3,508,800	18/12	66/37	89/42	923/111	996/104	832/84
KM1H (KQ2M,op)	3,299,791	17/13	93/49	99/59	682/110	719/96	972/99
K3OO	2,827,182	13/12	101/38	86/42	620/95	781/99	866/96
N6BV/1	2,783,550	6/6	76/41	126/46	508/103	850/99	844/90
K1RU	2,606,901	10/8	56/35	108/52	570/108	635/89	788/109
K3ZO	2,481,510	3/3	71/39	148/55	702/89	691/76	670/100
WOØG	2,481,042	10/7	45/28	121/51	527/100	745/99	678/104
N2LT	2,358,342	7/7	66/38	93/46	556/96	753/91	667/89
VO1MP	2,212,995	23/13	92/47	113/51	574/84	488/86	731/84
NR5M (WN4KKN,op)	2,191,068	12/10	38/25	156/42	467/91	565/87	774/108

Top Ten Single Operator—DX CW

Call	Score	160	80	40	20	15	10
P40GD (W2GD,op)	5,193,216	273/51	598/57	687/57	949/57	1093/57	1552/57
N3JT/HKØ	4,052,370	306/47	500/51	448/56	691/56	794/56	1456/56
8P9X (K4FJ,op)	3,858,069	200/44	385/47	394/50	662/56	1141/57	1407/53
XE2NQ (AA5B,op)	3,554,139	103/35	421/55	641/56	843/57	1057/57	794/47
KP2Z/KH6	3,081,720	96/32	418/53	644/55	490/54	609/55	1111/56
G3FXB	2,707,848	5/5	129/39	507/52	957/56	671/55	163/56
N5CT/KH6	2,455,446	1/1	324/47	476/56	544/52	731/54	1001/56
OK1ALW	2,423,250	4/3	136/31	429/51	974/56	729/55	959/54
NL7GP	2,354,688	1/1	158/32	373/52	606/57	901/57	1027/57
Y42MK	2,117,424	0/0	133/30	372/51	675/56	731/56	935/55

Top Ten Single Operator—DX Phone

Call	Score	160	80	40	20	15	10
V31C (KE5CV,op)	9,047,040	15/9	419/54	701/56	1670/57	2242/57	4241/57
P40V (AI6V,op)	7,711,680	12/6	507/53	520/57	2098/58	1147/58	3640/58
VP5T (NM2Y,op)	6,313,692	129/36	297/46	585/56	1817/57	1860/58	2145/56
PJ9JT (W1BIH, op)	4,839,039	57/22	337/48	365/50	705/56	1510/57	2569/58
XE2NQ (AA5B,op)	4,362,240	21/13	390/51	797/55	781/55	1513/56	1618/54
VP2MBA (W7FP,op)	4,311,780	42/13	238/43	547/52	1081/55	1015/57	2247/58
K6GSS/KH6	3,188,010	0/0	104/31	613/56	590/52	209/41	2949/58
9Q5NW (N4NW,op)	2,966,208	0/0	31/18	188/36	1133/57	1469/57	1593/56
FG5/KA3DSW	2,562,210	0/0	227/47	284/40	1007/54	836/54	1132/50
OK1RI	2,422,380	1/1	15/8	436/42	685/57	1081/56	1082/51

W/VE Low Power Top Ten (<150 W)

CW		Phone	
Call	Score	Call	Score
VO1MP	1,601,538	W2HPF	890,100
W1PH	1,503,054	W1PH	870,534
KZ2S	1,464,120	K6SIK	729,195
W2TZ	1,438,686	KQ3V	643,140
N5AW	1,080,108	WA2UUK	566,685
W7YAQ	905,364	W7YAQ	498,168
W6JTI	897,408	N5AW	456,816
KA2AEV	858,750	W9IL	369,981
N2AZS	841,995	WB3FYL	362,916
W1MX (AD1C,op)	813,483	KD5GD	326,106

W/VE QRP Top Five (<5 W)

CW		Phone	
Call	Score	Call	Score
KR2Q	570,825	KR2Q	391,950
W8VSK	389,340	N4JF	348,840
N4JF	328,251	KA2AJT	338,580
K3WS	291,456	KD2I	319,029
K1CGJ	287,175	N1AFC	182,106

Top DX QRP Scores (<5 W)

CW		Phone	
Call	Score	Call	Score
YU2TY	351,360	JA2JSF	103,005
JA9RPU	207,897	F1BEG	86,940
DL2HQ	172,989	IO0KHP	75,945
HB9ADD	169,176	A22AA	39,600
JR1IOS	138,384	EI8AU	35,295

DX Highlights

The top-ten, single-op listings shows a host of US ops who manned their favorite DX spots. Veteran W2GD returned to P40GD to win the single-operator CW plaque again this year scoring 5.1 meg. N3JT/HKØ finished second with 4 meg. Walking away with the phone plaque this year was V31C (KE5CV, op). His 9-meg score was well ahead of second place P40V (AI6V, op) with 7.7 meg.

The multioperator DX categories denoted some stiff competition from around the world. The multi-single CW plaque went to KP2A with 4.7 meg. PJ2J amassed 4.3 meg for a well-earned second-place CW finish. VP2MU and crew took the multi-single plaque on phone with an impressive 8.6 million points, outdistancing second place VP5V with 5.1 meg. The CW multi-two plaque went to 6Y5L who edged out 4N4C by 500k points. On phone, XE2FU and gang didn't let up and took the multi-two phone plaque with 9.8 meg. JA8YBY finished second with 2 meg. The Italian multi-unlimited crew at I3JSS edged out contender YT2R by only 100k points for the multi-unlimited CW plaque. On phone, 6D2DX walked away with 10 million points for an easy win. The crew at I3MAU was second with 4.3 meg.

Affiliated Club Competition

It was a close battle for the unlimited-club gavel. When all the dust had settled, the Frankford Radio Club emerged as gavel

N2AA, outdistanced all others on 20-meter CW with a score of 600k. The 20-meter phone champ was AI7B with 236k. Brass pounder K2VV won the 15-meter category with 557k. Scoring over 701k, W7EJ won the 15-meter phone plaque. K1RM lead the way on 10-meter CW, scoring 449k. The 10-meter phone champ was K4XS with 806k points.

The multioperator categories were a fierce tooth and nail battle all the way on both CW and phone for 1989. The multi-single category was a duel between W3BGN and AA1K, with the 'BGN crew edging out a victory by about 100k for the plaque. On phone however, AA1K and gang reversed the standings and claimed the plaque, edging out W3BGN by 100k. In the multi-two category, K1AR and friends showed no mercy and took the plaque on both modes, signing K1AR on CW and KC1F on phone. N3RS was second on CW with 5.7 meg, and N5AU with 5.3 meg was second during the phone weekend. Frank, W3LPL, and crew dominated the multi-unlimited category again in 1989. Their 8.9 million points efforts on both modes secured them the CW plaque along with the phone plaque. NR5M and gang finished second on CW with 7.3 meg. During the phone weekend, WM5G placed second with 7.3 meg.

Affiliated Club Program

Unlimited Category	*Score*	*Entries*	*CW Winner*	*Phone Winner*
Frankford Radio Club	126,810,402	129	N2LT	K3OO
Yankee Clipper Contest Club	126,254,961	107	KM1H (KQ2M,op)	KM1H (KQ2M,op)
Potomac Valley Radio Club	52,099,869	60	K3ZO	K3ZO
Northern California DX Club	28,903,092	74	N6QR	K6HNZ
Medium Category				
North Texas Contest Club	32,487,618	25	N5AU (WN4KKN,op)	N5AW
Mad River Radio Club	16,986,336	21	W8UA	N8ATR
Society of Midwest Contesters	15,135,894	26	K9UIY	WØØG
Western Washington DX Club	11,328,510	41	NN7L	N7TT
Texas DX Society	10,043,319	5	KC5CP	NR5M (WN4KKN,op)
Minnesota Wireless Assn	8,903,580	7	NØAT	NØAT
Murphy's Marauders	7,822,797	18	K1ZZ	K1BV
Central Virginia Contest Club	7,669,872	7	W4MYA	WA4HOT
Willamette Valley DX Club	6,315,501	10	K5MM/7	W7EJ
Southeastern DX Club	5,898,063	12	WX4G	WX4G
Dixie DXers Contest Club	5,052,282	18	K4BAI	N4FD
Southern California DX Club	4,578,015	20	W6AE	W6MFC
Rochester (NY) DX Assn	4,559,178	18	W2TZ	W2HPF
San Diego DX Club	3,162,477	19	AA4M	N6ADK
Eastern Iowa DX Assn	2,700,771	15	NØSM	WØEJ
Southern California Contest Club	2,476,647	9	N6AA	N6AA
Dauberville DX Assn	2,357,130	11	WA3LFY	KQ3V
Redwood Empire DX Assn	2,259,702	17	W6FSJ	W6FSJ
Salt City DX Assn	1,890,606	6	NM2L	WA2UUK
Albany ARA	1,860,882	7	KN2Q	N2AIF
Grand Mesa Contesters	1,729,023	9	KJØG	WØGOQ
South Jersey Radio Assn	1,696,290	17	WA2VYA	W2FGY
Kansas City DX Club	1,625,013	10	KBØG	WEØA
Colorado Contest Conspiracy	1,265,874	3	KØZX	KØCS
Albuquerque DX Assn	1,077,438	3	—	WS5O
Split Rock ARA	983,013	4	KR2Q	KR2Q
Western New York DX Assn	736,314	7	KD2YP	KD2YP
Ohio Valley ARA	693,108	3	W8RSW	NG8T
Long Island DX Assn	646,854	5	K2MFY	K1EFI
Tyler ARC	645,510	8	—	KD5GD
Northern California Contest Club	597,201	6	N6ZB	K6XQ
Western Illinois ARC	285,096	9	NM9C	N9JF
West Park Radiops	136,686	8	W8IDM	W8IMF
Northern Arizona DX Assn	108,741	6	—	NZ7D
Central Michigan ARC	62,790	4	W8TJQ	W8TJQ
Local Category				
Overlook Mountain ARC	14,900,697	8	K5NA	KY2J
North Coast Contesters	9,856,338	6	WB3KKX	K3TUP (K3LR,op)
Hoosier Contest Club	5,200,656	6	W9RE	W9RE
Carolina DX Assn	2,173,920	4	K2SD	N4UH
Falmouth ARA	1,902,663	4	K5MA/1	K1BT
Arrowhead Amateur Radio Club	1,624,344	5	KRØB	WØRXL
Utah Contest Club	1,422,330	4	WE7B	WE7B
Columbus (OH) ARA	1,318,302	9	K9ALP	W8ZCQ
New Mexico Big River Contest Club	1,024,926	4	KF7E	KI3L
Western Pennsylvaniac DX Assn	958,701	3	K3MD	K3UA
Alamo DX Amigos	903,690	8	K5DB	K5DB
Fox River Radio League	822,765	4	K9MMS	WD9GIG
Sturdy Memorial Hospital ARC	602,196	4	K1ZZJ	K1LXJ
No Dot DXers	509,838	3	K9QVB	—
Larkfield ARC	487,125	3	KK2E	KK2E
Inland Empire DX Assn	448,257	4	K7EFB	NQ7M
Gabilan ARC	290,619	4	—	KB6GV
Metro DX Club	268,881	5	K9MDO	K9MDO
Schenectady ARA	202,848	3	WB2EAR	WB2EAR
Northern Illinois DX Assn	144,099	3	W9CH	W9YYG
Utica ARC	142,746	4	K2XU	KK2B
Jay Hawks ARS	72,987	10	NØFMR	KØIEW
University ARC	32,838	3	—	NQ7Q

Overall Division Leaders

CW	*Division*	*Phone*
K3ZO	Atlantic	K3TUP (K3LR,op)
W9RE	Central	W9RE
NØAT	Dakota	NØAT
W4XJ	Delta	N4TG
NA8V	Great Lakes	WB3KKX
N2LT	Hudson	N2LT
NØSM	Midwest	WØØG
KM1H (KQ2M,op)	New England	KM1H (KQ2M,op)
K5MM/7	Northwestern	N7TT
N6QR	Pacific	K6HNZ
K4PQL	Roanoke	KX3Q
N2IC/Ø	Rocky Mountain	KI3L
N4RJ	Southeastern	N4FD
W6AE (KM9P,op)	Southwestern	K6EID
N5AU (WN4KKN,op)	West Gulf	NR5M (WN4KKN,op)
VO1MP	Canada	VO1MP

Top W/VE Single-Band Scores—CW

160

Call	*Score*
K1ZM	9,240
K5UR	1,914
N6LL (WA6CDR,op)	1,377
VE3DO	1,254
W2FCR	972

80

Call	*Score*
W1FV	115,710
K8HVT/1	41,415
W7IVX	16,830
K3JGJ	15,180
WA1HYN	14,400

40

Call	*Score*
KBØG	229,320
VE2FU	172,992
WB9Z	165,438
K9DX	163,296
N9AG	154,656

20

Call	*Score*
N2AA	600,696
W5FO	391,134
NI6W	365,904
WA7RKJ	302,160
K9QVB	281,340

15

Call	*Score*
K2VV	557,235
KE3Q	510,600
K1TO	504,495
K4XS (WC4E,op)	440,700
N4ZZ	352,968

10

Call	*Score*
K1RM	449,820
N8DCJ	422,718
WØZV	408,096
W5WMU	332,856
N8HHE (WA8DXB,op)	321,984

Top W/VE Single-Band Scores—Phone

160

Call	*Score*
K1ZM	4,500
K5UR	1,764
W2FCR	1,350

80

Call	*Score*
K4HJJ	27,180
A4YBV	24,462
N4XO	11,040
N3AHF	8,208
K8OQL	4,500

40

Call	*Score*
KVØQ	74,880
N4ZC	64,701
KC7KU	60,750
KZ2I	28,644
VE2FU	18,720

20

Call	*Score*
AI7B	236,844
K1UO	234,531
NK7U	176,532
K9CLO	128,520
WF5E	89,640

15

Call	*Score*
W7EJ	701,784
W7WA	665,160
KE3Q	505,158
NI7T	312,438
KØZX	279,282

10

Call	*Score*
K4XS	806,577
W5WMU (KE5FI,op)	587,250
KX4R	432,054
K5MK	359,373
KA1ZD	344,100

winners for 1989 at 126.8 million points—with the Yankee Clipper Contest Club right on their heels with 126.2 meg. In the medium-club category, the North Texas Contest Club easily out distanced all others for the gavel, amassing 32 meg. The Mad River Radio Club finished second with 16 meg. The Overlook Mountain ARC established themselves at the top of the local club pile with 14 meg for the gavel. Second place honors goes to the North Coast Contesters with 9.8 meg.

The 1989 contest season will be long remembered for its great conditions, unbelievable scores and loads of fun. May the 1990 DX Contest be blessed with the same propagation conditions. So get your antennas up and tuned—ready for hopefully another unforgettable ARRL International DX Contest in 1990.

SOAPBOX

CW

I was disappointed by the lack of Asian, Pacific and African stations that came through here (WA2WIP). South America, Africa and the affluent part of Europe was scarcely represented (W1PL). Conditions were excellent all weekend (K1FFX). I was just amazed how well I did on less than five watts! (W1JP). I had a great time in the contest. Thanks to all (WB2TPS). You have to love 10 meters—you could run Europeans with 100 watts and a dipole up 25 feet! (K2PS). It was great fun, and I got 18 new countries (WA2AXJ). Conditions were great—I never thought I'd ever find myself wishing the band would close so that I could rest! (KD2I). Thanks to the JAs and ZLs who worked a weak signal (K4FOY). The ice storm that hit Friday evening and lasted for the entire weekend gave new meaning to the term "fixed array." For the first time in years I was able to make more than 250 QSOs. Very very FB Contest! (W4YN). I enjoyed the contest as always! (KA4YAE). Band

W/VE Plaque Winners—CW

Single Operator

Category	*Winner*	*Donor*
All Band	KM1H (KQ2M,op)	Frankford Radio Club
1.8 MHz	K1ZM	Billy Lunt, KR1R
3.5 MHz	W1FV	Dayton Amateur Radio Assn
7 MHz	KBØG	Northern Arizona DX Assn
14 MHz	N2AA	Fox Cities Amateur Radio Club—W9ZL
21 MHz	K2VV	Carl Luetzelschwab, K9LA
28 MHz	K1RM	W5MYA
Low Power	VO1MP	Dauberville DX Assn
QRP	KR2Q	David Newkirk, AK7M

Multioperator

Single Transmitter	W3BGN	Northern Illinois DX Assn
Two Transmitter	K1AR	Kenwood USA Corporation
Unlimited	W3LPL	ETO Inc/ALPHA

W/VE Plaque Winners—Phone

Single Operator

Category	*Winner*	*Donor*
All Band	K3TUP (K3LR,op)	Frankford Radio Club
1.8 MHz	K1ZM	Butch Greve, W9EWC, Memorial
3.5 MHz	K4HJJ	Lance Johnson Engineering, KØCS
7 MHz	KVØQ	Dave Thompson, K4JRB
14 MHz	AI7B	Dayton Amateur Radio Assn
21 MHz	W7EJ	Kenwood USA Corporation
28 MHz	K4XS	Windsor Amateur Radio Club, VE3OW
Low Power	W2HPF	Dauberville DX Assn
QRP	KR2Q	Marlis, N4MZJ, Hermitage Wireless Inc

Multioperator

Single Transmitter	AA1K	Kenwood USA Corporation
Two Transmitter	KC1F	Kenwood USA Corporation
Unlimited	W3LPL	Western New York DX Assn—W2RR

DX Plaque Winners—CW

Single Operator

Category	*Winner*	*Donor*
World	P4ØGD (W2GD,op)	North Jersey DX Assn
Africa	5H1HK (JE3MAS,op)	WB3KTX
Asia	JA7FWR	Alamo DX Amigos
Europe	G3FXB	Clarke V. Greene, K1JX
North America	N3JT/HKØ	W4KFC Memorial Plaque—PVRC
Oceania	KP2Z/KH6	Robert J. Halprin, K1XA
South America	P4ØGD (W2GD,op)	Herbert Hoover, Jr, W6ZH Memorial Award
1.8 MHz	YV1OB	Jim Dionne, K1MEM, and Bill Poellmitz, K1MM
3.5 MHz	KØGVB/C6A	Mad River Radio Club
7 MHz	I2VXJ	Dr W.R. Staples, W4SME
14 MHz	AI6V/VP9	Bencher, Inc.
21 MHz	KV4FZ (N6OP,op)	Southern New England DX Assn
28 MHz	HC2G (HC2SL,op)	ZP5XDW
QRP	YU2TY	Rick, KZ2E, Hermitage Wireless Inc

Multioperator, Single Transmitter

World	KP2A	John Brosnahan, WØUN
Africa	EA8RCT	Kenwood Employees ARC, WD6DJY
Asia	UZØQWA	Kenwood USA Corporation
Europe	HG1S	The Radio Place
North America	KP2A	Kenwood USA Corporation
Oceania	KX6OI	Gary Stilwell, KI6T and Glenn Stilwell, WR6O
South America	PJ2J	Kenwood USA Corporation

Multioperator, Two Transmitter

World	6Y5L	Kenwood Employees ARC, WD6DJY
Asia	JA1YXP	Kenwood USA Corporation
Europe	4N4C	Kenwood USA Corporation
North America	6Y5L	David W. Brandenburg, K5RQ
South America	HK3MAE	Max Arnold, W4WHN, Memorial

Multioperator, Unlimited

World	I3JSS	H. Stephen Miller, NØSM
Asia	JA8YBY	Kenwood USA Corporation
Europe	I3JSS	Texas DX Society
North America	WF8C/VP9	ETO Inc/ALPHA

Special Plaques

Single Operator

Category	*Winner*	*Donor*
W/VE S/O Combined Score	KM1H (KQ2M,op)	*National Contest Journal*
W/VE Low Power, Combined Score	W1PH	Rochester (NY) DX Assn
World S/O Combined Score	XE2NQ (AA5B,op)	Mike Manafo, K3UOC, P46S, 4M4A
Africa Combined Score	CN8FC	Dave Heil, K8MN and Tom Gregory, N4NW
Japan Combined Score	JH7DNO	JA7WME, JG7SVZ, JH7AFR
Atlantic Division (CW)	K3ZO	K2NY Memorial—Salt City DX Assn
Great Lakes Division (CW)	NA8V	Livonia Amateur Radio Club, Livonia, MI
Great Lakes Division (Phone)	WB3KKX	Livonia Amateur Radio Club, Livonia, MI
Hudson Division (CW)	N2LT	W2AO Memorial—Order of Boiled Owls
Israel S/O (CW)	4X6UU	Robert E. Weinstock, KN1K
Japan (CW)	JA7FWR	Western Washington DX Club
Seventh Call Area (CW)	K5MM/7	Willamette Valley DX Club
Seventh Call Area (Phone)	N7TT	Willamette Valley DX Club
Single Op Under 18 (CW	NL7GP	Virginia A. Greene, WB1AVA
Single Op Under 18 (Phone)	NL7GP	Virginia A. Greene, WB1AVA
USSR All-Band (CW)	UP3BA	K1KI, WB4TDH, AA6BB, KA6V
USSR All-Band (Phone)	RB5DX	K1KI, W4MOM, AA6BB, KA6V

Multioperator

Caribbean Multi-Single (CW)	KP2A	The YASME Foundation
Caribbean Multi-Single (Phone)	VP2MU	W5MYA
Multi-Multi Combined World	YT2R	W2PV Memorial—Schenectady ARA

DX Plaque Winners—Phone

Single Operator

Category	*Winner*	*Donor*
World	V31C (KE5CV,op)	North Jersey DX Assn
Africa	9Q5NW (N4NW,op)	Kenwood USA Corporation
Asia	JH1AEP	Acadiana DX Assn
Europe	OK1RI	Gerald Griffin, MD, W8MEP
North America	V31C (KE5CV,op)	Chod Harris, VP2ML
Oceania	K6GSS/KH6	Doc Sayre, N7AVK
South America	P4ØV (AI6V,op)	Kenwood USA Corporation
1.8 MHz	HK3DFT	Fred Race, AL7JO, in Memory of Charlie, W8TCS
3.5 MHz	TE1L	Kenwood USA Corporation
7 MHz	ZF2MV	Central Arizona DX Assn
14 MHz	T32AF (KH6UR,op)	Don Wallace, W6AM, Memorial, Central CA DX Club
21 MHz	NP4CC	Ray Molony, W2NCL, Memorial, Long Island DX Assn
28 MHz	P4ØT (KB2HZ,op)	Contest Committee—LIMARC
QRP	JA2JSF	Gerald Griffin, MD, W8MEP

Multioperator, Single Transmitter

World	VP2MU	Gloucester County ARC
Africa	T5GG	Kenwood USA Corporation
Asia	JA7YAA	Kenwood USA Corporation
Europe	F6BEE	Kenwood Employees ARC, WD6DJY
North America	VP2MU	Society of Midwest Contesters
Oceania	KX6OI	Society of Midwest Contesters

Multioperator, Two Transmitter

World	XE2FU	Kenwood USA Corporation
Asia	JA8YBY	Kenwood USA Corporation
North America	XE2FU	Jan Hubach, OH1ZAA and John Brosnahan, WØUN
South America	ZY4BA	Kenwood USA Corporation

Multioperator, Unlimited

World	6D2DX	Wayne Yoshida, KH6WZ
Asia	JA9YBA	Kenwood Employees ARC, WD6DJY
Europe	I3MAU	Kenwood USA Corporation
North America	6D2DX	ETO Inc/ALPHA

conditions were great—it was a pleasure to be duped by a VS6 (K4AMC). This was a very good contest. I'm glad to see the great band conditions returning on the upper 3 HF bands (WB4DNL). Great contest! Sure wish that I could have worked everything I heard! (KD5PJ). The 10-meter CW band isn't big enough. Competition for frequencies was tough down here (AD5Q). Conditions were great on 10 and 15 meters! (W6LC). The conditions this year were outstanding! (KW6Q). A most enjoyable contest. I'll see you in '90 (W6MVW). Unfortunately, many Pacific and Caribbean multipliers were not there, but conditions were fantastic! (W6YA). Conditions were great, but there was not much activity from South America and the Pacific (N6ND). Conditions were very good. Same frequency was open to Japan at all times! (N7IR). Thanks for a great contest, and I hope to see you again next year (WA7EGA). The band conditions were poor on 80 meters. 10- and 15-meter bands seemed

Top W/VE Multioperator Scores—CW

Single Transmitter

Call	Score	160	80	40	20	15	10
W3BGN	2,897,424	20/17	121/40	455/64	863/72	581/76	696/84
AA1K	2,798,280	20/18	122/45	450/60	674/76	597/81	728/80
KY2J	2,793,630	13/13	142/49	544/64	741/82	534/80	536/83
K1IU	2,679,804	8/8	94/43	563/55	764/72	700/70	628/76
K5ZD/3	2,652,639	11/10	66/34	358/62	744/75	697/79	717/81

Two Transmitter

K1AR	6,892,194	19/17	254/52	899/79	1573/101	1179/93	1262/101
N3RS	5,781,849	20/16	234/61	701/78	1297/86	1203/97	996/95
K4VX/Ø	5,496,942	26/23	70/42	586/74	1387/85	1300/91	1133/92
WM5G	4,831,083	17/16	63/39	534/75	1187/99	1008/101	998/93
N6RO	4,561,716	10/9	152/28	578/70	1128/88	1153/102	898/91

Unlimited

W3LPL	8,953,632	44/29	387/60	1078/88	1548/101	1650/104	1485/100
NR5M	7,370,745	31/27	202/59	770/88	1429/107	1339/110	1274/96
K1ST	7,020,900	22/20	298/53	972/79	1585/94	1272/94	1231/95
KY1H	6,252,774	10/10	164/49	968/82	1483/90	1242/93	1072/98
WØAIH/9	5,798,520	18/16	92/45	722/75	1247/95	1363/95	1238/87

Top W/VE Multioperator Scores—Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
AA1K	2,972,025	14/11	82/39	104/54	874/115	623/97	634/109
W3BGN	2,869,590	22/13	98/43	115/55	753/105	691/98	654/96
K1YR	2,681,775	11/10	62/41	101/56	569/110	682/110	630/108
N3BB/5	2,425,776	9/6	35/23	231/45	619/102	440/87	750/125
N4KG	2,124,000	10/8	35/28	83/45	404/100	484/83	872/111

Two Transmitter

KC1F	6,390,900	17/15	138/53	177/77	1293/135	1437/123	988/123
N5AU	5,354,538	14/9	44/30	248/60	777/127	1526/122	1094/134
K1RX	4,864,500	11/10	68/33	165/67	889/116	1372/117	945/127
N6RO	4,696,314	3/3	66/29	412/53	749/126	1611/111	766/112
N2MG	4,343,808	4/4	95/44	187/62	1173/125	920/100	853/113

Unlimited

W3LPL	8,985,758	33/22	242/64	313/84	1402/151	1652/133	1432/135
WM5G	7,343,838	16/9	81/42	308/80	1253/145	1463/143	1266/139
NB1H	6,454,629	23/16	120/48	257/78	1315/125	1419/119	1093/124
KX4S	5,943,672	21/15	149/59	305/85	1294/136	1438/119	724/90
K5NA	5,677,890	30/21	159/61	175/70	1092/134	998/119	1117/125

Top DX Multioperator Scores—CW

Single Transmitter

Call	Score	160	80	40	20	15	10
KP2A	4,765,710	299/50	606/56	565/57	951/57	1039/57	1282/58
PJ2J	4,381,746	263/50	496/56	575/57	906/57	1084/57	1049/57
HG1S	2,873,034	0/0	130/24	469/53	1327/58	812/57	1155/54
J88A	2,846,160	105/36	542/49	521/54	725/53	893/54	427/49
XE2EBE	2,802,600	176/39	442/54	549/51	363/50	402/51	1182/55

Two Transmitter

6Y5L	2,572,317	247/42	531/50	662/54	334/47	349/51	764/53
4N4C	2,060,289	0/0	83/21	312/44	1121/57	528/56	929/53
SM5GMG	1,537,632	0/0	47/15	437/53	670/56	473/54	621/50
JA1YXP	1,161,864	0/0	49/20	343/47	141/45	986/56	274/48
HK3MAE	155,868	0/0	0/0	0/0	112/42	86/34	221/47

Unlimited

I3JSS	3,861,750	16/11	229/35	738/56	1518/56	1115/57	1134/56
YT2R	3,761,604	87/24	170/29	654/54	1529/57	1049/56	1054/56
JA8YBY	2,484,720	0/0	144/21	438/51	795/56	1052/56	1022/56
JA1YFG	2,129,166	0/0	126/18	454/51	651/55	898/57	904/53
WF8C/VP9	1,826,025	0/0	527/52	421/48	467/47	718/55	292/49

Top DX Multioperator Scores—Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
VP2MU	8,687,040	114/36	429/55	711/57	2325/58	1161/57	4309/57
VP5V	5,153,031	27/12	216/41	685/55	1391/56	1875/57	2007/56
J88A	5,027,616	31/15	417/53	487/52	1130/54	1000/57	2754/57
KX6QI	3,103,866	4/4	101/33	506/51	1159/55	814/52	1172/49
F6BEE	3,017,664	28/12	227/32	459/43	901/56	1269/56	1172/49

Two Transmitter

XE2FU	9,813,063	127/35	861/57	926/57	1669/59	2249/57	4295/58
JA8YBY	2,062,710	0/0	137/23	227/31	679/53	1270/57	885/51
ZY4BA	885,432	0/0	0/0	10/7	629/52	199/45	1030/54
JE3ZFS	319,620	0/0	7/1	29/9	366/53	269/48	90/29

Unlimited

6D2DX	10,313,550	140/40	576/55	899/57	2116/57	3298/57	3594/59
I3MAU	4,381,503	15/13	185/29	529/47	1766/58	2032/57	1112/55
YT2R	3,172,554	2/2	247/32	290/32	1545/57	1718/57	776/51
JA9YBA	2,658,003	0/0	102/17	228/43	1221/57	1213/58	1105/54
JE2YRD	2,211,900	0/0	73/12	86/21	873/56	1398/57	1220/56

Top DX Single-Band Scores—CW

160

Call	Score
YV1OB	39,555
NO9M/KP4	21,660
CT1AOZ	20,088

80

Call	Score
KØGVB/C6A	163,647
4N1A (YU1EA,op)	20,868
F6EPO	19,584
YU2VR	14,337
JA1BWA	8,424

40

Call	Score
I2VXJ	141,960
LZ1V	123,462
DL2ZAE	122,430
YT7A (YU7GO,op)	120,042
YU4CC	118,944

20

Call	Score
AI6V/VP9	342,684
YZ1U	292,320
4N2V	255,474
OH7MA	224,448
ZYØFX (W9VA,op)	194,040

15

Call	Score
KV4FZ (N6OP,op)	311,049
9Y4VU	308,826
AL7CQ	288,990
I4IND	257,172
G4CNY	232,389

10

Call	Score
HC2G (HC2SL,op)	306,600
VP2MW (N4MO,op)	286,926
GW4BLE (G3WVG,op)	280,056
VE7QO/AH6	247,800
YZ3A (YU3BC,op)	247,779

Top DX Single-Band Scores—Phone

160

Call	Score
HK3DFT	18,495
CT1TM	1,170

80

Call	Score
TE1L	200,925
CU2BR/CU8	123,552
YV6BTF	97,785
IK5BAF	77,238
F6CTT	66,780

40

Call	Score
ZF2MV	312,075
HK3MAE	250,734
HC1OT	191,349
4M5T (YV5JBI,op)	113,232
JA2BAY	76,464

20

Call	Score
T32AF (KH6UR,op)	420,831
KH6FKG	339,996
CT1BOP	334,080
CE6EZ	328,149
YT3T (YU3BQ,op)	223,326

15

Call	Score
NP4CC	606,879
HC1HC	541,728
AL7CQ	367,821
G4CNY	352,431
YZ1E (YU6AR,op)	301,368

10

Call	Score
PØT (KB2HZ,op)	887,301
ZV5A (PY5EG,op)	809,796
ZP5JCY	798,138
HC2G (HC2CG,op)	773,946
TI2DU	582,552

open like the good old days! (W7DRA). Signals were dynamite. I got most on the first call and got some new countries (NC7O). It was a great contest with great propagation conditions. I can't wait for next year! (N8AGU). The contest was great! Conditions on all bands could not have been better. (WD9Q). Thanks to all the A-1 operators who picked up my 4 watts and the mini-quad only up 25 feet (NX9T). There was fantastic 40-meter openings into Europe both nights (KØOST). I came away feeling that I had made many new overseas friends and having nearly doubled last year's score. The big thrills were four new countries, including 9Q5DX through a very large pileup (WB2V). My biggest thrill was working Europe on 40 and 80 meters with 100 watts and a dipole! (WAØOUI). Conditions were fantastic for the contest this year. I had a ball and I am looking forward to the SSB portion (VE3NYT). It was a very good contest and there was good conduct from the stateside stations (ZS1VP). Band conditions were very good. Thank you very much (JA7FWR). Nice conditions on 10 meters in Japan! I could contact all the states. (JM1LRQ). The conditions seemed to be poor on 160-40 meters, but I had fun on 15 and 10! Great contest! (UZ9CWW). This again was a wonderful contest! Only the 80-meter band was crammed by very strong European stations! (DL1TH). It was nice to see that 10 meters was wide open to W/VE (DF1LX). Thanks for an enjoyable contest, and it was nice to hear the old familiar call signs (G2HPF). I hope I helped give a new multiplier, and also I hope to return in '90 if the weather is suitable (G4UOL). I had call letter problems—Europe was answering my CQs, not W/VEs (W9LT/IØ). It was an exciting contest due to good propagation! (JK2EGL). The propagation was rather good and especially to the West Coast (ON6LO). It was fantastic to work all states on 40 meters (OZ1FTE). Even with my low beam, I could reach North America (OZ4UN). It certainly was very nice to operate with US radio amateurs again! Many thanks for a great contest! (UA2EC). Nice propagation on 15 meters again after many years (UT4UX). Wonderful conditions on 10-meter band! (UP2BBF). We were very pleased to work so many stations on 80, and this certainly testifies that CW is not dead! (KØGVB/C6A). It was great to work some hard-to-find states for WAS! (XE2IZ). The hardest thing, torture actually, was to stay at the radio while the view of the pool and fantastic lagoon tugged away at me (KHØ/KU2C). Thanks to all those ops who continue to work 160 meter! (W2GD).

Phone

I've been a ham for almost 35 years, and I finally worked China in the contest (K1JB). I was very pleased by conditions, and also how well my 75-meter quarter-wave vertical worked with QRP! I'll see you next year! (KD2J). I worked 100 VK/ZLs from 0418Z-0612Z Saturday night. I didn't know you could run VKs and ZLs! (K4XS). My wife made me stop at 4:30 PM Sunday to take her out for dinner, just because it was our 33rd wedding anniversary! (W4TMN). I couldn't believe all those countries came back to me and my little vertical and 100 watts (KN5Y). Ten meters on Sunday was fantastic (KA5PVB). By chance, I turned on the rig, heard a lot of pileups, and that was it. I lost the weekend being hooked by the contest (WD6EWG).

Fifteen meters was the best that I have seen. It opened up, and the DX was great (K8OSF). Thanks for a great contest, and I hope to enter future contests QRP! (KD8JN). I was able to work 36 DX stations in a couple of hours with only 100 watts and vertical (WB9GKA). Special thanks to JY9SR for coming up (NX9T). Conditions were good on Sunday (VE3EVZ). The highlight of this contest was a call from SU1EK on 15 meters (VE5RA). There was excellent propagation on 10 meters (CN8FC). Very good propagation on 10 meters. A good chance for QRPers (F1BEG). The overall propagation from Finland was frustrating, but the Sunday morning opening was one of the best ever (OH1NOA). Conditions this year were average, but we all had a lot of fun! (OK1RI). Ten-meters was greatly opened! (PAØKDM). It's always fun to work this contest (SM5IWC). Thanks for an interesting contest (UA6LQ). I can't say about the other bands, but 10 meters was hot! I never got so many +20 reports ever (TI2DU). Conditions were good except on the 160-meter band (W7FP). It was a great contest with great propagation. Thanks to all the Novices and Techs who responded to my CQs on 10 (8P6SH). There were great high-band conditions, but lightning made 160 and 80 terrible (K6GSS/KH6).

Scores

The scores are listed by mode—CW and phone. For both W/VE and DX scores, single operators are listed first, followed by multioperator single-transmitter, multioperator two-transmitter, then multioperator unlimited. W/VE single transmitter scores are broken down by call area and ARRL Section. W/VE multi-single scores are broken down by call area only. All W/VE multiop two-transmitter and unlimited scores are grouped together in descending order by score. DX single-op and multiop scores are broken down by continent and country. Under each ARRL Section (and country for DX), single-op scores are listed in descending order by category. All-band scores are listed first, followed by 160, 80, 40, 20, 15, and 10-meter single-band scores. Each line score lists the following information: call, score, QSOs, multipliers, power output used (A = 5 W or less; B = 6-150 W; C = more than 150 W). Single-band entries are indicated by 160, 80, 40, 20, 15, and 10. For example, in Connecticut, the top all-band CW scorer is K1ZZ. The top low-power (150 W or less) entrant is WA1FCN. K8HVT/1 has the top 80-meter single-band score, NQ1K has the top 40-meter single-band score, K1KI has the top 20-meter single-band score, K1TO has the top 15-meter single-band score, and K1RM has the top 10-meter single-band score. W1HUE has the top QRP score.

W/VE CW

Single Operator

1

Connecticut

K1ZZ	2,797,167	2687	347	C	
K1RU	2,598,186	2693	334	C	
K1XA	2,319,884	2329	332	C	
K1YR	2,017,800	2242	300	C	
KG1D	1,138,176	1536	247	C	
WA1FCN	688,491	1011	227	B	
K1WJL	675,321	983	229	C	
K1VDF	672,894	1466	153	C	
K1YRP	371,583	779	159	B	
K1BV	353,655	813	145	C	
K1DD	304,707	601	169	C	
WA2WIP	229,761	521	147	C	
W1HUE	139,092	346	134	A	
K3FN	129,762	267	162	C	
KA1CZF	75,492	233	108	A	
W1VH	37,128	182	68	C	
NR1L	33,858	198	57	C	
AB1U	23,316	134	58	B	
NI1L	19,890	102	65	A	
KH6CP/1	7,938	63	42	A	
NT1E	7,680	64	40	A	
K1CVF	7,221	83	29	B	
NJ2L	1,134	21	18	C	
K8HVT/1	41,415	251	55	C	80
NQ1K	2,160	36	20	C	40
K1KI	7,533	81	31	C	20
K1TO	504,495	1665	101	C	15
WA1NYU	10,404	102	34	B	15
K1RM	449,820	1530	98	C	10
W1CNU	20,088	186	36	C	10

Eastern Massachusetts

K5MA/1	1,876,554	2242	279	C	
W1FJ	1,376,229	1621	283	C	
W1MK	1,001,646	1458	229	C	
W1MX (AD1C,op)	813,483	1089	249	B	
W1GIH	600,495	931	215	C	
W1HN	511,704	824	207	C	
K1CGJ	287,175	547	175	A	
W1PL	226,628	447	169	C	
K1CLN	213,180	418	170	C	
KR1B	198,072	393	168	C	
K1TWF	192,090	337	190	B	
K1FFX	178,890	445	134	B	
N1RC	123,504	332	124	B	
N1AU	117,885	271	145	C	
K1ZZJ	91,188	298	102	C	
AD1Z	71,022	266	89	C	
N1EDM	69,840	240	97	B	
KB1VL	25,908	127	68	B	
NQ1F	18,816	112	56	B	
W1JR	9,027	59	51	B	
KA1LSZ	7,482	58	43	B	
W1BK	288	12	8	B	
W1FV	115,710	551	70	C	80
NR1R	15,618	137	38	C	40
AA1M	45,192	269	56	C	20
N1DC	22,650	151	50	B	20
W2SC	277,290	1027	90	C	15
WB2DND	34,515	195	59	B	10
KQ1V	6,138	66	31	C	10

Maine

W1XN	33,600	140	80	C	
W9KDR	31,746	143	74	B	
W1APU	24,948	108	77	B	
K1JB	130,950	582	75	C	15
N1AFC	40,020	230	58	A	15

New Hampshire

KM1H (KQ2M,op)	3,313,218	2914	379	C	
W1PH	1,503,054	1659	302	B	
K8LT/1	477,708	847	188	B	
K1PTF	276,208	504	184	B	
K1NH	57,600	200	96	B	
W1VY	23,730	113	70	C	20

Rhode Island

K2MN	162,756	396	137	B	
W1GL	130,707	309	141	A	
W1RFQ	52,800	176	100	B	
WB7NRE	5,508	54	34	C	
K1VSJ	1,058	32	11	B	
WA1HYN	14,400	100	48	C	80
K8IM/1	58,176	303	64	C	10

Vermont

W3SOH	331,230	610	181	B	
WA1GUV	112,893	311	121	B	
KA1FJ	1,575	35	15	B	15
WA1ZLD	76,560	440	58	C	10

Western Massachusetts

K1BW	2,709,357	2633	343	C	
KZ1M	564,990	1018	185	C	
W1AUT	243,324	751	108	C	
W1BR	187,980	482	130	C	
W1BYH	139,500	250	186	C	
W1JP	14,763	133	37	A	
WA1ZAM	11,115	95	39	C	15
KA1XN	292,059	1119	87	C	10

2

Eastern New York

K5NA	2,391,606	2331	342	C	
N2BA	1,855,350	1995	310	C	
W2IU	1,212,432	1508	268	C	
W2XL	1,030,194	1331	258	C	
N2AZS	841,995	1155	243	B	
KN2Q	644,784	1064	202	C	
N1CC	300,855	647	155	C	
NW2J	198,407	471	139	C	
N2AIF	180,398	402	133	C	
WA2AXK	142,308	354	134	C	
K2UR	81,627	299	91	C	
WB2EAR	77,280	322	80	B	
W2AWF	62,727	203	103	C	
KD2NE	31,758	158	67	C	
W2QYA	25,596	158	54	A	
NA2M	3,240	36	30	C	
WD2K	2,079	33	21	B	
K1ZM	9,240	88	35	C	160
KB2AUQ	26,586	211	42	B	15
KF2O	165,756	727	76	C	10

NYC-Long Island

KA2AEV	858,750	1250	229	B	
KD2TT	328,536	648	169	C	
KK2E	247,086	518	159	A	
WB2ENW	215,718	458	157	A	
WB2TPS	188,853	391	161	C	
W2GKZ	109,728	288	127	C	
W2HLI	69,000	250	92	B	
W2KTF	13,680	95	48	B	
W2KPA	2,112	32	22	C	
WB2AMU	14,112	112	42	B	40
N2DTW	189,540	780	81	C	15
N2KW	196,056	778	84	C	10
K2MFY	137,760	574	80	B	10
NT2X	39,900	350	38	C	10
K2KTT	6,240	65	32	B	10

Northern New Jersey

N2LT	2,956,224	2848	346	C	
N2NT	2,120,730	2230	317	C	
KZ2B	1,464,120	1660	294	B	
W2RQ	1,188,684	1484	267	C	
W1GD	1,065,960	1316	270	C	
KR2Q	570,825	885	215	A	
W2NJ	492,414	767	214	B	
K2PH	462,501	767	201	B	
WA2UDT	165,453	421	131	C	
K2HPV	164,808	436	126	A	
KQ2O	180,800	400	134	C	
KT2D	128,898	341	126	C	
KD2YG	90,792	194	156	B	
WB2FGZ	90,513	339	89	B	
WAØQOA	53,760	160	112	B	
W2HCA	44,118	171	86	B	
W9NTU	30,600	150	68	B	
W2AOY	13,524	92	49	B	
N2COH	6,138	62	33	C	
N2IN	2,304	32	24	C	
W2FCR	972	18	18	C	160
N2AA	600,696	1944	103	C	20
WA2ASO	74,169	389	67	C	20
WC2R	5,694	73	26	B	20
K2FE	51,504	296	58	C	10

Southern New Jersey

N2MM	1,927,200	2200	292	C	
N2RM	1,586,781	1981	267	C	
WA2VYA	729,729	1001	243	C	
K2PS	564,318	879	214	B	
K2FL	412,686	681	202	C	
N2MR	324,216	632	171	C	
W2PAU	197,784	402	164	C	
W2EA	142,245	327	145	C	
K2SB	119,925	325	123	B	
K2SWZ	76,588	236	111	B	
WA2AXJ	38,505	151	85	B	
WA2VSQ	33,216	173	64	B	
N2GZL	32,943	139	79	A	
W3ELJ	24,723	123	67	B	
K2LOO	21,960	122	60	B	
K2OSV	12,282	89	46	C	
AG2S	10,857	77	47	C	
K3JGJ	15,180	115	44	C	80
W5KI	22,050	150	49	B	20
W2GTN	16,500	125	44	B	15
KD2I	208,026	889	78	C	10

Western New York

W2TZ	1,438,686	1866	257	B	
NM2L	761,910	1165	218	B	
WF2W	308,160	642	160	B	
KW2J	305,448	572	178	C	
KD2YP	235,944	452	174	C	
K2LGJ	230,384	474	162	A	
K2IJ	229,245	527	145	C	
N2WK	220,752	438	168	C	
W2FR	155,844	351	148	C	
WJ2O	140,685	415	113	C	
WJ2X	128,856	364	118	B	
W2FUI	99,216	318	104	C	
W2PHT	84,552	271	104	B	
KA2Y	80,898	278	97	B	
WA2EYA	57,655	203	85	B	
WB2ABD	54,684	217	84	B	
K2ZJ	47,499	223	71	C	
K2XU	38,354	186	73	B	
NA2Q	32,640	136	80	B	
KK2B	15,000	100	50	B	
W2OMV	8,052	61	44	B	
WA2AOG	7,104	64	37	C	80
KA2VYW	20,304	144	47	C	40
K2VV	557,235	1769	105	C	15
W2HPF	305,487	1119	91	C	15
WB2YQH	79,380	378	70	C	10
W2SAW	47,196	276	57	C	10
W2HG	39,528	244	54	C	10

3

Delaware

KC3RY	104,838	346	101	C	
KD3JQ	55,926	239	78	C	
AD3V	50,196	188	89	C	
K3HBP	35,280	240	49	B	10
K3OO	2,373,081	2449	323	C	
N3AD	2,135,556	2598	274	C	
W3UM	1,622,205	1833	295	C	
AA3B	994,896	1316	252	C	
K3VW	989,172	1278	258	C	
K3NW	929,806	1102	251	C	
K3TEJ	748,896	1076	232	B	
N3ED	553,536	992	186	C	
K3WJV	538,242	823	218	C	
NO3B	398,712	898	148	B	
K3ZA	354,960	680	174	C	
W3KV	347,508	581	196	C	
W3ARK	325,413	627	173	B	
W3FW	308,424	724	142	C	
W3EVW	247,599	451	183	C	
KC3M	195,624	429	152	B	
K3OX	151,200	336	150	B	
W3EHZ	147,030	377	130	B	
W3QIR	98,154	266	123	B	
W3AP	48,216	164	98	C	
K3ZLK	39,039	169	77	C	
NQ3S	29,547	147	67	C	
NM3W	21,054	121	58	B	
W3CEI	13,407	109	41	B	
K3YD	2,496	32	26	A	
WB3KTX	960	20	16	B	
KA3SIO	305,025	1225	83	C	10
WA3LFY	154,956	698	74	C	10
K3WGR	58,962	317	62	C	10
KJ3R	54,126	291	62	C	10
AA4MD/3	34,128	237	48	B	10
KB3TS	24,840	138	60	A	10

Maryland-DC

K3ZO	2,878,050	2741	350	C	
K3NA	1,857,600	2064	300	C	
W3USS (K1ZZI,op)	1,619,550	1830	295	C	
W3GRF	1,148,436	1387	276	C	
W3UJ	739,848	1063	232	C	
W3IUU	684,216	1032	221	C	
W3GN	638,028	958	222	C	
W3HVQ	582,075	995	195	C	
WB3AVN	406,620	753	180	C	
W3FG	401,232	643	208	B	
K3WS	291,456	506	192	A	
N2USI/3	275,076	566	162	A	
N3AM	129,600	360	120	C	
K3NCO	69,264	222	104	A	
K3DI	57,720	185	104	B	
W3HVM	53,400	200	89	C	
W3CPB	53,400	200	89	B	
W3XE	36,000	160	75	B	
K3EI	25,338	103	82	C	
WA3EOP	18,522	126	49	A	
W3TFA	18,300	100	61	C	
K3SA	9,135	87	35	A	
WA3YVT	5,616	48	39	B	
N3RR	262,710	973	90	C	20
W3TUX	1,620	30	18	B	20
W3FQE	510	17	10	B	20
KE3Q	510,600	1702	100	C	15
WA3EEE	66,456	312	71	C	15
W3EWL	120,546	543	74	B	10
W3IDT	2,280	40	19	B	10

Western Pennsylvania

K3MD	946,854	1283	246	C	
K2QF/3	98,820	270	122	B	
K3UA	108	6	6	B	160
KA3HIE	119,070	490	81	C	15
W3KYN	11,178	69	54	B	10

4

Alabama

KC4ZV	692,310	982	235	B	
N4JF	328,251	539	203	A	
KK4SM	319,056	578	184	B	
K4NNQ	80,100	267	100	B	
AA4XM	12,555	93	45	B	
K4KZE	41,472	218	64	B	20

Georgia

N4RJ (KM9P,op) 2,591,730- 2610-331-C
WX4G 2,078,364- 2294-302-C
K4BAI 1,926,030- 2071-310-C
K4EZ 400,392- 664-201-C
W4DXI 339,234- 574-197-C
KB4GID 240,240- 455-176-A
W8MHS 238,250- 450-176-A
KF4CI 186,608- 356-156-C
N8LM 159,600- 400-133-B
W1UA 83,360- 220- 96-C
KD3GC 54,282- 218- 83-B
AA4GA 49,800- 200- 83-B
AB4LX 9,072- 63- 48-A
NO4I 4,284- 42- 34-C
WB4NMA 912- 19- 16-C- 160
N4UZ 243- 9- 9-C- 160
W4JFL 31,044- 199- 52-B- 20
N4VZ 268,068- 1004- 89-C- 10
KX4R 211,992- 803- 88-C- 10

Kentucky

N4XM 517,215- 841-205-C
N9RR 304,110- 654-155-C
WB4FOT 61,425- 225- 91-C
N4BOC 38,010- 181- 70-B
K4FU 14,400- 100- 48-C- 40
K2UPD 142,650- 634- 75-C- 20
N4OGW 95,700- 470- 70-B- 10

North Carolina

K4POL 2,005,242- 2243-298-C
K4PB 401,280- 704-190-C
K2SD 239,316- 539-148-C
N4QVM 27,072- 141- 64-B
KY2P/4 11,520- 64- 60-B
K4FOY 7,956- 78- 34-B
K5LZT 6,105- 55- 37-B
AA4NC 3,645- 45- 27-C- 80
WA4GQG 9,450- 90- 35-B- 15

Northern Florida

KC4CSD 123,066- 318-129-B
W4HBK 5,816- 71- 32-C- 80
W9GIL/M 36,285- 205- 59-B- 20
K4XS (WC4E,op) 440,700- 1469-100-C- 15

South Carolina

W3VT 1,639,905- 1853-295-C
W6OKX/4 566,916- 794-238-C
K4YYL 521,040- 1040-167-C
N4BPP 313,200- 580-180-B
W8CNL/4 84,750- 250-113-B
K4HOG 30,879- 141- 73-B
WF2G 855- 19- 15-B
W4NL 277,884- 996- 83-C- 15
N4LM 17,415- 129- 45-B- 15

Southern Florida

K4GKD 957,816- 1272-251-C
WD4AHZ 728,358- 1042-233-B
K4MF 677,586- 1022-221-B
K1TN 325,752- 554-198-B
NZ0R/4 119,680- 270-148-B
W4YN 106,560- 320-111-C
KO4J 57,000- 190-100-C
KM4KJ 15,555- 85- 81-B
W2SDB/4 10,296- 66- 52-C
KA4YAE 58,882- 314- 71-B- 20
WB4TDH 259,590- 1018- 85-C- 10
W4OO 61,008- 328- 62-C- 10

Tennessee

W4XJ 1,327,404- 1742-254-C
AK8M/4 117,729- 309-127-B
NU4B 41,310- 135-102-A
K4YPX 40,296- 184- 73-B
AA4WX 26,550- 150- 59-C
W4AY (WA4ZZU,op) 2,268- 36- 21-B
K4AMC 273,672- 1088- 84-C- 20
N4ZZ 952,968- 1337- 88-C- 15
KI4UZ 132,264- 668- 66-C- 10

Virginia

W4MYA 855,036- 1568-182-C
K3RV 535,107- 1667-107-C
WB4BVY 303,645- 653-155-C
K4BAM 292,962- 622-157-B
WU4G 267,288- 518-172-A
N3QS 265,200- 520-170-C
K4FPF 223,947- 447-167-B
AA4XU 197,478- 477-138-C
N4ZR 164,800- 400-129-B
AA4UJ 111,218- 331-112-C
K4OD 106,110- 270-131-C
AA4YZ 75,684- 238-106-A
N4RUM 73,656- 198-124-B
WD4JHY 71,340- 205-116-B
K6ETM/4 55,521- 199- 93-B
W4KMS 51,615- 155-111-C
W4NM 51,264- 192- 89-B
N3RC 50,798- 204- 83-C
N4MM 26,220- 115- 76-C
WB4UBD 4,200- 40- 35-C
KC4CEB 2,950- 38- 25-B
W4BQF 129,024- 672- 64-C- 40
W4YE 51,840- 288- 60-C- 40
K4YT 52,863- 263- 67-C- 10
W3FTG 10,206- 81- 42-B- 10
W4EZ 6,840- 76- 30-B- 10
WB4DNL 3,192- 38- 28-B- 10

5

Arkansas

KA5KPE 72,288- 251- 96-C
W5RZ 54,810- 203- 90-C
NS5C 39,618- 186- 71-B
W5EIJ 37,680- 157- 80-C
K5UR 1,914- 29- 22-C- 160
KM5G 207,207- 1001- 69-C- 20
k5ASB 16,800- 140- 40-B- 10

Louisiana

NT5G 617,322- 751-274-B
K5KLA 137,550- 350-131-C
WA5JWU 28,044- 114- 82-B
W5WMU 332,856- 1206- 92-C- 10

Mississippi

WO5H 119,865- 305-131-C
WB5CON 11,970- 70- 57-B
WA5OYU 27- 3- 3-B- 40
WD5JZL 157,398- 709- 74-B- 10

New Mexico

AA5JF 169,413- 379-149-B
KI3L 1,890- 35- 18-C
W5TVX 58,308- 452- 43-B- 20
KF7E 108,336- 488- 74-C- 15
W5YZ 91,290- 358- 85-C- 10
N7RP 74,160- 412- 80-C- 10
KT5X 10,500- 100- 35-B- 10

North Texas

N5AU (WN4KKN,op) 2,795,688- 2709-344-C
N5RZ 2,381,925- 2275-349-C
N5AW 1,080,108- 1233-292-B
KA5W 756,318- 1082-233-C
WG5J 573,024- 1016-189-C
N5RM 297,918- 613-162-C
KY5N 214,428- 428-167-B
W5MW 208,362- 451-154-C
K5MR 149,175- 325-153-C
NJ1V 76,077- 237-107-C
W5TB 63,855- 215- 99-A
KD5PJ 28,461- 179- 53-B
KA4CVL 22,326- 122- 61-B
W5WXZ 912- 19- 16-C- 160
W5FO 391,134- 1387- 94-C- 20
NI5M 83,439- 381- 73-B- 15
NZ5M 132- 11- 4-B- 10

Oklahoma

W8RRY 139,950- 311-150-C
WV5S 12,276- 93- 44-C- 40
N8CL 37,125- 225- 55-B- 10

South Texas

AD5Q 1,478,556- 1839-268-C
K5DB 320,352- 568-188-C
K5TSQ 231,447- 431-179-C
N5HB 204,768- 474-144-B
W5ODD 127,280- 303-140-C
KA5IAU 58,794- 239- 82-B
NX8G 56,772- 228- 83-B
WG4Q/5 26,100- 116- 75-C
W9HRF 23,226- 98- 79-C
WV5K 17,442- 114- 51-C
N5KAE 4,929- 53- 31-B
AA5HI 360- 12- 10-C
W5WQN 67,470- 346- 66-C- 40
KC5CP 16,779- 119- 47-C- 10

West Texas

W5VGX 360,819- 547-159-A
KD5IA 2,277- 33- 23-C- 80
WB5UDX 126,063- 609- 89-C- 15

6

East Bay

N6EK 448,020- 786-190-B
W6FSJ 383,838- 703-182-C
NF6S 313,740- 630-166-C
K2GMY 47,214- 258- 61-C
K6SIK 32,706- 138- 79-B
W6EYC 17,856- 93- 64-C
KS6H 33,600- 224- 50-C- 20
W6BSY 131,100- 575- 76-C- 15
WZ6Z 147,420- 585- 84-C- 10

Los Angeles

W6AE 801,900- 1188-225-C
N6AA 401,232- 643-208-C
K6EID 361,284- 644-187-C
W6NNV 173,799- 369-157-B
N6IBP 87,912- 264-111-B
N6ZZ 55,776- 224- 83-B
W6MFC 51,678- 198- 87-C
W8KIE/6 43,077- 173- 83-B
K1EQA 24,570- 195- 42-A
W6CN 17,286- 134- 43-B
NE8I 810- 27- 10-C
N6LL (WA6CDR,op) 1,377- 27- 17-C- 160
K5KT/6 52,704- 288- 61-B- 40
WA6TLA 20,424- 148- 46-C- 20
WA7ZTN/6 75,072- 391- 64-C- 10
AI6Z 53,754- 289- 62-C- 10

Orange

N6AW 281,396- 548-159-B
N6AV 257,166- 546-157-C
W6BA 184,824- 408-151-C

Santa Barbara

W6UM 453,420- 680-229-C
W6UJX 351,453- 607-193-C
WA5VGI 335,664- 666-168-C
WA6FGV 212,796- 514-138-C
AA6EQ 95,445- 315-101-B
W6OUL 19,824- 118- 56-C
N6HK 17,556- 133- 44-C- 15
N6NMH 6,075- 81- 25-B- 10

Santa Clara Valley

N6AN 318,470- 685-154-C
NS6V 186,705- 461-135-C
W6YHM 176,484- 382-154-C
W6VG 173,040- 412-140-C
K6RO 128,112- 314-135-C
KE6OT 85,500- 250-114-B
N6IP 69,930- 259- 90-B
W6LC 56,580- 230- 82-C
W6FGD 53,856- 187- 96-C
W6YVK 43,737- 239- 61-A
W6PLJ 39,093- 157- 83-B
AA6KX 29,601- 143- 69-B
NC6S 19,032- 104- 61-A
AG1H 18,240- 95- 64-B
W6MZQ 2,160- 45- 16-B
KG6AM 918- 18- 17-B
W6QHS 244,038- 914- 89-C- 10
N6ZB 111,870- 565- 66-C- 10
K6XO 15,480- 129- 40-B- 10

San Diego

W6UQF 730,800- 1050-232-B
AA4M 577,299- 967-199-B
K6NA 408,915- 699-195-C
K6ZH 338,283- 603-187-B
K6MC 311,199- 511-203-C
KW6Q 218,508- 524-139-A
W6MVW 168,480- 432-130-B
W6OVO 64,680- 245- 88-C
W6BZE 38,097- 153- 83-C
AA6MN 13,161- 107- 41-B
N6ADK 3,456- 38- 32-B
AA6EE 2,394- 38- 21-B
K8DX 163,296- 758- 72-C- 40
NI6W 365,904- 1386- 88-C- 20
K6JYO 207,690- 805- 86-C- 15
N6CDA 130,248- 603- 72-C- 15
W6YA 286,794- 1017- 94-C- 10
N6ND 290,820- 945- 92-C- 10
WA6TKT 4,785- 55- 29-C- 10

San Francisco

W6JTI 897,408- 1216-246-B
W6BIP 386,398- 549-234-C
K6ZUR 145,530- 385-126-C
WA6CTA 29,559- 167- 59-C
K6ILM 26,487- 109- 61-A
KI6YB 6,138- 62- 33-B
W6PM 99,264- 376- 88-C- 15

San Joaquin Valley

KA6BIM 125,664- 272-154-C
W6BYH 17,280- 96- 60-C
K6OZL 33,660- 165- 68-C- 40
W6IFC 960- 20- 16-B- 20

Sacramento Valley

N6QR 1,519,155- 1705-297-C
K6DR 248,979- 557-149-C
N6GG 201,120- 838- 80-C
W6NKR 169,623- 401-141-C
K6SG 85,800- 275-104-C
N6DOJ 80,958- 262-103-B
NV6O 7,956- 78- 34-B- 20
N6JM 27- 3- 3-B- 10

7

Arizona

N7IR 225,780- 530-142-A
W7YS 111,069- 301-123-B
KX7J 57,810- 205- 94-C
W2HTX 46,864- 168- 91-B
N7CPL 20,520- 120- 57-B
W8LYT 9,584- 78- 41-B
W7AYY 47,040- 280- 58-C- 10

Eastern Washington

NQ7M 370,548- 857-188-B
W7LGG 64,152- 243- 88-C
K7EFS 147- 7- 7-C
WA7EGA 65,352- 389- 56-C- 40
W7TJ 60,264- 372- 54-C- 10

Idaho

WS7U 14,820- 95- 52-A
KA7T 35,376- 268- 44-C- 15

Montana

KS7T 239,838- 563-142-C
W7LR 69,630- 211-110-C
N8RM/7 64,500- 250- 86-B
W6ALQ 4,536- 56- 27-C- 20
KE7X 203,580- 870- 78-C- 15
K7ABV 97,902- 518- 63-C- 10

Nevada

WA7UTM 199,305- 515-129-C
KZ4H/7 26,032- 146- 64-B
W6PBU7 33,480- 186- 60-B- 10

Oregon

K5MM/7 2,006,760- 2389-280-C
W7YAQ 905,364- 1212-249-B
AD7T 132,240- 304-145-C
W7IMP 61,632- 192-107-C
W7GUR 55,350- 225- 82-C
W7IVX 16,830- 165- 34-C- 80
KA7FEF 11,430- 127- 30-C- 15
K7OVM 52,965- 321- 55-B- 10
KQ7I 38,745- 287- 45-C- 10
KL7KG/W7 21,279- 173- 41-B- 10

Utah

WE7B 541,890- 1115-162-C
W7HS 278,478- 573-162-B
KE7NS 206,145- 509-135-B
K7CU 6,084- 52- 39-C

Western Washington

NN7L 1,663,110- 2174-255-C
N7TT 1,534,107- 1901-269-C
KR7G 827,424- 1352-204-C
K7RIE 664,020- 1020-217-C
K7WA 523,068- 958-182-B
K7RA 361,880- 652-185-B
N7HUS 288,419- 593-161-B
W7IIT 277,920- 579-160-C
N7KZN 224,808- 493-152-B
N6AX 209,751- 503-139-B
K7SS 167,844- 394-142-B
K7NW 162,864- 348-156-C
W7QN 94,500- 300-105-C
WA7UVJ 83,334- 323- 86-B
W7MCU 81,648- 189-144-C
N7LOX 49,164- 241- 68-B
N7EPD 43,425- 193- 75-B
K7LXC 8,811- 89- 33-A
W7VIH 3,750- 50- 25-C
W7DRA 144- 8- 6-B
WA7RKJ 302,160- 1259- 80-C- 20
NX7K 300,672- 1044- 96-C- 15
N7RO 206,280- 955- 72-C- 15
W7WA 294,570- 1091- 90-C- 10

Wyoming

K7MM 631,734- 998-211-C
WC7S 18,081- 123- 49-C
NC7O 4,290- 55- 28-C

8

Michigan

NA8V 2,218,437- 2813-283-C
W8UA 1,793,940- 2052-290-C
N8CXX (K8JM,op) 1,340,238- 1607-278-C
W8TWA 512,775- 795-215-C
W8VSK 389,340- 630-208-A
K4FW/8 172,860- 430-134-C
W8URM 114,954- 322-119-B
W8JRK 106,362- 311-114-B
K8CV 98,838- 269-114-C
K8TDJ 87,633- 273-107-B
N8CQA 52,599- 197- 89-A
K8OSF 29,574- 159- 62-B
NE8T 25,500- 125- 68-B
W8EGI 18,900- 100- 63-B
K8QWG 4,680- 52- 30-B
W8UVZ 234,264- 908- 86-C- 15
WG8M 136,875- 625- 73-C- 10
W8WVU 74,112- 386- 64-B- 10
W8TJQ 33,990- 206- 55-B- 10
K8SB 13,200- 110- 40-B- 10
WB8SFF 1,500- 25- 20-B- 10

Ohio

WB3KKX 1,250,511- 1789-233-C
KV8Q 796,446- 1029-258-C
K8MR 679,725- 1007-225-C
W8RSW 653,184- 1008-218-C
K9ALP 620,658- 841-246-B
N8BC 365,238- 618-197-C
N8AGU 269,325- 513-175-C
W8ZCQ 247,008- 496-166-C
WB8YJF 229,377- 487-157-B
NC8V 192,042- 454-141-C
KW8N 183,464- 392-139-C
W8UPH 142,800- 425-112-C
W8NPF 141,960- 364-130-C
W8XT 139,080- 305-152-B
K8EF 125,961- 347-121-B
AB8O 78,960- 235-112-B
W8YGR 71,775- 185-145-B
W8IDM 53,400- 200- 89-B
W8PN 36,603- 147- 83-B
W8UMA 29,184- 152- 64-B
W8GOC 22,302- 128- 59-B
NG3O 15,006- 122- 41-B
WB8MIP 14,715- 108- 45-C
WA8Y 10,962- 63- 58-C
AF8C 5,124- 61- 28-B
N9AG 154,658- 716- 72-C- 40
K8CCV 93,186- 501- 62-C- 40
WA8RCN 11,742- 103- 38-C- 40
N8BJQ 252,305- 1005- 87-C- 15
N8DCJ 422,718- 1499- 94-C- 10
N8HHE (WA8DXB,op) 321,984- 1118- 96-C- 10
KA8DJZ 61,686- 298- 69-C- 10
W8DWP 1,275- 25- 17-B- 10

West Virginia

K8OQL 277,245- 505-183-C
W8TN 2,331- 37- 21-B
W8UMR 42,816- 223- 64-C- 20

9

Illinois

K9UIY 1,072,500- 1430-250-C
K9MMS 370,617- 731-169-B
N9TI 292,068- 532-183-C
W9LNQ 274,407- 511-179-B
KS9U 227,835- 415-183-A
N9AEJ 218,316- 644-113-C
W9AG 142,002- 322-147-C
K9PNG 124,382- 294-141-A
W9EBY 108,554- 301-118-B
K9UQN 40,779- 197- 69-C
W9REC 32,370- 130- 83-B
K9MDO 32,085- 155- 69-C
WD9IWP 18,312- 108- 58-A
K9GO 16,497- 117- 47-A
KA9ACS 12,285- 105- 39-B
AG9E 11,700- 100- 39-B
W9PNE 11,385- 69- 55-A
KA9SAY 10,260- 90- 38-C
WD9IIC 663- 17- 13-B
KG9N 300- 10- 10-B- 160
KG9Z 1,254- 22- 19-C- 80
WB9Z 165,438- 707- 78-C- 40
W9CH 39,780- 221- 60-B- 40
K9QVB 281,340- 1042- 90-C- 20
WB9TIY 159,354- 681- 78-B- 15
KC9FS 6,300- 70- 30-C- 15
KC9T 265,936- 1036- 92-C- 10
WE0B 209,760- 920- 76-C- 10
W9IL 54,162- 306- 59-B- 10
NM9C 31,641- 199- 53-B- 10
N9JF 28,224- 196- 48-B- 10
W9YYG 10,098- 99- 34-C- 10

Indiana

W9RE 2,449,890- 2505-326-C
N9NS 300,618- 586-171-C
K9HCX 283,200- 472-200-B
AG9S 147,138- 358-137-C
W9PC 144,672- 352-137-C
WD9Q 126,775- 325-129-B
K2CF 81,300- 271-100-B
NT9T 51,156- 203- 84-B
NX9T 41,001- 173- 79-A
N9RD 2,574- 33- 26-C- 80
KK9G 22,701- 161- 47-B- 40
K9CLO 140,015- 635- 63-C- 20
W8UD/9 83,904- 437- 64-C- 20
K9VQK 11,025- 105- 35-C- 20

Wisconsin

K9CAN 1,003,842- 1302-257-C
W9GXR 650,832- 1192-182-C
N9ER 253,872- 518-164-C
NI9C 233,585- 435-179-B
W9HE 230,160- 580-137-B
KB9S 217,560- 490-148-A
W9XT 177,795- 438-135-B
W9NA 119,427- 329-121-C
NG9L 116,280- 340-114-B
N9EZ 96,408- 309-104-B
WB9HRO 76,986- 273- 94-A
K9OSH 34,965- 185- 63-C
W9YCV 31,590- 117- 90-B
AJ9K 23,490- 135- 58-C
W9WAQ 6,048- 56- 36-C- 80
W9QP 134,976- 608- 74-C- 15
WA9TZE 1,530- 30- 17-B- 10

0

Colorado

N2IC/0 2,407,980- 2508-320-C
AC0S 558,900- 900-207-C
KJ8G 376,200- 680-190-C
N8ZA 337,134- 698-161-C
W0GOR 135,660- 323-140-B
N0GOS 124,584- 358-116-B
W0IZV 108,891- 327-111-B
N0FFZ 77,112- 252-102-B
K9AY 58,308- 225- 86-A
K8OST 7,548- 74- 34-B- 40
KC0D 175,332- 769- 76-C- 20
NI0E 304,647- 1141- 89-C- 15
K8ZX 302,535- 1215- 83-C- 15
KI8J 33,276- 238- 47-B- 15
W8ZV 408,098- 1417- 96-C- 10

Iowa

N0SM 885,168- 1366-216-C
W8IZ 281,358- 608-154-A
W6WP 232,848- 588-132-B
KE8Y 185,250- 475-130-C
KZ0C 66,822- 259- 88-C
KF8Z 35,154- 186- 63-B
W9MJN 6,237- 63- 33-C
WB0B 2,112- 32- 22-B

Kansas

KA0HKD 29,889- 123- 81-B
N0FMR 27,135- 135- 67-B
WB0YJT 21,948- 124- 59-B
W8WPL 12,825- 75- 57-B
KB0BXF 3,192- 38- 28-B
K0IEW 210- 10- 7-C
W8RT 432- 12- 18-C- 160
KR8G 229,320- 910- 84-C- 40
WO0E 936- 28- 12-B- 20
KA8SIX (N/T) 3,822- 49- 26-B- 15
NO0Y 12- 4- 1-B- 10

Minnesota

N0AT 1,481,498- 2021-246-C

KØTO 152,625- 407-125- B
WØRXL 61,380- 186-110- C
WØML 58,395- 229- 85- C
KFØT 54,600- 200- 91- C
WØHBE 44,037- 233- 63- C
WØNGB 35,784- 158- 71- A
WB2V 24,833- 119- 69- B
WØLP 5,670- 63- 30- C
KIØF 71,610- 385- 62- C- 20
KRØB 310,768- 1164- 89- C- 15

Missouri

NSØB 370,268- 611-202- C
WAØOUI 155,136- 404-128- B
KØRWL 108,032- 376- 94- C
W3HDH/Ø 88,776- 274-108- C
WØPKO 42,174- 198- 71- C
KAØP 4,590- 51- 30- B
KMØL 6,720- 64- 35- C- 80

North Dakota

NMØN 67,410- 210-107- C
WØLHS 13,677- 97- 47- C
WBØO 18,360- 153- 40- C- 40

Nebraska

KØSCM 645,474- 1202-179- C
KVØI 552,780- 1110-166- C
KØSW 107,100- 300-119- C

South Dakota

KDØEE 290,871- 513-189- C
WAØNSY 15,105- 95- 53- C
KØZZ 149,668- 756- 66- C- 40

VE

Maritime-Newfoundland

VO1MP 1,601,536- 1822-293- B
VE1FW 227,040- 473-160- B
VO1AW 177,606- 414-143- C
VE1NH 124,146- 363-114- A

Quebec

VE2AYU 688,662- 1053-218- C
VE2FFE 31,395- 161- 65- B
VE2BLX 10,488- 78- 46- A
VE2FU 172,992- 848- 68- C- 40
VE2ICU 3- 1- 1- A- 20

Ontario

VE3KP 632,214- 1023-206- C
VE3ST 405,840- 712-190- C
VE3BZR 101,745- 285-119- C
VE3OOL 91,728- 273-112- A
VE3TEE 71,064- 252- 94- B
NE8Z/VE3 48,843- 201- 81- B
VE3DO 1,254- 22- 19- C- 160
VE3CUI 2,964- 38- 26- C- 40
VE3NYT 26,208- 182- 48- B- 20
VE3NBE 20,790- 126- 55- B- 15
VE2AEJ/3 81,144- 392- 69- C- 10
VE3NXQ 12,978- 103- 42- C- 10

Manitoba

VE4JB 263,160- 510-172- C
VE4SN 9,600- 100- 32- B

Saskatchewan

VE5SG 16,074- 141- 38- B

Alberta

VE6BMX 22,797- 87- 87- C
VE6BF 80,940- 355- 76- B- 15

British Columbia

VE5RA/7 473,100- 950-166- C
VE7BSB 5,358- 47- 38- B
VE7FPT 2,736- 48- 19- C- 80
VE7DLM 130,746- 566- 77- B- 15

Multioperator

Single Transmitter

1

K1IU (+ NS1I) 2,679,804- 2757-324- C
W1XS (+ NQ1F,KD2SX) 1,701,375- 1745-325- C
K1VR (+ KM3T) 1,579,662- 1791-294- C
KA1KPH (+ NC1B) 698,884- 1218-246- C
AK1A (+ NET) 751,376- 1232-206- C
K1IN (+ NET) 507,780- 930-182- C
AI3E (+ NET) 209,510- 543-190- C
K1TR (+ NET) 308,342- 558-163- B
NO1I (+ NET) 244,881- 483-169- C
KA1CB (+ NET) 216,540- 401-180- C
N1TZ (+ NET) 201,168- 381-176- C
K1CC (+ NET) 97,350- 295-110- C
KA1CLV (+ NET) 61,596- 174-118- C

2

KY2J (+ KA2s TIP,VQY,KU2Q,NA2N,WB2Q) 2,793,630- 2510-371- C
K2SG (+ N2EA,WA2SRQ) 2,129,595- 2119-335- C
K2NJ (+ KQ2O,NR2H) 1,964,160- 2046-320- C
N2NU (+ WA2IUO) 1,584,468- 1726-306- C
WB2P (+ NET) 945,852- 1058-298- C
K2QMF (+ KA2UJH) 633,633- 1001-211- C
K2TD (+ NET) 584,550- 868-225- C
W2UI (+ N3KR) 446,920- 696-215- C
WB2K (+ NET) 223,839- 399-187- C

3

W3BGN (+ K2TW) 2,897,424- 2736-353- C
AA1K (+ NET) 2,798,280- 2591-360- C
K5ZD/3 (+ K3UA) 2,652,639- 2593-341- C
W3GG (+ KS1G) 2,495,124- 2567-324- C
N2FB (+ K3YDX,KC3X,WB6VGI) 2,445,552- 2515-324- C
K3WUW (+ W4FOA) 1,884,420- 2204-285- C
K3NZ (+ KA3MND,KU3X) 1,469,565- 1695-289- C
KQ3F (+ NET) 1,456,704- 1686-288- C
K3YL (+ NET) 1,287,900- 1590-270- C
N3LR (+ NJ3A)† 1,279,488- 1568-272- C
K3IE (+ KB3MM,N3ARK) 1,226,526- 1537-266- C
W3MA (+ NET) 1,224,405- 1385-299- C
NN3Q (+ NET) 1,028,304- 1158-296- C
K3YGU (+ NET) 884,520- 1170-252- C
K3UEI (+ NET) 624,024- 972-214- C
W3AZ (+ NET) 500,556- 707-236- C
NA3R (+ K3NL) 416,430- 661-210- C
N3RW (+ N3HW) 373,746- 746-167- C
K3ANS (+ K3YD,KD3HS) 228,420- 405-188- C
K3ND (+ NET) 199,755- 345-193- C
KW3Z (+ NET) 177,795- 439-135- C
WA3JJZ (+ NET) 122,688- 284-144- B
N3II (+ NET) 113,184- 262-144- C
NK3U (+ NET) 75,960- 211-120- B

4

N4KG (+ N4QB,KU4J) 2,464,800- 2528-325- C
W3YY (+ NET) 729,000- 1080-225- C
N4AU (+ N4LZK) 240,036- 482-166- C
W4RV (+ K1FR) 34,632- 148- 78- C

5

KRØY (+ NET) 1,948,860- 2005-324- C
WF5E (+ K5CFA) 946,440- 1320-239- C
N4QS 753,567- 1051-239- B
W5EHM (AA5BT,WB5VZL,ops) 722,160- 1003-240- C
N7KA (+ AI9X) 496,980- 1004-165- C
W5ASP (+ NET) 399,360- 832-160- C

6

W6REC (+ N6TIB,W6FAH) 1,052,059- 1354-259- C
KG6GF (+ NET) 1,014,972- 1124-301- C
N6JV (+ NET) 828,344- 998-276- C
AF6S (+ NET) 501,228- 819-204- C
AD6E (+ NET) 427,020- 647-220- B
K2ITG/6 (+ NET) 370,182- 599-206- C
K6MA (+ NET) 252,234- 486-173- C
W6OAT (+ WX5S) 211,248- 326-216- C
K6LRN (+ NET) 168,948- 361-156- C
KJ6V (+ NET) 165,075- 355-155- C
WC6I (+ NET) 129,792- 338-128- C
K6TQ (+ K7MO) 127,512- 322-132- C
AJ6V (+ NET) 122,625- 327-125- C
WA6LLY/6 (+ NET) 120,900- 310-130- B
W6OSP (+ NET) 105,984- 276-128- C
KE6WL (+ NET) 60,516- 184-123- C
WW6D (+ NET) 59,388- 202- 98- B
KD6NT (+ NET) 30,429- 161- 63- C
NT6G (+ NET) 6,762- 49- 46- C
N6VR (+ NET) 6,324- 62- 34- C

7

N7NG (+ WA6AUE) 1,745,100- 1939-300- C
KC7V (+ NET) 680,312- 1019-216- C
KA7CSE (+ ops) 58,536- 271- 72- B

8

W8FN (+ KU8E) 1,852,200- 2058-300- C
W8EDU (AF8A,WB8WTS,ops) 225,504- 522-144- C
K8CC (+ NET) 215,985- 605-119- C

9

NA9J (+ K9LJN,KS9O) 1,810,215- 2385-253- C
K9UWA (+ K9FW,KA9A,KE9AG,KR9U, NO9H,W9FC) 1,228,338- 1587-258- C
NW9K (+ NO9O,NW9T) 58,092- 208- 94- C

0

KØRF (+ W8UA) 2,600,631- 2651-327- C
WØNA (W0s AR,CY,YR,WAØOZP,ops) 380,472- 764-166- C
WIØS (+ KTØF) 120,912- 458- 88- C

VE

VE6AO (VE6s AFO,AEM,AMR,CAO,CIZ,EY, JO,KC,LES,LP,PY,ops) 307,500- 820-125- C

Two Transmitter

K1AR (+ K1s EA,GQ,KC1F) 6,892,194- 5186-443- C
N3RS (+ WM2H,K3JJG,N3s NA,RD,W3XU) 5,781,849- 4451-433- C
K4VX/Ø (+ K4XU,KØBGL,KA9VAK,N9JF, W9WI, NS0Z,WO8G) 5,496,942- 4502-407- C
WM5G (+ AA5DX,K5s RX,SXO,KC5DX, KM5R,KW5P,N5IWA,NJ5N,KO9Y) 4,831,083- 3807-423- C
N6RO (+ K3EST,K6TMB,N6s IG,KT,NB6G) 4,561,716- 3919-388- C
K2LE/1 (+ K2SX,N2UN,W2AX,AA6RX) 4,406,265- 3855-381- C
N2MG (+ KC2FD,KD2RD,NQ2D) 4,215,375- 3747-375- C
KO7N (+ W7IL,WA7s FXO,TDZ,WG7N, WJ7s R,S,NØXX) 3,249,900- 3450-314- C
K8AQM (+ AC8W,K8DD,KB8ECG,KI8W, KJ8A,W8IQ,WD9INF) 2,505,195- 2851-315- C
W3NX (+ N8NA) 1,685,430- 1830-307- C
K1XM (+ KQ1F) 1,667,952- 1716-324- C
WR6R (+ K4UVT,AK6T,K8s XO,ZM,KI6EZ,W6RGG) 1,330,944- 1733-256- C
W6TMD (+ KB6RXF) 1,030,446- 1311-262- C
KS3F (+ NE3F) 964,158- 1222-263- C
N6IC (+ AD8C,N6s DX,UR) 258,330- 545-158- C

Unlimited

W3LPL (+ KA1GD,WB2EKK,K3s RA,TM, ZZ,KF3P,KT3Y,N3GB,W3EKT, WB3JRU,NW5E,WA8MAZ) 8,953,632- 6192-482- C
NR5M (K2TNO,K5s GA,GN,LZO,WA,KE5IV, KZ5M,N5EA,ops) 7,370,745- 5045-487- C
K1ST (+ K1s BG,FWE,MNS,N1s ATN,ELN, NB1H,WA1TFH,NI8L) 7,020,900- 5380-435- C
KY1H (+ KB1W,KM1P,KR1R,KT1O,NB1Y, NS1M,AK4L) 6,252,774- 4939-422- C
W8AIH/9 (+ W8FVF,KNØV,KSØT,NØBSH, W8UC,WBØGGM,NB9C) 5,798,520- 4680-413- C
W3GM (+ AB2E,K3s ND,VW,KA3PIT,N2EA, NU2U,NZ2R,W3FV,WA2C,WB2R,AA4II) 45,184,712- 3496-389- C
K1RX (+ KA1s CI,ION,N1EPU,KC8PE) 3,155,168- 2946-357- C
K3WW (+ NET) 3,019,896- 2708-372- C
K1DG (+ NET) 2,219,783- 2249-329- C
K3IPK (+ NET) 2,006,843- 2137-313- C
N3BNA (+ NM2Y) 5,972,152- 2107-312- C
NF2L (+ K2BU,KY2T) 1,306,968- 1534-284- C
K3RL (+ NET) 227,955- 455-167- C

DX CW

Africa

Morocco

CN8FC (AA4U,op) 1,505,838- 2221-226- B

Canary Islands

EA8AB 563,160- 988-190- B
EA8BIE 156,612- 421-124- B
EA8IR 38,979- 183- 71- B

South Africa

ZS1VP 22,116- 194- 38- B- 10

Tanzania

5H1HK (JE3MAS,op) 1,545,048- 2488-207- B

Zaire

9Q5DX (WN7S,op) 1,647,990- 1810-193- C

Asia

China

BY1QH (NS7Z,op)11,400- 100- 38- C

Korea

HL9FN 22,833- 129- 59- B
HL9CA 18,480- 112- 55- B
HL1CG 45,012- 341- 44- B- 20
HL9EP 21,879- 187- 39- C- 20
HL1LW 48,528- 337- 48- B- 10

Japan

JA7FWR 1,748,682- 2491-234- C
JH7WKQ 1,491,120- 2280-218- C
JH7DNO 1,489,098- 2248-221- C
JF1PUW 1,067,310- 1770-201- C
JH7XGN 992,775- 1525-217- B
JM1LRQ 666,936- 1256-177- B
JA7SUR 648,885- 1195-181- B
JA2EU 642,252- 1196-179- C
JH4NMT 552,036- 1028-179- C
JA9CWJ 483,171- 953-169- C
JK3GAD 456,960- 952-160- B
JH3CXL 445,776- 1004-148- C
JR3BOT 445,008- 1016-146- C
JE1AER 350,700- 835-140- B
JA9RPU 207,897- 529-131- A
JA2VUP/3 194,256- 568-114- B
JA8AJE 175,698- 454-129- B
JA6YJS 173,013- 571-101- B
JE7RJZ 150,282- 414-121- B
JR1IOS 138,384- 372-124- A
JA1JQY 137,214- 378-121- B
JJ1GQH 129,537- 389-111- B
JR4GPA 101,559- 349- 97- A
JJ3JJL 99,831- 311-107- A
JA7ASD 85,263- 293- 97- B
JR3XEX 85,260- 290- 98- C
JA6YAI (JG6OZC,op) 79,800- 266-100- C
JA5IP 59,241- 217- 91- C
JA6BWH 55,080- 216- 85- B
JA1GTF 49,914- 177- 94- C
JE4VRF 48,960- 204- 80- B
JA3UWB 43,068- 194- 74- B
JA0BMS/1 35,088- 172- 68- A
JA2DN 35,052- 254- 46- B
JA3ARM 27,081- 153- 59- C
JA9YE 24,960- 128- 65- B
JR7DPU 24,453- 143- 57- B
JO1QZI 22,656- 128- 59- B
JH1PXY 21,948- 118- 62- B
JA4VAD 21,420- 119- 60- B
JG2IGY 20,574- 127- 54- A
JA1BUI 13,674- 108- 43- B
JA0BPY/1 12,408- 88- 47- B
JF1GWJ 9,482- 83- 38- B
JG3EHD 8,118- 66- 41- B
JA1KKA 7,560- 63- 40- C
JH8RGQ 6,030- 67- 30- A
JE8RUY/7 6,006- 77- 26- B
JG7JBZ 4,992- 64- 26- B
JI6BRB 4,374- 54- 27- A
JF2MTW 3,036- 46- 22- B
JA1IZ 2,664- 37- 24- B
7J2AAF 1,953- 31- 21- B
JA2QVP 1,827- 29- 21- C
JG1RYQ 1,440- 32- 15- A
JG1RDV 966- 23- 14- B
JA3OLI 918- 18- 17- B
JH3CYZ 60- 10- 2- C- 160
JE1SPY 3- 1- 1- C- 160
JA1BWA 8,424- 117- 24- C- 80
JRØXOJ 2,772- 77- 12- B- 80
JG1XLV 297- 33- 3- C- 80
JAØJHA 108,528- 646- 56- B- 40
JA3YKC (JH4RHF,op) 76,956- 484- 53- C- 40
JA1YAD 72,072- 462- 52- C- 40
JAØUMV 69,642- 438- 53- B- 40
JA5JCC 40,905- 303- 45- B- 40
JA1JKG 30,240- 224- 45- C- 40
JAØSHL 12,006- 138- 29- B- 40
JA1QWL 1,806- 43- 14- B- 40
JA7RXU 1,260- 35- 12- C- 40
JF1SQC 600- 20- 10- A- 40
JA2JLG 456- 19- 8- A- 40
JF2LTH 185- 11- 5- A- 40
JA7FTR 143,298- 838- 57- C- 20
JH7QXJ 34,290- 254- 45- C- 20
JA7BE 26,928- 187- 48- C- 20
JA1WYQ 14,763- 133- 37- B- 20
JA2WZ 7,524- 76- 33- B- 20
JR4WKV/1 2,100- 35- 20- B- 20
JA2KPV 864- 24- 12- B- 20
JA8HC 126- 7- 6- C- 20
JA3YBF (JA4-37631,op) 179,928- 1071- 56- C- 15
JAØNFO 153,048- 911- 56- C- 15
JA7YCQ (JI7GBI,op) 120,780- 732- 55- C- 15
JL1EDB 118,140- 716- 55- B- 15
JA6YCU 99,825- 609- 55- B- 15
JR3WXA 52,800- 362- 50- C- 15
JA2YAU (JE7MAY,op) 37,050- 247- 50- B- 15
JA4ETH 28,413- 231- 41- B- 15
JR7CDL 25,344- 192- 44- B- 15
JR5FHC 14,145- 115- 41- B- 15
JA9TSI 13,542- 122- 37- C- 15
JO1ACW 11,988- 111- 36- A- 15
JS1OSP/1 11,655- 111- 35- B- 15
JA6BJY 9,180- 102- 30- B- 15
JE7JZT 5,964- 71- 28- B- 15
JA8RJE 5,226- 67- 26- A- 15
JH1BUB 792- 22- 12- A- 15
JL1DUU 336- 16- 7- B- 15
JR7HOD 144- 8- 6- A- 15
JHØKHR 215,655- 1307- 55- B- 10
JA8RWU 177,744- 1058- 56- B- 10
JA9YBA (JA9VDA,op) 172,920- 1048- 55- C- 10
JG1NBD 171,879- 1081- 53- B- 10
JA1KFX 157,464- 972- 54- B- 10
JR3NZC 126,048- 808- 52- B- 10
JF1SEK 92,976- 596- 52- B- 10
JG3KIV 88,893- 581- 51- B- 10
JA2AXB 82,650- 551- 50- B- 10
JA1SJV 69,231- 491- 47- B- 10
JA6BIF 47,775- 325- 49- B- 10
JI1JVG 45,264- 328- 48- B- 10
JRØBQD 43,632- 303- 48- B- 10
JJ1VRO 40,698- 266- 51- B- 10
JG1GGF 33,087- 269- 41- B- 10
JA7XBG 29,256- 212- 46- B- 10
JA8CJY 27,864- 216- 43- B- 10
JA1OP 23,736- 184- 43- B- 10
JA2DHL 19,152- 152- 42- B- 10
JH7CJM 18,840- 157- 40- B- 10
JH4UTP 17,928- 166- 36- A- 10
JI1LAI 17,082- 146- 39- B- 10
JA1DFQ 16,848- 144- 39- B- 10
JH6TYD 13,653- 123- 37- B- 10
JA1EMQ 12,741- 137- 31- B- 10
JA2AJA 12,636- 117- 36- B- 10
JA1BUN 6,282- 81- 34- B- 10
JG1GZN 4,464- 62- 24- B- 10
JR2IGV 3,933- 57- 23- B- 10
JA3DLE/1 3,450- 50- 23- B- 10
JA6WIF 1,710- 30- 19- B- 10
JE8IUR 741- 19- 13- B- 10

Jordan

JY9SR 54,492- 239- 76- B

Asiatic RSFSR

UWØLT 1,560,510- 2477-210- C
UZ9CWW (RV9CFA,op) 500,310- 981-170- C
UAØQGB 247,203- 681-121- C
UA9QA 233,160- 580-134- C
UA9CDV 224,136- 566-132- C
UA9CBR 161,280- 448-120- C
UA9TS 135,750- 362-125- B
UAØLH 111,900- 373-100- B
UWØCM 84,150- 275-102- C
RAØJX 66,720- 278- 80- B
UA9FJZ 59,535- 245- 81- B
UA9WNR 58,032- 248- 78- B
UØAG 52,479- 343- 51- C
UW9CP 45,396- 194- 78- B
UA9URF 38,592- 192- 67- B
UV9CQ 32,913- 159- 69- C
RAØJD 31,758- 158- 67- B
RA9UKM 30,504- 248- 41- B
RAØSR 23,352- 139- 56- C
UAØFDX 4,272- 69- 18- C- 80
UAØFZ 2,064- 43- 16- C- 80
UAØSAU 192,930- 1090- 59- C- 20
UW9CO 160,893- 909- 59- C- 20
RAØJJ 125,721- 687- 61- C- 20
UA9YC 120,726- 706- 57- C- 20
UZ6HV/UAØQ 112,365- 681- 55- B- 20
UA9XHT 94,446- 583- 54- C- 20
UA9UPG 19,479- 151- 43- C- 20
UA9XCI 10,878- 98- 37- B- 20
UW9AU 7,584- 79- 32- C- 20
UAØCS 648- 24- 9- C- 20
UAØSR 29,283- 227- 43- C- 15
UA9CAX 7,812- 93- 28- B- 15
UA9OF 4,650- 62- 25- C- 15
UA9FAR 18,792- 174- 36- C- 10
UA9XB 17,280- 160- 36- C- 10
UA9YNC 4,425- 59- 25- B- 10

Azerbaijan

UD6DKW 21,744- 151- 48- C
UD6DFF 8,832- 92- 32- B- 20
RD6DJ 4,899- 71- 23- C- 10

Georgia

UF6QAC 215,757- 549-131- C
UF6FAL 22,491- 153- 49- B
UF6CX 18,972- 186- 34- B- 20

Uzbekistan

UI9ACQ 29,970- 222- 45- B- 20
RI8BQ 5,460- 65- 28- B- 20

Tadzhikistan

UJ8JCM 71,808- 272- 88- A
UJ8AQ 2,898- 42- 23- C- 20
UJ8JA 37,506- 266- 47- C- 15
UJ8XDH 9,282- 119- 26- B- 10

Kazakhstan

UL7CF 309,213- 731-141- C
UL7CD 4,293- 53- 27- B
UL7GDX 27,186- 197- 46- B- 20
UL7BX 44,556- 316- 47- B- 15
UL8LWF 24,420- 220- 37- C- 10
UL7BY 13,344- 139- 32- C- 10

Kirghizia

UM8DX 68,484- 439- 52- C- 20
RM8MO 45,750- 305- 50- C- 20
UM8MCF 10,098- 102- 33- B- 20
RM8MA 17,804- 163- 36- C- 15

HongKong

VS6UP 471,975- 1085-145- C

Europe

Portugal

CT1YF 183,522- 419-146- B
CT1AOZ 20,088- 186- 36- B- 160
CT4DX 10,197- 103- 33- B- 40

Federal Republic of Germany

DL1HBT 920,436- 1468-209- C

DKØSA (DJ1YJ,op)
287,826- 622-154-C
DL1TH 209,844- 522-134-C
DL5XAS 195,048- 504-129-B
DK2OY 190,017- 491-129-C
DL7CF 180,498- 449-134-C
DL2HQ 172,989- 447-129-A
DJ4OE 165,996- 477-116-C
DL2OBF 165,564- 438-126-B
DK3LM 143,352- 362-132-B
DL2HBX/A 137,880- 383-120-A
DL4YAO 128,418- 348-123-B
DL1ZQ 128,064- 368-116-B
DL4FN 123,735- 365-113-A
DL2GBB 79,002- 231-114-B
DF4PD 48,305- 315- 49-C
DK8AX 40,800- 170- 80-B
DF5XN 35,568- 208- 57-C
DJ3GE 24,833- 119- 69-B
DL6SF 22,572- 198- 38-A
DL9MDW 20,736- 128- 54-A
DL4ZBN 13,674- 106- 43-C
DL4GBR 13,500- 150- 30-A
DF3QN 11,880- 88- 45-B
DL1SBF 10,125- 75- 45-B
DL2DBS 1,677- 43- 13-B
DL2ZAE 122,430- 742- 55-C- 40
DK8LN 57,876- 364- 53-B- 20
DL6IU (DL4AAE,op)
178,424- 1068- 56-C- 15
DL4RX 141,246- 826- 57-C- 15
DL9OE 37,320- 311- 40-A- 15
DF4ZL 31,548- 239- 44-B- 15
DK8FD 200,070- 1170- 57-C- 10
DL8WW 164,883- 1037- 53-C- 10
DF1LX 146,190- 886- 55-C- 10
DF8WS 106,272- 656- 54-C- 10
DL6YAO 47,388- 359- 44-C- 10
DK7QB 47,235- 335- 47-C- 10
DL5GBG 40,098- 328- 41-C- 10
DJ1DB 25,440- 212- 40-C- 10
DL2JX 21,924- 203- 36-C- 10
DL1GGT 19,188- 164- 39-B- 10
DJ6TK 3,900- 52- 25-B- 10
DF8AN 189- 9- 7-C- 10

Spain

EA5YU 432,639- 907-159-C
EA4DUL 130,572- 372-117-B
EA3DBO 113,526- 367-106-B
EA4EP 91,200- 320- 95-B
EA2CR 84,746- 218- 99-B
EA7CIW 57,570- 190-101-B
EA5BZM 42,240- 220- 64-B
EA1JO 40,824- 168- 81-C
EA3KT 24,480- 136- 60-B
EA3GGV 24,408- 113- 72-B
EA5EYP 21,996- 156- 47-B
EA4BV 18,408- 104- 59-B
EA1GT 9,360- 120- 26-A
EA3DGM 8,640- 90- 32-C
EA7AAW 34,194- 278- 41-B- 20
EA7AZA 11,040- 115- 32-B- 15
EA7KW 21,648- 164- 44-B- 10
EA7XC 11,340- 126- 30-B- 10
EC7DMU 5,670- 63- 30-B- 10

Balearic Islands

EA6QN 22,875- 125- 61-B

Ireland

EI5DI 50,490- 198- 85-A
EI4DQ 17,613- 103- 57-A
EI9J 16,023- 109- 49-B
EI1AA 189,090- 1146- 55-B- 10
EI9FK 132,447- 833- 53-B- 10

France

F6BEE 677,286- 1146-197-C
F6EPQ 324,564- 731-148-C
FD1MWW 198,120- 636-104-B
F6FYA 84,915- 555- 51-C
FD1NIX 75,396- 244-103-B
F1JDG 69,564- 341- 68-B
F8BB 38,348- 154- 83-B
F5AM 32,760- 156- 70-B
F3BC 21,060- 117- 60-B
F6CCI 16,695- 105- 53-B
F8TM 9,324- 74- 42-B
F6EPO 19,584- 204- 32-B- 80
F1JKQ 20,757- 187- 37-B- 40
FD1NLX 1,536- 32- 16-B- 40
F6DKV 133,110- 765- 58-C- 15
F8DK 29,532- 214- 46-B- 15
F8TQ 26,004- 197- 44-B- 15
FV9NDX 230,340- 1398- 55-C- 10
F6EQV 21,201- 191- 37-B- 10
F9QE 13,260- 130- 34-B- 10

England

G3FXB 2,707,848- 3432-263-B
G3SJX 1,084,332- 1658-218-B
G4BUO 504,900- 850-198-B
G3ESF 335,988- 732-153-B
G2QT 247,752- 558-148-B
G3APN 241,152- 512-157-B
G2HPF 238,464- 552-144-B
G3HJF 128,100- 350-122-B
G3WRR 61,560- 228- 90-B
G6NK 56,133- 231- 81-B
G4ZME 26,730- 185- 54-B
G2HDR 15,525- 115- 45-B
G3IJV 6,840- 57- 40-A
G8IDE 3,894- 58- 22-B- 40
G4OTY 513- 19- 9-B- 40
G3JKY 17,880- 149- 40-B- 20
G4CNY 232,389- 1359- 57-B- 15
G3MXJ 165,816- 987- 56-B- 15
G4BKI 73,062- 451- 54-B- 15
GB6DX (G6CLY,op)
12,240- 120- 34-B- 15
G3SXW 205,713- 1203- 57-B- 10
G3SQX 72,150- 481- 50-B- 10
G4ARI 23,760- 198- 40-B- 10
G0KDZ 20,298- 199- 34-B- 10

Scotland

GM3LYY 226,440- 510-148-B
GM4HQF 67,032- 268- 84-A
GM4CXM 193,104- 1192- 54-B- 10
GM3CFS 32,535- 241- 45-B- 10

Wales

GW3NYY 318,600- 708-150-B
GW4UOL/P (G4UOL,op)
248,024- 536-153-B
GW3HGJ 15,228- 141- 36-B- 40
GW3JI 26,322- 214- 41-B- 20
GW4BLE (G3WVG,op)
280,056- 1667- 56-B- 10

Hungary

HA0NNN 1,161,888- 1862-208-C
HA0HW 667,584- 1216-183-C
HA3NU 428,665- 796-178-C
HA6NW 273,294- 723-126-B
HA5KF 225,792- 588-128-B
HA0LM 166,402- 1021- 54-C
HA8XX 113,670- 421- 90-B
HA6IAM 109,368- 372- 98-B
HA1SL 100,116- 324-103-B
HA2RQ 48,840- 220- 74-C
HA7ML 46,560- 194- 80-B
HA4DB 43,617- 217- 67-B
HA2MF 34,920- 194- 60-B
HA8ZD 33,642- 267- 42-B
HA7ZT 11,316- 82- 46-B
HA5AGS 22,230- 199- 39-B- 40
HA6VA 26,190- 194- 45-B- 20
HA6WR 11,220- 110- 34-B- 15

Switzerland

HB9AGA 1,091,913- 1829-199-C
HB9BGU 196,500- 500-131-C
HB9AGH 174,636- 462-126-B
HB9ADD 169,176- 424-133-A
HB9DDZ 96,360- 292-110-C
HB9DFY 95,400- 300-108-B
HB9COL 67,158- 246- 91-B
HB9RE 46,833- 233- 67-B
HB9XY 28,188- 162- 58-A
HB9AYZ 9,612- 89- 36-B
HB9DX 58,448- 384- 49-C- 10
HB9DAX 14,148- 131- 36-A- 10

Italy

IK8FWI 818,496- 1421-192-B
W9LTI/I0 423,429- 899-157-B
I2SVA 337,365- 765-147-C
I0KHP 85,680- 255-112-A
IK0FUX 45,390- 178- 85-B
IK8FEC 18,432- 96- 64-C
I1VTX 357- 17- 7-B
IK4GNK 60- 5- 4-C- 80
I2VXJ 141,960- 845- 56-C- 40
IQ7LMR 10,368- 96- 36-B- 20
IV3ALI 5,184- 72- 24-C- 20
IK0ADY 4,680- 65- 24-B- 20
I4IND 257,172- 1478- 58-C- 15
IK2GSN 142,725- 865- 55-C- 15
IK2AHB 87,320- 408- 55-B- 15
IK4HLO 56,301- 383- 49-B- 15
IK2EGL 190,350- 1175- 54-C- 10
IO3VJW 177,408- 1056- 56-C- 10
I1XPQ 59,364- 388- 51-B- 10
IK1GPH 7,482- 88- 29-C- 10

Sardinia

IS0OMH 159,375- 425-125-B
IS0LYN 51,840- 192- 90-A
IS0ILDT 2,442- 37- 22-A- 10

Norway

LA1EE 199,800- 450-148-C
LA6FC 188,136- 468-134-C
LA1T (LA4BQ,op)
177,246- 458-129-B
LA9VDA 46,956- 182- 86-A
LA3WBA 15,900- 100- 53-B
LA4BY 12,672- 96- 44-B
LA6MP 1,200- 25- 16-C
LA9HW 24,852- 218- 38-C- 40
LA6PB 660- 20- 11-B- 40
LA4HJ 100,842- 686- 49-C- 10
LA8DY 23,885- 215- 37-B- 10

Bulgaria

LZ2TU 756,090- 1355-186-C
LZ1KNP 183,300- 470-130-C
LZ2JE 140,580- 355-132-C
LZ2QV 68,208- 232- 98-B
LZ1KBL 41,400- 300- 46-B
LZ1KAZ 12- 2- 2-C- 160
LZ1YA 630- 21- 10-B- 80
LZ1V 123,462- 722- 57-C- 40
LZ1GC 84,240- 520- 54-C- 40
LZ1W (LZ1BP,op)
190,836- 1116- 57-C- 15
LZ1QN 17,115- 169- 35-B- 15
LZ1KKR 2,916- 54- 18-C- 15
LZ1KDP 148,680- 885- 56-C- 10
LZ1KSP 107,406- 663- 54-C- 10
LZ2AX 83,400- 556- 50-C- 10
LZ1KVZ 76,140- 564- 45-C- 10

Austria

OE3JOS 253,524- 571-148-C
OE3RE 132,480- 384-115-B
OE9SLH 65,988- 234- 94-C
OE7SEL 6,696- 62- 36-B
OE6IMB 46,224- 321- 48-B- 10

Finland

OH1AF 1,398,879- 2091-223-C
OH6YF 1,082,988- 1796-201-C
OH2PM 932,988- 1532-203-C
OH2AQ 688,896- 1248-184-C
OH6AP 613,200- 1169-175-C
OH4RH 477,840- 905-176-C
OH3JF 311,892- 658-158-C
OH6NEV 133,623- 441-101-C
OH3NM 119,667- 353-113-C
OH6MM 93,024- 323- 96-B
OH1AI 40,950- 195- 70-C
OH1NSJ 9,450- 70- 45-B
OH7MA 224,448- 1336- 56-C- 20
OH1AA (OH1SY,op)
95,742- 591- 54-C- 20
OH7NW 6,384- 76- 28-B- 20
OH1/DL1KAV 189- 9- 7-A- 20
OH6MCW 219,744- 1308- 58-C- 15
OH5NFS 80,676- 498- 54-C- 15
OH6NVC 44,280- 369- 40-B- 15
OH5RZ 819- 21- 13-C- 15
OH6RC 16,200- 135- 40-B- 10
OH2EJ 15,873- 143- 37-B- 10

Aland Island

OH0PA 78,957- 283- 93-B

Czechoslovakia

OK1ALW 2,423,250- 3231-250-C
OK2BFN 1,217,040- 1844-220-C
OK1VD 985,017- 1571-209-C
OK2HI 164,580- 422-130-B
OK2ABU 146,109- 431-113-C
OK1KZ 144,228- 404-119-B
OK1MIN 133,140- 317-140-B
OK1GS 132,305- 365-119-B
OK3FON 110,214- 314-117-B
OK2YN 104,751- 339-103-B
OK1MNW 99,600- 332-100-B
OK3CEL 92,160- 320- 96-B
OK1FGU 87,210- 342- 85-B
OK1DXW 83,538- 273-102-B
OK1AXB 80,700- 269-100-B
OK1DWC 57,474- 206- 93-B
OK2XA 48,240- 201- 80-B
OK3TCF 42,639- 233- 61-B
OK2PFP 39,990- 215- 62-B
OK1AJY 39,648- 224- 59-B
OK1FGS 37,590- 179- 70-B
OK1MZO 36,270- 195- 62-B
OK1DKR 30,615- 157- 65-A
OK1DMQ 28,182- 154- 61-B
OK3CXS 26,730- 165- 54-B
OK3TFY 25,920- 192- 45-B
OK1DZD 25,308- 148- 57-A
OK3CTX 23,667- 161- 49-C
OK3CWF 18,900- 126- 50-B
OK2PAW 16,200- 135- 40-A
OK2AJ 15,972- 121- 44-B
OK2OVZ 12,915- 105- 41-C
OK2ON 10,701- 87- 41-B
OK1DJD 5,301- 57- 31-A
OK1FIW 4,356- 44- 33-B
OK2KHD 3,393- 39- 29-B
OK1JDJ 2,040- 34- 20-B
OK1KRJ 960- 20- 16-B
OK1DRQ 324- 12- 9-A
OK1DFP 1,728- 36- 16-C- 160
OK1JDX 90- 6- 5-C- 160
OK2FD 8,073- 117- 23-C- 80
OK1FGC 5,922- 94- 21-B- 80
OK2BCI 68,939- 421- 53-C- 40
OK3CGN 6,804- 81- 28-B- 40
OK3TEC 3,402- 54- 21-B- 40
OK3CVI 2,640- 55- 16-B- 40
OK3KAG 161,112- 959- 56-C- 20
OK2PLH 42,900- 275- 52-B- 20
OK3CMW/P 42,723- 303- 47-C- 20
OK2PKS 22,137- 157- 47-B- 20
OK2BWH 18,360- 153- 40-C- 20
OK1MKI 15,984- 144- 37-B- 20
OK1DWU 15,444- 143- 36-B- 20
OK1SZ 14,805- 141- 35-B- 20
OK1DHB 12,420- 115- 36-B- 20
OK1FKI 12,000- 125- 32-B- 20
OK3TNA 7,728- 92- 28-A- 20
OK2BNZ 6,510- 70- 31-B- 20
OK1MHI 4,824- 67- 24-B- 20
OK1AQW 4,347- 63- 23-A- 20
OK1MWN 2,112- 32- 22-B- 20
OK2BBJ 2,109- 37- 19-C- 20
OK1HR 1,536- 32- 16-A- 20
OK1DOH 1,488- 31- 16-B- 20
OK1DXK 561- 17- 11-A- 20
OK3GI 139,608- 831- 56-C- 15
OK2BHV 127,380- 772- 55-C- 15
OK2EC 118,305- 717- 55-C- 15
OK2QX 62,700- 418- 50-C- 15
OK2VX 17,544- 172- 34-B- 15
OK1DCF 13,335- 127- 35-B- 15
OK1MKD 5,796- 84- 23-B- 15
OK3NA 176,094- 1087- 54-C- 10
OK1TW 39,285- 291- 45-C- 10
OK2SG 39,204- 297- 44-B- 10
OK3UG 26,190- 194- 45-B- 10
OK1MNW 14,688- 136- 36-C- 10
OK2PO 14,595- 139- 35-C- 10
Ok2PBG 10,656- 111- 32-A- 10
OK2BHE 9,450- 105- 30-B- 10
OK2BGQ 8,214- 74- 37-B- 10
OK2BHQ 6,552- 78- 28-C- 10
OK1MSO 4,464- 62- 24-B- 10
OK1DHJ/P 4,260- 71- 20-A- 10
OK3YDP 1,581- 31- 17-B- 10
OK2PXJ 252- 12- 7-B- 10

Belgium

ON4YN 551,598- 1234-149-C
ON1KFM 87,009- 299- 97-B
ON6CW 80,655- 283- 95-B
ON5WL 1,911- 49- 13-C- 80
ON4XG 43,218- 294- 49-B- 20
ON6LO 29,985- 195- 41-B- 20
ON5MT 7,560- 84- 30-B- 20
ON7CC 14,904- 138- 36-B- 15
ON5CW 4,752- 66- 24-B- 15

Faroe Island

OY3QN 163,944- 1012- 54-C- 10

Denmark

OZ1LO 1,929,096- 2748-234-C
OZ4RS 269,892- 714-126-B
OZ7OP 58,743- 183-107-B
OZ5UR 46,170- 171- 90-B
OZ4CG 41,586- 239- 58-B
OZ1JVN 13,653- 111- 41-A
OZ1JSZ 6,216- 56- 37-B
OZ1FTE 101,136- 802- 56-C- 40
OZ2E 11,583- 117- 33-C- 40
OZ7HT 11,424- 119- 32-C- 40
OZ5WQ 3,975- 53- 25-B- 40
OZ9BX 912- 19- 18-B- 40
OZ4UN 84,504- 503- 56-B- 20
OZ7YL 28,380- 220- 43-C- 20
OZ3PE 26,224- 224- 42-A- 20
OZ9MM 1,092- 28- 13-B- 20
OZ8XO 855- 19- 15-B- 20
OZ1KPB 42,159- 299- 47-B- 10
OZ8AE 28,854- 229- 42-B- 10
OZ1BUR 23,940- 190- 42-B- 10
OZ7AX 2,268- 42- 18-B- 10
OZ8E 720- 20- 18-B- 10

Netherlands

PA0CLN 381,270- 710-179-B
PA9XPQ 278,880- 581-180-C
PA3CWL 241,776- 552-146-B
PA3FCD 121,808- 402-101-B
PA0JPA 97,644- 316-103-A
SM6LQG/PA 93,564- 276-113-B
PA0ADT 85,995- 315- 91-A
PA3DUA 61,509- 203-101-B
PA3BTH 50,844- 223- 76-B
PA0CF 29,784- 136- 73-B
PA6YN 19,221- 149- 43-B
PA3CAL 12,972- 94- 46-A
PA3ALV 11,742- 103- 38-B
PA3BNH 10,560- 80- 44-B
PA3ELD 9,768- 74- 44-A
PA0PLN 7,980- 76- 35-B
PA3EOB 5,046- 58- 29-B
PA3BNT 3,420- 57- 20-B- 40
PA3ABA 936- 24- 13-A- 40
PA2REH 89,676- 564- 53-B- 15
PA0UV 41,952- 304- 46-B- 10
PA3DMH 29,832- 226- 44-B- 10
PA3BBP 11,340- 105- 36-B- 10
PA2CHM 1,050- 25- 14-B- 10

Sweden

SK6PC 952,083- 1793-177-C
SM6DHU 684,138- 1253-182-C
SM3EVR 618,129- 1191-173-C
SM0CCE 456,450- 850-179-C
SM3GSK 323,379- 809-177-C
SM3CER 225,854- 526-143-C
SM6BGG 215,712- 642-112-B
SM0BDS 180,972- 457-132-B
SK0UX (SM6JHF,op)
180,414- 514-117-C
SM5ARL 138,750- 370-125-B
SM0TW 123,878- 333-124-C
SM5RE 107,415- 341-105-C
SM5CLE 98,604- 332- 99-A
SM5IDO 77,805- 273- 95-B
SM5CAK 64,500- 250- 86-C
SM3CVM 33,930- 145- 78-B
SM0OFW 33,180- 158- 70-B
SM6CST 27,540- 135- 68-C
SM7EH 23,430- 142- 55-C
SM7CZC 1,800- 30- 20-A
SM5DQC 15,540- 140- 37-C- 40
SM6HVR 33,480- 248- 45-B- 20
SM0BVQ 29,400- 200- 49-C- 20
SM7TV 22,275- 165- 45-B- 20
SM3KMB 21,168- 168- 42-C- 20
SM5DUT 18,090- 134- 45-C- 20
SM5MX 7,980- 95- 28-A- 20
SM3OAU 4,104- 57- 24-B- 15
SM6BSK 55,695- 395- 47-B- 10
SM5IMO 42,525- 315- 45-C- 10
SM6LWH 17,370- 193- 30-B- 10
SM4ASI 10,710- 102- 35-B- 10

Poland

SP3HC 92,302- 319- 86-B
SP9EMI 79,705- 265- 99-B
SP2BME 45,120- 188- 80-C
SP1AEN 21,870- 135- 54-B
SP5CJQ 14,081- 109- 43-A
SP9EQS 8,175- 109- 25-C
SP9FKQ 234- 13- 6-B- 80
SP9DGO 135- 9- 5-C- 80
SP3RBR 78,069- 491- 53-C- 40
SP5ELA 55,554- 394- 47-B- 40
SP2FAP 27,135- 201- 45-B- 40
SP5JXK 11,682- 118- 33-B- 40
SP9CVY 3,465- 55- 21-B- 40
SP3JIA 3,300- 50- 22-C- 40
SP2FCX 2,115- 47- 15-B- 40
SP2ASJ 49,545- 367- 45-B- 20
SP2JGK 20,064- 152- 44-C- 20
SP8CXH 12,075- 115- 35-B- 20
SP4GFG 10,179- 117- 29-A- 20
SP3MEY 9,600- 100- 32-B- 20
SP2JKC/3 189,488- 1089- 58-C- 15
SP6HEK 63,668- 393- 54-B- 15
SP5JTR 17,280- 144- 40-B- 15
SP5KVW 119,808- 768- 52-C- 10
SP5DIR 78,030- 510- 51-C- 10
SP5ALV 41,712- 316- 44-B- 10
SP3SUX 36,564- 277- 44-A- 10
SP3LPR 9,156- 109- 28-B- 10
SP9AJT 8,840- 76- 30-B- 10

Greece

SV1RP/SV2 272,415- 715-127-B

Crete

SV8CR/9 42,480- 177- 80-C

Iceland

TF3SD 21,798- 173- 42-B- 15
TF3CW 32,292- 299- 36-C- 10

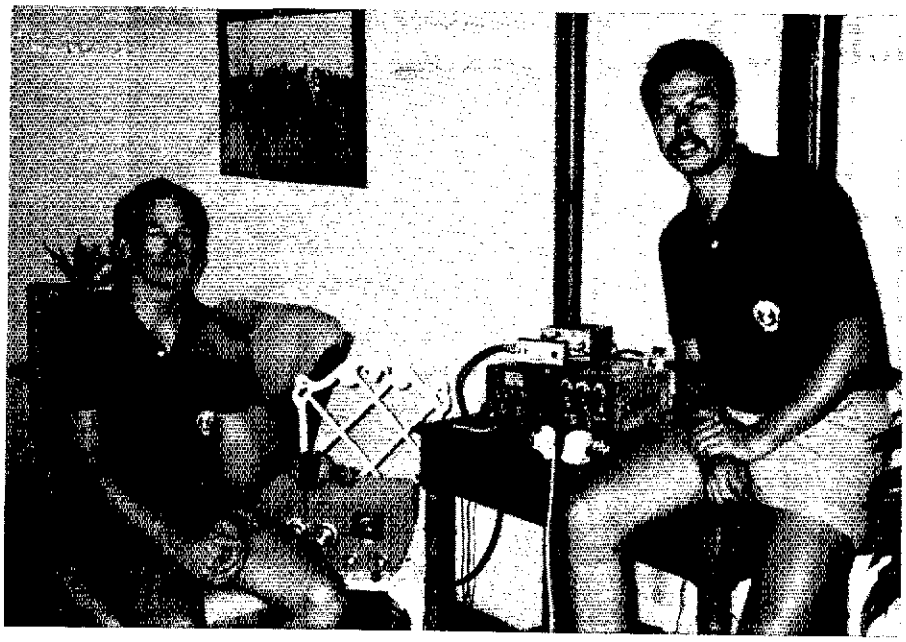
Kaliningrad

UA2FZ 209,976- 673-104-C
UA2EC 22,440- 187- 40-B- 15

European Russian RSFSR

UZ4FWD 440,112- 848-173-C
UW3ZV 376,329- 798-157-C
UA4HFK 191,438- 602-106-C
UA6EED 152,781- 401-127-B
UA3LAR 146,376- 428-114-C
UZ3AC 128,400- 400-107-C
RZ3AA 111,945- 439- 85-C
UV6HFK 87,210- 306- 95-B
UV3DN 81,528- 316- 86-C
RW3AH 79,443- 273- 97-B
RA3VA 78,982- 254-101-B
UV6AAQ 71,823- 269- 89-B
RA3YH 67,575- 265- 85-C
UA1AFM 65,018- 301- 72-B
RV1AF 63,516- 268- 78-C
UV3DA 62,250- 250- 83-C
UA1QBQ 60,000- 250- 80-B
UA4ALI 52,398- 213- 82-C
UA4WFE 49,350- 235- 70-B
UA4RL 43,890- 190- 77-C
UV6LEC 36,480- 160- 76-B
UA4ANZ 33,165- 165- 67-C
UA3THA 32,400- 180- 60-B
UA1AUA 32,319- 171- 63-B
UA4NCI 29,058- 167- 58-C
UA6YHR 28,620- 159- 60-B
UA3OJC 22,500- 150- 50-B
UA3DRG 18,488- 108- 57-B
UA4QK 16,899- 131- 43-B
UA1NDR 15,450- 103- 50-B
UA4PMO 14,694- 79- 62-B
RA4AI 10,824- 82- 44-C
UW6QE 10,788- 124- 29-B
RV6ACZ 9,936- 92- 36-B
UA6LFQ 2,331- 37- 21-B
UA3YBJ 180- 10- 6-B- 80
UW6NV 36,340- 284- 45-C- 40
RA4PC 21,546- 171- 42-C- 40
UA8LTI 17,535- 167- 35-B- 40
RA3DX 15,720- 131- 40-C- 40
UA6HRZ 15,540- 148- 35-C- 40
RA3EA 12,240- 120- 34-C- 40
RZ3DM 9,408- 98- 32-C- 40
UA3DJY 672- 16- 14-B- 40
UA4WI 181,956- 1028- 59-C- 20
UA4ANO 124,062- 713- 58-C- 20
UA4FZ 119,712- 688- 58-C- 20
RA3ZC 90,972- 532- 57-C- 20
UA4WEJ 55,500- 370- 50-B- 20
UW3HY 48,576- 352- 48-C- 20
UV3ADW 29,520- 205- 48-C- 20
UA3TU 27,000- 200- 45-C- 20
UA3IIA 20,640- 160- 43-B- 20
UA1ANA 19,200- 160- 40-B- 20
UA6HSV 16,146- 138- 39-B- 20
RA1QM 15,561- 133- 39-B- 20
UA6LIG 13,923- 119- 39-B- 20
UZ6HO 13,407- 109- 41-C- 20
UA1AGZ 11,328- 118- 32-B- 20
UV6LDP 4,950- 66- 25-B- 20
UA4NF 2,820- 47- 20-B- 20
UA6BPM 32,121- 244- 43-B- 15
UA3EAT 14,364- 133- 36-B- 15
UA4YJ 14,160- 118- 40-C- 15
RA3DOL 13,545- 129- 35-A- 15
UA3YAO 12,800- 120- 35-B- 15
RW3DC 8,652- 103- 28-B- 15
RA3DJA 7,650- 85- 30-B- 15
UV6LIX 4,275- 57- 25-A- 15
RA3ZB 1,530- 34- 15-C- 15
RA3QR 82,181- 441- 47-C- 10
UA4HNP 46,125- 375- 41-B- 10
RW3DA 5,382- 78- 23-A- 10
UA6HPW 1,332- 37- 12-B- 10

Pedro, YV6PM, played 10-meter phone and won from Venezuela.



Doug, WD8AUB, and "Goose", WD8LLD, team-up to operate 6Y5L and win first-place, Multi-two, CW world.

Ukraine

UB5QKC	737,118-	1321-186-C		
RB5GW	601,866-	1153-174-C		
RT5UO	437,712-	829-176-C		
UB5IAN	294,450-	650-151-B		
UB5PAG	235,494-	534-147-B		
UB5CGN	207,378-	562-123-B		
UB5QKN	134,784-	416-108-B		
UT4UZ	119,682-	366-109-C		
UB5GDF	118,437-	407- 97-B		
UB4TWL	93,480-	328- 95-C		
UB5EF	85,860-	270-106-C		
UB4LCB	81,540-	302- 90-B		
UY5TE	60,480-	288- 70-C		
UB5TN	58,509-	197- 99-C		
UB4LAT	55,695-	235- 79-B		
UB5IIH	42,840-	170- 84-B		
UB5KV	38,934-	206- 63-C		
UT5LF	27,900-	155- 60-C		
RB5EKB/UB5V	24,072-	136- 59-B		
UB5EPV	21,708-	134- 54-B		
RB5JS	17,136-	112- 51-B		
UB4QJ	14,124-	107- 44-B		
UB5LFG	12,222-	97- 42-B		
UB5IFN	6,912-	96- 24-C-	80	
RB5LO	5,520-	92- 20-C-	80	
UT3UA	24,552-	186- 44-B-	40	
UB5ZBG	12,648-	124- 34-C-	40	
UB4LDD	10,266-	118- 29-B-	40	
UB5LCV	9,216-	96- 32-C-	40	
UB5REF	4,950-	75- 22-B-	40	
UY5WA	3,249-	57- 19-B-	40	
UB5MA	2,709-	43- 21-B-	40	
RB5MA	134,160-	860- 52-C-	20	
UT4UW	19,188-	156- 41-C-	20	
RB5WR	18,720-	160- 39-C-	20	
UB5MQS	18,396-	146- 42-B-	20	
RB5RF	17,712-	144- 41-C-	20	
UB5NBW	16,317-	147- 37-C-	20	
UB5JNW	16,188-	142- 38-B-	20	
RB5FT	15,444-	143- 36-B-	20	
RB5XQ	14,916-	113- 44-C-	20	
UB5VK	3,264-	64- 17-B-	20	
UB5MMP	1,581-	31- 17-B-	20	
UB5SBR	330-	11- 10-B-	20	
U5WF	172,536-	1027- 56-C-	15	
JT4UX	82,467-	539- 51-C-	15	
UB4UFT	20,628-	191- 36-A-	15	
JT5ULJ	7,242-	71- 34-C-	15	
UB5JAP	1,632-	32- 17-B-	15	
UB5ZCW	134,655-	955- 47-C-	10	
UB7VA	51,606-	356- 47-B-	10	
UB5CDX	20,709-	177- 39-B-	10	
UB5ZEL	9,000-	100- 30-A-	10	
RB5QW	8,400-	100- 28-C-	10	
UB5FJA	3,174-	46- 23-A-	10	

Byelorussia

RC2CR	201,188-	528-127-C	
UC2ADX	59,400-	398- 50-C-	40
UC2OG	68,750-	445- 50-C-	20
UC2CBR	8,874-	102- 29-B-	20
UC2ACZ	10,812-	106- 34-C-	15
UC2AGT	3,717-	59- 21-B-	15
UC2AT	1,995-	35- 19-B-	15
UC2OL	121,863-	829- 49-C-	10

Moldavia

RO4OA	340,680-	835-136-B	
UO5OAL	103,200-	430- 80-C	
UO5ONV	96,672-	304-106-B	
UO5ON	92,115-	345- 69-B	
UO5ODA	12,285-	117- 35-B-	15

Lithuania

UP3BA	1,715,472-	2508-228-C	
LY2WR (UP2BIL,op)			
	1,117,080-	1605-232-C	
UP2BOC	75,690-	290- 87-B	
UP2PAQ	14,850-	150- 33-B	
UP2BBF	14,382-	102- 47-C	
UP2BPO	6,075-	75- 27-B-	40
UP2BEI	66,990-	406- 55-B-	20
UP2BB	11,772-	109- 36-B-	20
LY2WW (UP2-838-1162,op)			
	143,208-	936- 51-C-	10
UP2DM	74,448-	517- 48-C-	10

Latvia

UQ2GEO	28,602-	227- 42-B-	20
UQ2GMB	16,308-	151- 36-B-	15

Estonia

UR2QD	474,594-	953-166-C	
RR2RW	6,966-	54- 43-C	
UR2RNG	10,583-	107- 33-C-	20
UR2RND	16,206-	146- 37-C-	10
UR2RHF	16,014-	157- 34-C-	10

German Democratic Republic

Y42MK	2,117,424-	2846-248-C	
Y33VL	1,793,475-	2657-225-C	
Y21RM/A	1,620,066-	2269-238-C	
Y43GO	494,592-	896-184-C	
Y51XE	474,768-	942-168-C	
Y27IO	421,428-	812-173-C	
Y44NO	278,400-	640-145-C	
Y22IC	219,252-	484-151-C	
Y25ZN/A	205,335-	507-135-B	
Y32WF	202,692-	508-133-C	
Y39ZH	162,192-	436-124-C	
Y21BE/A	157,248-	504-104-C	
Y49RF	152,490-	391-130-B	
Y55TJ	132,804-	357-124-C	
Y62SD/P	126,630-	402-105-B	
Y36XC	113,904-	336-113-B	
Y43TD	111,492-	326-114-C	
Y35ZJ	104,133-	337-103-B	
Y62QH	101,115-	321-105-B	
Y23RJ/P	86,814-	318- 91-B	
Y56WG	84,039-	257-109-C	
Y22BK	81,672-	328- 83-B	
Y23OH/A	79,443-	273- 97-B	
Y74XG	74,676-	254- 98-B	
Y72SI	74,580-	220-113-B	
Y23GB	69,840-	240- 97-B	
Y36BC	66,639-	229- 97-B	
Y44UI	62,379-	239- 87-B	
Y41ZH	57,810-	235- 82-C	
Y24MI	47,880-	210- 76-C	
Y22HF	46,665-	183- 85-B	
Y32JK	42,984-	199- 72-C	
Y27YH/A	41,070-	185- 74-C	
Y21WI	40,716-	174- 78-C	
Y26JD	38,532-	247- 52-A	
Y24YH	37,908-	162- 78-C	
Y22LE	36,360-	202- 60-B	
Y37ZM	36,252-	159- 76-B	
Y36TI	36,120-	172- 70-B	
Y32PI/P	35,424-	164- 72-B	
Y42VN/P	33,600-	160- 70-C	
Y22SC	32,256-	168- 64-A	
Y23TL	31,692-	139- 76-A	
Y56YE	25,704-	136- 63-C	
Y25PE	22,794-	131- 58-B	
Y43RJ	22,260-	140- 53-B	
Y26XM	19,866-	154- 43-C	
Y22KO	17,820-	110- 54-B	
Y24ZM	17,280-	120- 48-B	
Y71VA	17,052-	116- 49-B	
Y32TD	15,738-	122- 43-B	
Y23YJ/P	15,207-	137- 37-B	
Y21EA	14,151-	89- 53-B	
Y21NE	13,794-	121- 38-A	
Y22AN/A	13,674-	108- 43-C	
Y61XM	8,424-	78- 36-B	
Y24HJ	8,295-	79- 35-B	
Y39ZC/Y56ZC	8,435-	85- 33-B	
Y83ZN	5,394-	62- 29-B	
Y23LM	5,355-	51- 35-B	
Y36VF/P	4,959-	57- 29-B	
Y24HB	4,212-	52- 27-C	
Y21IM	4,131-	51- 27-B	
Y21RG/A	3,969-	49- 27-C	
Y37ZK	3,174-	46- 23-C	
Y26DM	2,880-	40- 24-C	
Y67UL	2,850-	38- 25-B	
Y25DA	1,914-	29- 22-B	
Y38YB	672-	16- 14-B	
Y41JH	312-	13- 8-B	
Y26LG	75-	5- 5-B	
Y25JA	18-	3- 2-A-	80
Y25TG	11,187-	113- 33-C-	40
Y22FG/A	7,998-	86- 31-C-	40
Y25MG	3,782-	57- 22-B-	40
Y68YF/P	1,350-	30- 15-B-	40
Y28RL	513-	19- 9-C-	40
Y25IJ	252-	12- 7-C-	40
Y21EF	31,950-	213- 50-C-	20
Y23WM	16,872-	152- 37-C-	20
Y54WM/P	15,960-	140- 38-B-	20
Y23CM	11,988-	108- 37-B-	20
Y23HN	10,584-	98- 36-B-	20
Y67XI	10,260-	95- 36-B-	20
Y21GO	7,740-	86- 30-B-	20
Y27GL	6,873-	79- 29-B-	20
Y26SO	6,699-	77- 29-B-	20
Y22CF	6,480-	80- 27-B-	20
Y65LN	6,480-	80- 27-B-	20
Y32NL	6,438-	74- 29-B-	20
Y22UN	4,392-	61- 24-A-	20
Y92ZL	4,248-	59- 24-B-	20
Y77YH	4,140-	69- 20-B-	20
Y26WM	3,822-	49- 26-B-	20
Y24TG	3,780-	60- 21-A-	20
Y56ZA	2,484-	36- 23-C-	20
Y23JN	1,710-	30- 19-A-	20
Y22XN	1,200-	25- 16-B-	20
Y23HJ	684-	19- 12-B-	20
Y24XA	55,800-	372- 50-C-	15
Y52ZL	29,151-	237- 41-B-	15
Y35WF	28,756-	213- 45-B-	15
Y37ZE	26,730-	198- 45-B-	15
Y23KF	26,532-	201- 44-B-	15
Y28WG/A	11,865-	113- 35-B-	15
Y31WI	9,504-	98- 32-B-	15
Y55XH	8,712-	88- 33-B-	15
Y42ZG	8,217-	83- 33-B-	15
Y37WK	3,366-	51- 22-B-	15
Y51QL	663-	17- 13-C-	15
Y23DL	180,350-	1175- 54-C-	10
Y32KE	93,492-	636- 49-C-	10
Y22TO	53,016-	376- 47-C-	10
Y22PF	35,376-	268- 44-B-	10
Y21DG/A	22,600-	190- 40-B-	10
Y25TO	19,872-	184- 36-C-	10
Y24JJ	17,760-	160- 37-C-	10
Y27PN/P	16,986-	149- 38-C-	10
Y21YA	16,758-	147- 38-B-	10
Y26TO	14,553-	147- 33-C-	10
Y26DO	12,240-	120- 34-C-	10
Y26BH	8,910-	99- 30-B-	10
Y36VM	8,613-	99- 29-B-	10
Y23YE	8,160-	85- 32-B-	10
Y33RA	7,722-	99- 26-C-	10
Y25PA	7,176-	104- 23-B-	10
Y22JF	5,796-	69- 28-B-	10
Y25MG/A	5,727-	83- 23-B-	10
Y31UE	3,024-	48- 21-B-	10
Y62XG	3,009-	59- 17-C-	10
Y28GO/A	1,620-	30- 18-C-	10

Romania

YO8FR	23,184-	138- 56-B	
YO7BGA	14,628-	106- 46-B	
YO5KTS	4,368-	56- 26-B-	40
YO8DHC	3,630-	55- 22-B-	40
YO5BQ	3,078-	38- 27-A-	40
YO5CUU	2,754-	54- 17-A-	40
YO4DCF	2,565-	45- 19-B-	40
YO3LX	2,064-	43- 16-C-	40
YO4AAC	27-	3- 3-B-	40
YO9HP	32,379-	251- 43-C-	20
YO9DAF	13,320-	120- 37-B-	20
YO4BQV	9,270-	103- 30-B-	20
YO5ALH	9,207-	99- 31-B-	20
YO9HG	891-	27- 11-B-	20
YO4ZF	14,985-	135- 37-B-	15
YO6EZ	6,300-	75- 28-C-	15
YO4BQV	4,536-	54- 28-B-	10

Yugoslavia

YU2TY	351,360-	732-160-A	
YT3AU	172,995-	607- 95-B	
YU3ND	75,078-	291- 86-B	
YU7RU	22,176-	132- 56-C	
YU2EY	15,300-	100- 51-A	
YU3SX	8,904-	106- 28-B	
4N1A (YU1EA,op)	20,868-	188- 37-C-	80
YU2VR	14,337-	177- 27-C-	80
YU7KM	198-	11- 6-C-	80
YT7A (YU7GO,op)			
	120,042-	741- 54-C-	40
YU4CC	118,944-	708- 56-C-	40
YT3GP	114,534-	707- 54-C-	40
YU1KQ	108,120-	680- 53-C-	40
YT2D (YU2TS,op)			
	102,708-	634- 54-C-	40
YU7LS	8,670-	85- 34-B-	40
YZ1U	292,320-	1740- 56-C-	20
4N2V	255,474-	1494- 57-C-	20
YU2CAH	9,744-	112- 29-B-	20
4N3E (YT3UT,op)			
	169,119-	989- 57-C-	15
YU1WR	152,874-	894- 57-C-	15
YU3EQ	136,125-	825- 55-C-	15
YU3AI	133,392-	794- 56-C-	15
YZ3A (YU3BC,op)			
	247,779-	1449- 57-C-	10
YU7DR	240,912-	1434- 56-C-	10
4N1W (YU2EU,op)			
	174,798-	1079- 54-C-	10
YU3BU	146,160-	870- 56-C-	10
YU2SD	132,330-	802- 55-C-	10
YU3M (YT3FM,op)			
	119,250-	750- 53-C-	10
YT2B (YU2NK,op)			
	118,092-	757- 52-C-	10
YT1T (YU1UA,op)	82,044-	516- 53-C-	10
YU2QU	79,524-	564- 47-C-	10
YU7SF	66,144-	424- 52-B-	10
YZ1Z	60,996-	442- 46-B-	10
YU2HB	59,388-	404- 49-B-	10
YU7FT	52,170-	370- 47-B-	10
YU1VG	13,974-	137- 34-A-	10
YT2KK	9,603-	97- 33-B-	10
4N4K (YU4XA,op)	8,667-	107- 27-B-	10

North America

Bahamas

N4RP/C6A	647,745-	995-217-B	
KØGVB/C6A	163,647-	957- 57-B-	80

San Andreas and Providence

N3JT/HKØ	4,052,370-	4195- 22-	

Panama

HP1AC	139,875-	373-125-C	

St Lucia

KJ8G/J6L	1,162,116-	1699-228-C	

Alaska

NL7GP	2,354,688-	3066-256-C	
NL7DU	18-	3- 2-B-	80
AL7CQ	288,990-	1690- 57-C-	15
KL7UR	110,700-	738- 50-B-	10

Virgin Islands

KV4FZ (N8OP,op)			
	311,049-	1819- 57-C-	15

Puerto Rico

NP4XM	1,782-	54- 11-B	
NO9M/KP4	21,660-	190- 38-B-	160

Belize

V31JZ (NN7A,op)			
	203,520-	530-128-B	

Montserrat

VP2MW (N4MO,op)			
	286,926-	1649- 58-C-	10

Bermuda

A36V/VP9	342,684-	2004- 57-B-	20

Mexico

XE2NQ (AA5B,op)			
	3,554,139-	3859-307-C	
XE2GAT	750,624-	1117-224-B	
XE2IZ	15,300-	85- 60-B	

Barbados

8P9X (K4FJ,op)			
	3,858,069-	4189-307-C	
8P6NX	836,784-	1341-208-C	

Oceania

Philippines

KE9A/DU3	860,535-	1471-195-C	

N7ET/DU7 4,275- 75- 19-B- 10
N7JJQ/DU3 3,816- 53- 24-B- 10

French Polynesia

FO5IW 65,043- 297- 73-C

Mariana Island

KH0/KU2C 595,188- 1189-167-B

Guam

KD7P/NH2 1,336,608- 2016-221-C
NY6M/KH2 93,798- 578- 54-C- 20
KG6DX 187,587- 1097- 57-C- 15

Hawaiian Islands

KP2Z/KH6 3,081,720- 3368-305-C
N5CT/KH6 2,455,446- 3077-266-C
WL7E/KH6 287,280- 760-126-B
AH6JF 140,970- 370-127-C
AH6O 38,640- 181- 80-A
VE7QO/AH6 247,800- 1475- 56-C- 10
AH6IM 17,589- 143- 41-B- 10

Australia

VK8XX 1,145,016- 2052-186-B
VK2APK 683,750- 1250-185-B
VK6HG 80,333- 221- 91-B
VK2BQQ 49,410- 305- 54-B- 40
VK4TT 33,927- 283- 43-B- 20
VK4XA 112,385- 681- 55-B- 10

Indonesia

YC3HCM 355,515- 865-137-C
YB3ASQ 226,008- 516-148-C
YB2FEA 55,209- 239- 77-B
YB8EMJ 19,920- 166- 40-B- 15
YC1IOI 14,260- 136- 35-B- 15
YB2CTW 33,600- 280- 40-C- 10

South Cook Islands

ZK1XP (SM4DHF,op)
226,748- 663-114-C

New Zealand

ZL3GQ 1,240,932- 1738-238-B

South America

French Guiana

FY4FC 3,477- 61- 19-B

Ecuador

HC2G (HC2SL,op)
306,600- 1825- 58-C- 10

Argentina

LU1EWL 141,450- 410-115-B
LU5DVO 93,288- 598- 52-B- 10

Peru

OA4ZV 123,648- 736- 56-B- 15

Aruba

P40GD (W2GD,op)
5,193,216- 5152-336-C

Brazil

PY2RLQ 89,523- 343- 87-C

Fernando de Noronha

ZY0FX (W9VA,op)
194,040- 1155- 58-C- 20

Venezuela

YV1OB 39,555- 293- 45-C- 160
4M7A (YV7QP,op)
93,333- 587- 53-B- 40
YV5IWT 137,376- 848- 54-B- 10

Trinidad and Tobago

9Y4VU 308,826- 1806- 57-C- 15

Multioperator

Single Transmitter

Africa

EA8RCT (OH2BH,OH2MM,ops)
1,523,397- 2237-227-C

Asia

JE2YRD (JF2EQC,JI2KVW,JK2CZL,JR2SCJ,
JR7OMD,ops)
31,559,925- 2311-225-C
JA7YAA (JH7GFO,JH8ORW, JJ3CNL,
ops) 1,452,954- 2143-226-C
JA7YAB (JH0MGJ,JA1-36363,ops)
1,121,169- 1841-203-C
JA3YDS(JF4LIR,JG3QSJ,JH9LYC,
JI2KKY,JI3GAB,JJ3AIBM,TWT,
JM3KGV,ops)
961,155- 1843-195-C
JA7YRR (JA7s MOM,OZW,JH7VHZ, ops)
61,776- 396- 52-C
TA2AO (+TA2s BU,DA)
94,470- 335- 94-B
UZ0QWA (UA0sQDL,QN,ops)
1,597,554- 2454-217-B
UZ0CWA (UA0s CAD,CDI,
CDX,RW0CA,UW0s CA,CN,CY,ops)
1,581,768- 2441-216-B
UZ9CWA (UA9CGA,UV9CAF,ops)
454,020- 940-161-C
UA9SJY (+UA9s SDR,SJZ)
264,828- 761-116-C
UZ9OWD (UA9-145s-233,-338,-339,ops)
149,577- 683- 73-C
UZ0SXF (UA0s SLT,SNR,-214-484,ops)
149,112- 436-114-B
UZ0KWT (UA0s KCL,KZ,UP2BMC,ops)
140,094- 543- 86-B
UZ0QXU (UA0s QEZ,-098-148,-098-206,-098-
298,ops) 93,840- 391- 80-B
UZ9XWV (UA9-095s-1053,-1058,-1085,ops)
56,445- 265- 71-B
UZ9XXM (UA9s XF,-098-743,-098-972,ops)
28,860- 148- 65-C
UI9BWF (+ops)
70,467- 283- 83-C
UL8LWO (UL7s LEB,LF,-026-788,ops)
157,614- 482-109-C
UL8CWW (UL7s CC,CT,-028-278,ops)
50,796- 249- 68-C

Europe

DF0RR (DJ0GK,DL7s AEN,AKC,ALM,APU,
ON,SI,UX,ops)
1,608,984- 2292-234-C
DK7FP (+DK7ZT)
819,458- 1408-194-C
EI7M (EI3DP,EI4s BZ,DQ,EI5FT,EI6BT,EI6s
EI,GS,ops)
2,032,044- 2846-238-B
F5IN (+ops)
2,727,972- 3393-268-C
GM3ZAS (+GM3WIV)
71,145- 279- 85-B
HG1S (HA1s AG,AH,DAC,DAE,TJ,ops)
2,873,034- 3893-246-C
HG8D (HA8s DR,DU,HG,NAR,ops)
1,166,538- 1954-199-C
HA1KRR (HA1s DRM,DRR,XO,XU,ZN,
ZZ,ops) 1,048,320- 1792-195-C
HA8KCK (HA8s FT,FW,KH,ops)
519,537- 1037-167-C
HA6KZS (+ops)
96,600- 322-100-C
HA5KDF 20,879- 189- 37-C
LZ2KIM (LZ2MP, +op)
39,396- 198- 67-C
OE1XTU (+OE4s SKU,TSS)
1,048,746- 1697-206-C
OK1KQJ (OK1s AYP,AZG,DC,DLE,DXS,ICM,
VKX,ops) 1,270,752- 1891-224-C
OK2KOD (OK2s BDI,BGR,ops)
526,785- 1015-173-B
OK1OFM (OK1DRQ,OK1-19973,ops)
248,850- 553-150-B
OK2KYC (+ops)
209,214- 591-118-B
OK2KDS (OK2s BXD,-31846,ops)
15,048- 88- 57-A
OK3KZA (OK3s AUI,CLM,YCT,ops)
14,916- 113- 44-B
OK1OPT (+ops)
3,528- 49- 24-B
SK5DB (SM5s LRM,PAX,PEY,ops)
143,208- 442-108-C
SP2ZFJ (+ops)
296,079- 613-161-B
UZ6LWZ (UA6s LV,-158-1164,-158-1336,ops)
756,756- 1388-182-C
UZ4HWS (+ops)
587,724- 1139-172-C
UZ6AZR (UA6s BPU,-161-38,UW6AU,ops)
488,546- 977-168-B
UZ1TWB (+ops)
358,706- 894-133-C
UZ3AWR (UA3s AEV,-176-1656,-176-1149,
ops) 185,760- 516-120-B
UZ3AYR (+ops)
151,200- 400-126-C
UZ3XWB (UA3s XAC,-127-208,-127-216,ops)
123,966- 428- 87-C
UZ3AWC (+ops)
109,536- 652- 56-C
UZ3MWQ (UA3s MHI,MHY,MHZ,ops)
56,940- 260- 73-B
UZ4YWY (+ops)
41,580- 210- 66-B
UZ5AXE (+ops)
32,868- 249- 44-C
UZ4AXQ (+ops)
30,810- 130- 79-C
UZ3XWM (UA3s XBY,XCT,ops)
1,485- 33- 15-B
UB3JWW (UB3JM,UB4s JCF,JJR,JFV,ops)
581,330- 1134-165-C
UB4QWW (RB5QW,UB5s QDU,-064866,ops)
465,612- 964-161-C
UB3IWA (RB5II,UB5s IFZ,IOK,ops)
328,923- 681-161-C
UB4LWY (UB4LEZ,UB5s LJC,-077-1868,ops)
292,950- 630-155-C
UB4FWH (+ops)
107,835- 455- 79-C
UB4VWN (3 ops)
66,240- 460- 48-C
UB4IWI (UB5s-073-3025,-073-4293,-073-
4328) 31,650- 211- 50-B
UB4IZH (+op)
3,312- 46- 24-A
UC1AWK (UC2s AUZ,LCQ,ops)
168,237- 603- 93-B
UC1WWM (+ops)
33,306- 182- 61-B
UC1AWP (+ops)
1,827- 29- 21-B
UO4OXW (RO4OR,RO5OO,ops)
11,760- 98- 40-C
UP1BYC (+ops)
191,160- 1080- 59-C
UP1BYL (+ops)
8,034- 103- 26-C
UR1RWX (UR2s RDJ,RHF,RJ,RRR,ops)
1,729,368- 2453-235-C
Y32CN (Y32s TN,WN,YN,ops)
455,940- 894-170-C
Y54CO (Y54s ML,NL,ops)
181,173- 481-131-B
Y43CF (Y21XF,Y43s CF,RF,ops)
170,952- 419-136-B
Y46CA (Y23IA,Y46KA,ops)
121,701- 358-113-B
Y42CB (Y42s WB,ZB,ops)
37,446- 158- 78-C
Y37CB (Y37s RB,WB,ZB,ops)
25,920- 192- 45-B
YT3T (YT3EW,YU3BQ,ops)
1,644,300- 2436-225-C
4N2D (NP2CG,YT2s DU,VM,YU2s FK,WQ,
ops) 1,292,346- 2013-214-C
4N4B (+ops) 677,160- 1320-171-C
YU2CCJ (+ops) 663,462- 1271-174-C
4N2Y (+ops) 650,700- 1205-180-B
YU7AJR (+ops) 251,262- 594-141-B
4N4Y (+ops) 153,384- 913- 56-C

North America

J88A (K4s LTA,PJ,W5PWG,WE5P,ops)
2,843,505- 3213-295-C
KP2A (K4s TEA,TKM,ops)
4,765,710- 4742-335-C
XE2EBE (AA6DP,N6PE,NF6H,op)
2,802,600- 3114-300-C

Oceania

KX6CI (NP2C,AB5K,WB5SQR,WB8SBH,ops)
2,194,995- 2761-265-C

South America

PJ2J (W1s BIH,WEF,ops)
4,381,746- 4373-334-C

Two Transmitter

Asia

JA1YXP (JI1UTP,JO1JOZ,op)
1,161,864- 1793-218-C

Europe

4N4C (+ops)
2,050,289- 2973-231-C
SM5GMG (+SM6LRR,SM0NSJ)
1,537,632- 2248-228-C

North America

6Y5L (WD8s AUB,LLD,ops)
2,572,317- 2887-297-C

South America

HK3MAE (+HK3KME,HK7IMB)
155,868- 419-124-C

Unlimited

Asia

JA8YBY (JE8BRO,JH8s GFB,PNE,WBR,
JO1DFG,JR8DHA,ops)
2,484,720- 3451-240-C
JA1YFG (JE7WBI,JH0NZN,JJ3OLZ,
JO1s IDL,RUR,JP1s JFG,OGL,JQ1BRW,
ops) 2,128,166- 3033-234-C

Europe

I3JSS (+I3s EVK,FIY,JTC,VHO)
3,861,750- 4750-271-C
YT2R (YT2FI,YU2s DQ,HO,IQ,LJ,MM,MP,
MY,OG,OH,ops)
3,761,604- 4543-276-C

North America

WF8C/VP9 (+K8WW)
1,826,025- 2425-251-B

W/VE Phone

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Connecticut

K1RU 2,606,901- 2167-401-C
K1CC 1,947,456- 1764-368-C
W1WEF 608,256- 792-258-C
K1DD 532,389- 803-221-C
KC8PE 514,468- 776-221-C
K1BV 194,880- 560-116-C
N1FQO 141,384- 344-137-C
K8HVT/1 137,670- 353-130-A
K1RM 120,888- 278-146-B
N4XR 51,198- 161-108-C
AB1U 41,652- 178- 78-B
W1DO 30,000- 100-100-C
KA1UJ 29,376- 136- 72-A
WA1SHM 23,994- 129- 62-B
N1EFE 21,114- 102- 69-C
NF1J 15,300- 100- 51-B
KH6CP/1 5,394- 58- 31-A
KA1CZF 4,356- 44- 33-A
NI1L 3,915- 45- 29-A
KA1JNG 2,775- 37- 25-C
W0PAN 1,653- 29- 19-B- 80
N8RA 169,545- 635- 89-C- 15
W1QK 104,625- 465- 75-C- 15
NO1Y 50,463- 267- 63-B- 15
WA1NYU 14,582- 128- 38-B- 15
KA1ZD 344,100- 1147-100-C- 10
K1EFI 221,616- 684-108-C- 10
WB1BXS 108,621- 447- 81-C- 10
KA1RDX 104,076- 413- 84-C- 10
W1HUE 7,752- 76- 34-B- 10
WB1EPO (N/T) 612- 17- 12-B- 10

Eastern Massachusetts

N6BV/1 2,783,550- 2410-385-C
K1VR 1,518,428- 1442-351-C
W1GIH 1,271,727- 1273-333-C
K1CLN 807,576- 1012-266-C
N1AU 384,678- 602-213-C
W1KRS 324,768- 544-199-C
KA1DWX 271,440- 484-195-C
N1FIO 171,678- 403-142-B
N1DEA 110,532- 302-122-C
W1FJ 83,394- 246-113-C
W1MK 34,170- 170- 67-C
K1LXJ 32,832- 144- 76-B
KB1RB 27,126- 137- 66-B
W1HN 21,672- 88- 84-C
K1BT 12,972- 92- 47-B
N1CLC 9,963- 81- 41-B
W1FV 9,594- 78- 41-C
N1FYZ 4,680- 60- 26-B
W1JR 4,329- 39- 37-B
KA1IOR 3,174- 46- 23-C
KA1LSZ 912- 19- 16-B
NK1Z 89,559- 321- 93-B- 20
NU1C 44,604- 236- 63-B- 15
W1PLJ 825- 25- 11-C- 15
AB1A 159,720- 605- 88-C- 10
KA1JJR 74,115- 405- 81-B- 10
WA1EOT 49,842- 234- 71-C- 10
KQ1V 37,788- 188- 67-C- 10

Maine

K1JB 504,600- 841-200-C
N1AFC 182,108- 453-134-A
N1GBL 79,104- 256-103-B
KA1DZP 35,478- 162- 73-B
WA1TRE 21,924- 126- 58-B
K1UO 234,531- 759-103-C- 20
KA1RLI (N/T) 38,016- 198- 64-B- 10
N1AHG (N/T) 6,120- 60- 34-B- 10
K1FUY (N/T) 8,075- 45- 45-B- 10
N1FDU (N/T) 2,052- 36- 19-B- 10
KA1NWL/M (N/T) 1,953- 31- 21-B- 10

New Hampshire

KM1H (KQ2M,op)
3,299,798- 2582-426-C
W1PH 870,534- 987-294-B
K1PTF 45,540- 165- 92-C
K1TR 23,868- 117- 68-A
KA1LMR 3,510- 39- 30-A
W1VY 46,065- 185- 83-C- 20
W2IQL 62,622- 294- 71-B- 15
KE1E 8,772- 88- 34-B- 10

Rhode Island

WA2FTC 84,888- 262-108-B
N1EKX 17,595- 115- 51-B
WB7NRE 3,600- 40- 30-C
K2MN 23,976- 148- 54-B- 20
W1RFQ 13,770- 102- 45-C- 20
K1VSJ 16,875- 125- 45-B- 10

Vermont

W3SOH 150,084- 379-132-B
WA1GUV 6,669- 57- 39-B
N1FHY 6,324- 62- 34-B
KF7CD 5,688- 79- 24-B
KA1FJ 1,560- 26- 20-B
WA1QGC 867- 17- 17-B
NJ7J 31,950- 213- 90-C- 20
KA1RRX 4,230- 47- 30-C- 10

Western Massachusetts

W1BYH 197,100- 365-180-B
W1AUT 120,396- 316-127-C

2

Eastern New York

N2BA 1,736,568- 1626-356-C
KY2J 1,681,560- 1730-324-C
N2AIF 238,874- 407-194-C
WB2EAR 101,268- 291-116-B
KF2O 60,904- 168-101-C
K1ZM 4,500- 50- 30-C- 160
K2IBW 32,190- 185- 58-C- 20
WB2SPN 24,300- 162- 50-B- 15
N2AZS 42,657- 241- 69-B- 10
WB2MRX 2,457- 39- 21-B- 10

NYC-Long Island

KD2TT 259,578- 418-207-C
W2MOY 183,057- 379-161-C
KA2NWO 116,874- 302-129-B
NN2C 79,800- 205-120-B
WA2OVG 41,310- 162- 85-B
NS2W 24,708- 116- 71-B
KK2E 24,321- 121- 67-C
KD2BW 15,045- 85- 59-C
W2GKZ 12,480- 80- 52-C
WM2E 7,992- 74- 36-B
WB2AMU 1,800- 30- 20-B- 80
K2MFY 103,950- 385- 90-B- 10
N2UN 21,800- 144- 50-C- 10
K2KTT 11,664- 108- 36-B- 10
KA2RSJ 3,726- 46- 27-B- 10

Northern New Jersey

N2LT 2,358,342- 2142-367-C
KR2Q 391,950- 670-195-A
K4BNC 172,260- 318-180-C
K3FNW 171,444- 354-157-B
W1GD 186,074- 311-178-C
WB2PAG 152,295- 355-143-B
WA2UDT 149,382- 366-129-C
W2PHW 143,682- 311-154-C
W2RQ 114,576- 308-124-C
WA8QQA 31,758- 158- 67-B
W9NTU 30,030- 143- 70-B
KT2D 29,376- 144- 68-C
W2AOY 18,585- 105- 59-B
N2COH 14,100- 100- 47-C
W2HCA 12,480- 80- 52-B
WB2JTE 1,800- 30- 20-B
W2FCR 1,350- 25- 18-C- 160
N3AHF 8,208- 72- 38-C- 80
KC7KU 60,750- 250- 81-C- 40
K3RWW 9,945- 85- 39-C- 40
K2PH 3,168- 44- 24-C- 40
W2FFQ 18,666- 102- 61-C- 20
N2AA 312,225- 905-115-C- 10
K2TW 283,815- 795-119-C- 10
K2OLG 45,924- 172- 89-B- 10
K2FE 15,372- 122- 42-C- 10

Southern New Jersey

K2FL 512,556- 706-242-C
KD2I 319,029- 551-193-A
KF2U 230,460- 460-167-C
W2FGY 175,338- 382-153-C
W2PAU 154,304- 336-163-C
N2GZL 128,232- 274-156-A
K2LOO 111,756- 278-134-B
K2HPV 58,637- 217- 87-A
W2SDO 48,546- 174- 93-C
K2SWZ 40,812- 179- 76-B
N2MR 37,082- 142- 87-C
W2EA 27,531- 133- 69-C
WA2VYA 27,432- 127- 72-C
KA2KFO 17,226- 99- 58-B
KA2YKN 6,156- 54- 38-B
N2AWC 5,916- 58- 34-C
N2DN 5,408- 53- 34-C
KZ2I 28,644- 154- 82-C- 40
W2QKJ 17,955- 133- 45-B- 10
N2HQL (N/T) 6,144- 64- 32-B- 10
WA2VSQ 5,445- 55- 33-B- 10

Western New York

W2HPF 890,100- 1075-276-B
WA2UUK 566,685- 771-245-B
KB2SE 384,399- 619-207-C
KA2AJT 338,580- 570-198-A
N2WK 321,645- 523-205-C
KD2YP 289,028- 477-188-B
KB2WN 181,260- 364-140-C
WJ2O 114,228- 334-114-C
WE2T 74,400- 248-100-C
W2PHT 68,708- 218-102-B
KK2B 58,752- 204- 96-B
WJ2X 54,180- 210- 86-B
NQ2O 54,144- 188- 96-C
W2TZ 52,605- 187-105-B
W2FUI 39,150- 145- 90-C
W2LU 26,782- 123- 78-C
WB2ABD 27,930- 133- 70-B
K2CF 21,750- 145- 50-B
W2FR 20,088- 93- 72-C
W2OMV 16,074- 94- 57-B
W2HG 12,800- 75- 56-C
KB2EMU 68,154- 307- 74-C- 10
WB2YQH 62,244- 268- 78-C- 10

3

Delaware

KD3JO 566,207- 937-237-C
AD3V 301,740- 535-188-C
KC3RY 258,600- 431-200-C
N3FDL 58,743- 183-107-C
N3FDL 58,743- 183-107-C
KB3XD 43,320- 152- 95-B

Eastern Pennsylvania

K3OO 2,827,182- 2467-382-C
NI3P 660,264- 902-244-C
KQ3V 643,140- 784-270-B
WB3FYL 362,916- 593-204-B
W3GK 261,057- 503-173-C
WB3CIW 231,660- 396-195-C

N3ED 207,234- 397-174-C
W3OV 175,338- 382-153-C
W3ARK 172,620- 411-140-B
AD3Z 132,342- 274-161-C
KB3TS 101,268- 291-116-A
W3KV 90,360- 251-120-C
N3EOF 70,029- 251- 93-A
W3EHZ 63,360- 220- 96-B
W3EAN 36,972- 156- 79-C
NM3E 21,420- 119- 60-B
KA3LCF 20,358- 117- 58-B
W3QIR 8,190- 66- 42-B
K3IE 8,118- 66- 41-B
KC3QS 4,200- 50- 28-B
NQ3S 1,425- 25- 19-C
N3BNA 12,384- 86- 48-C- 40
K3ZPG 4,896- 51- 32-C- 20
K3ZLK 124,497- 477- 87-C- 15
WB3FPA 78,692- 332- 77-B- 15
KA3SIO 270,480- 784-115-C- 10
KA3PLC (N/T) 251,664- 749-112-B- 10
KJ3R 181,272- 581-104-C- 10
AA4MD 58,362- 274- 71-C- 10
KA3PDY 2,970- 45- 22-B- 10

Maryland-DC

K3ZO 2,481,510- 2285-362-C
K3NA 1,579,923- 1509-349-C
N3II 566,832- 784-241-C
W3UJ 546,189- 839-217-C
K3WS 178,782- 359-166-A
W6AXX 112,962- 281-134-C
W3HVM 109,032- 308-118-C
K3WX 81,840- 310- 88-C
KD3KX 53,856- 204- 88-A
K3DI 22,230- 114- 65-B
WB3AVN 21,840- 112- 65-C
W3FQE 21,594- 118- 61-C
W3EE 16,500- 100- 55-B
W3CPB 11,169- 73- 51-B
W3TFA 8,235- 61- 45-C
KA3LKQ 6,090- 58- 35-B
WA3YVT 3,150- 35- 30-B
KE3O 505,158- 1427-118-C- 15
WA3EEE 29,733- 187- 53-C- 15
N3EYB 12,792- 104- 41-B- 15
WA3SQU (W3IDT,op) 62,208- 288- 72-C- 10
N3FYN 22,344- 152- 49-B- 10
WB2BZR (N/T) 10,578- 82- 43-B- 10
W3GN 2,925- 39- 25-C- 10
KA3UBJ 1,428- 28- 17-B- 10

Western Pennsylvania

K3TUP (K3LR,op) 3,508,800- 2924-400-C
K5ZD/3 915,876- 988-309-C
KA3ROX 58,302- 237- 82-B
KC3XD 30,222- 138- 73-B
K3LA 12,201- 83- 49-C
K3UA 11,739- 91- 43-C- 40
N3FAS 26,712- 159- 56-C- 20
W3FSB 270- 10- 9-B- 15
W3KHQ 64,242- 258- 83-C- 10
W3KWH (K3RYA,op) 5,307- 61- 29-C- 10
KA3UAY (N/T) 1,296- 27- 16-B- 10

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Alabama

AA4LE 426,756- 671-212-C
N4JF 348,840- 570-204-A
KE4BM 346,302- 583-198-C
N4UN 138,096- 336-137-C
KC4ZV 82,080- 304- 90-B
AA4XM 6,360- 53- 40-C
KB4LFH 1,587- 23- 23-B
W4CYC 81,891- 337- 81-C- 20
WA4VEK 130,725- 525- 83-C- 10

Georgia

N4FD 1,018,800- 1415-240-C
WX4G 456,729- 637-239-C
K4EZ 396,891- 633-209-C
W4DXI 319,968- 528-202-C
KA1WR/4 246,330- 483-170-C
KF4CI 199,698- 401-166-C
W9KTB/4 132,126- 361-122-B
NQ4I 102,396- 322-108-C
K4BAI 96,432- 287-112-C
N4REE 79,530- 241-110-C
AB4HQ 18,981- 111- 57-B
W4UYC 14,076- 92- 51-B
W4OWY 16,432- 128- 48-C- 40
AB4LX 4,368- 52- 28-B- 40
WB4NMA 21,420- 140- 51-C- 15
KX4R 432,054- 1143-126-C- 10
KJ4FW 109,200- 455- 80-C- 10
N4PNI 52,260- 268- 65-C- 10
KB4IOS 19,950- 133- 50-A- 10
KB4BBC (N/T) 19,035- 135- 47-B- 10

Kentucky

N1GL 693,090- 908-255-C
WB4FOT 165,858- 359-154-C
N4BOC 15,390- 90- 57-B
KJ4ND 4,320- 48- 30-B
AA4VI 30,846- 194- 53-B- 15
KB4YJG (N/T) 13,524- 98- 46-B- 10

North Carolina

N4ANV 767,520- 1040-246-C
W8NGO 481,587- 701-229-C
KJ4TI 184,338- 399-154-B
WD4OHD 9,000- 75- 40-A
K4HJJ 27,180- 151- 60-C- 80
N4XO 11,040- 92- 40-C- 80
N4ZC 64,701- 273- 79-C- 40
W4CVX 77,847- 337- 77-C- 15
K4GHS 51,716- 278- 74-C- 10
KC4FGG (N/T) 26,871- 169- 53-B- 10
K5LZT 3,444- 41- 28-B- 10

Northern Florida

WC4E 773,415- 1011-255-C
KK4RV 191,484- 394-162-B
W4WKQ 163,020- 380-143-C
KC4CSD 145,044- 316-153-B
W9LSD 68,375- 213-107-B
K4JDV 4,437- 51- 29-B- 20
K4XS 806,577- 2117-127-C- 10
K4OZO 30,951- 181- 57-B- 10
KC4APJ (N/T) 9,477- 81- 39-B- 10

South Carolina

K4YYL 1,606,944- 1762-304-C
N4UH 1,012,989- 1219-277-C
W3VT 568,890- 774-245-C
N4BPP 177,390- 355-162-B
K4WJV 78,900- 263-100-C
WD4BHM 23,316- 134- 58-B

Southern Florida

K4MF 249,390- 489-170-C
KF4MA 180,588- 404-149-B
WA4EMU 167,139- 379-147-B
KO4J 103,875- 277-125-C
WK4F 84,252- 238-118-C
KA4UBC 75,756- 236-107-C
K4GKD 71,928- 222-108-C
KD4O 60,525- 269- 75-C
K1TN 58,560- 160-122-C
KM4KJ 34,272- 136- 84-B
W3DHN 8,352- 58- 48-B
W4YN 10,647- 91- 39-B- 20
KB4YA 337,995- 1015-111-C- 10
WB4BBH 104,076- 413- 84-B- 10
KB4RAC 5,856- 61- 32-C- 10

Tennessee

N4TG 856,914- 1138-251-C
K4UVH 333,234- 561-198-C
K4JHT 242,466- 502-161-B
K4YPX 27,405- 145- 63-B
W4AY (WA4ZZU,op) 5,130- 57- 30-C
W4ZWZ 40,298- 184- 73-C- 20
N4ZZ 279,720- 888-105-C- 10

Virginia

KX3Q 1,634,319- 1607-339-C
W3YY 976,896- 1272-256-C
KJ4VG 453,222- 693-218-C
N4PMQ 271,284- 481-188-B
AA4UJ 249,237- 459-181-C
W4TMN 231,248- 443-174-C
N4MM 196,320- 409-160-C
K2AOE/4 130,800- 400-109-C
K1ZZI 130,032- 258-168-B
W4LMJ 109,980- 282-130-C
K4FPF 93,612- 269-116-B
AA4XU 84,102- 262-107-C
W4WJJ 73,188- 228-107-C
KB4ROW 53,133- 199- 89-B
W1WTG 46,593- 167- 93-C
WA4FHQ 43,326- 188- 87-A
N6NSM 38,465- 143- 85-C
W4KMS 25,359- 107- 79-C
AA4YZ 25,125- 125- 67-A
KC3YO 18,180- 101- 60-B
N1AME/4 756- 21- 12-B
WA4YBV 24,462- 151- 54-C- 80
W4DR 3,219- 37- 29-C- 40
N4XD 66,360- 316- 70-C- 15
WA4HOT 4,050- 50- 27-C- 15
N4PUV (N/T) 7,980- 70- 38-B- 10

5

Arkansas

KC5TA 368,424- 602-204-C
AA5CV 102,366- 242-141-C
W5RZ 74,928- 223-112-C
WA5VBE 35,235- 145- 81-B
W5EIJ 30,015- 145- 69-C
K5UR 1,764- 28- 21-C- 160

Louisiana

K5NV 54,924- 199- 92-C
WA5JWU 10,653- 67- 53-B
KN5Y 10,494- 66- 53-B
N5NJT 8,946- 71- 42-B
W5WMU (KE5FI,op) 587,250- 1566-125-C- 10

Mississippi

WA5OYU 133,416- 327-138-B
N8DTW 94,743- 319- 99-B
N5IQI 47,241- 181- 87-C
K5MK 359,373- 1099-109-C- 10
KB5IOM (N/T) 15,146- 117- 46-B- 10

New Mexico

KI3L 823,410- 1307-210-C
WA5VAL 6,873- 79- 29-C
WS5O 81,174- 326- 83-C- 10

North Texas

NI5M 602,127- 769-261-C
N5AW 456,816- 614-248-C
KD5GD 326,106- 549-198-B
KA4CVL 205,242- 433-158-B
KA5W 199,806- 413-154-C
KG5NE 108,174- 298-121-B
NJ1V 86,688- 258-112-C
AA5IE 78,375- 275- 95-B
N5LXD 42,021- 181- 87-B
AA5EG 39,342- 166- 79-B
KG5QL 23,730- 113- 70-B
AA5AA 19,602- 121- 54-B
W5AE 18,306- 113- 54-C
WW5L 8,319- 59- 47-B
KG5QT 8,160- 80- 34-C
K5WXZ 231- 11- 7-C- 160
WK5Z 2,700- 36- 25-C- 20
NZ5M 27- 3- 3-B- 20
AB5C 39,879- 211- 63-B- 10

Oklahoma

W0RRY 513,648- 698-248-C
N5JKN 115,584- 344-112-B
W5UXR 48,761- 171- 87-B
KF5JN 35,784- 142- 84-B
WV5S 12,672- 96- 44-C- 40

South Texas

NR5M (WN4KKN,op) 2,191,068- 2012-353-C
K5DB 142,830- 345-138-C
WA5IYX 129,918- 367-118-B
KA5WGL 85,932- 231-124-B
KG5KL 17,667- 151- 39-B
KA5PVB 16,200- 100- 54-A
KG5LM 8,658- 74- 39-B
WB0YEA 8,064- 64- 42-B
N5KAE 6,771- 61- 37-B
KA5N 3,198- 41- 26-B
W5ELN 2,772- 44- 21-B
KC5CP 65,367- 269- 81-C- 10
WB5RUS (N/T) 40,077- 219- 61-B- 10

West Texas

KD5IA 271,272- 508-178-B
W5VGX 160,080- 368-145-A
WF5E 88,640- 360- 83-C- 20
WB5UDX 134,379- 567- 79-C- 15
N5IMO 26,364- 169- 52-B- 10

6

East Bay

K6SIK 729,195- 865-281-B
N6EK 409,200- 880-155-C
W6FSJ 351,360- 610-192-C
K2GMY 32,835- 199- 55-C
N6SRT 25,821- 151- 57-B
W6RPY 1,302- 31- 14-C

Los Angeles

K6EID 343,800- 573-200-C
N6AA 227,340- 421-160-B
W6MFC 192,666- 394-163-C
W6CN 69,276- 251- 92-A
N6BIP 68,115- 239- 95-B
WS6V 59,292- 244- 81-B
K6ICS 41,184- 156- 88-B
W8KIE/6 36,450- 150- 81-B
AA6MC 25,803- 141- 61-B
WB6NFD 17,802- 129- 46-B
K5KT/6 18,315- 185- 33-B- 40
W6OK 23,100- 140- 55-C- 20
AI6Z 14,256- 144- 33-C- 10

Orange

KE6SU 78,114- 277- 94-C
WD6EWG 63,147- 217- 97-B
WA6FIT 27,666- 159- 58-B
AA6IE 18,876- 121- 52-B
WB6QTI 4,347- 63- 23-C
NC6U 16,878- 194- 29-C- 40
NM6L 14,319- 111- 43-C- 20
WB6DFA 600- 25- 8-C- 20
N6AW 105,294- 763- 46-C- 15

Santa Barbara

W6UM 250,800- 418-200-C
WA6FGV 303,967- 519-131-C
AA6EQ 12,168- 104- 39-B
N6HK 10,374- 91- 38-C- 15

Santa Clara Valley

K6HNZ 1,070,055- 1659-215-C
KB6GV 244,620- 540-151-C
K6RQ 208,656- 432-161-C
K6CXT 167,754- 383-146-C
K6ITL 154,062- 317-162-C
K6MA 139,200- 320-145-C
KG6AO 119,238- 334-119-C
KE6QT 101,790- 290-117-B
W6YVK 89,385- 295-101-A
NC6S 74,730- 265- 94-A
W6YHM 46,484- 176- 88-C
W6FGD 44,082- 158- 93-C
KG6WU 27,342- 147- 62-C
N6KZY 18,645- 113- 55-B
KG6XF 15,912- 102- 52-C
W6FDU 12,324- 79- 52-B
KI6YB 11,520- 80- 48-C
W6LC 10,836- 86- 42-C
KG6AM 6,300- 50- 42-C
W6PLJ 5,100- 68- 25-B
WD6EKR 51,678- 319- 54-B- 10
KC6BQM (N/T) 18,612- 188- 33-B- 10
K6XO 5,925- 79- 25-B- 10
KA6NG 3,306- 38- 29-B- 10
WA6BWT 42- 7- 2-C- 10
KB6MTT (N/T) 12- 2- 2-B- 10

San Diego

N6ADK 247,476- 503-164-B
W6IJQF 142,128- 423-112-B
K6MC 56,500- 185-100-B
W6LUN 27,531- 161- 57-C
K6NA 17,574- 101- 58-C
AA6MN 11,433- 103- 37-B
AA6EE 3,375- 45- 25-B
W6BZE 3,045- 35- 29-C
N6ND 258,762- 854-101-C- 10
W6PU 229,830- 815- 94-C- 10
WA6TKT 4,602- 59- 26-C- 10
W6MVW 2,580- 43- 20-B- 10

San Francisco

W6BIP 170,739- 311-183-C
K6ILM 62,244- 182-114-B
W6PM 42,147- 223- 63-C- 10
WA6CTA 2,592- 36- 24-C- 10

San Joaquin Valley

KA6BIM 311,976- 619-168-B
WW6O 234,228- 524-149-C

Sacramento Valley

N6JM 23,940- 140- 57-B
NV6O 6,726- 59- 38-B
N6QCW 3,900- 50- 26-B
KH6DW/W6 159,390- 690- 77-C- 15
N6QBZ 22,755- 185- 41-B- 10

7

Arizona

KC7V 75,924- 333- 76-C
NZ7D 40,590- 205- 66-C
KD7XO 33,078- 149- 74-C
W7YS 15,741- 99- 53-B
NN7F 9,918- 58- 57-C
N7GLT 5,508- 54- 34-C
K6FM 3,906- 42- 31-C
KX7J 8,964- 83- 36-C- 15
WN7J 32,424- 193- 56-B- 10
W7AYY 22,572- 171- 44-C- 10

Eastern Washington

K7IOO 156,600- 435-120-B
K7EFB 17,298- 93- 62-C
W7LGG 16,068- 103- 52-C

Idaho

KE7RT 11,340- 84- 45-B

Montana

KC7UO 235,467- 459-171-C
KS7T 152,544- 454-112-C
KC7UP 147,240- 409-120-C
W6ALQ 22,320- 155- 48-C- 20
K7ABV 47,277- 309- 61-C- 10

Nevada

KF7RO 107,070- 430- 83-B
WB7SBY 106,110- 262-135-C
KC7DB 52,614- 158-111-B
KZ4H/7 45,675- 203- 75-B
KB7GAP (N/T) 11,583- 99- 39-B- 10

Oregon

N7AVK 564,453- 1053-177-C
W7YAQ 498,168- 814-204-B
W7GUR 117,453- 329-119-C
KE7GI 74,844- 252- 98-B
W7EYE 30,600- 136- 75-B
W7IMP 18,576- 86- 72-C
W7QK 9,450- 75- 42-B
AI7B 236,844- 731-108-C- 20
NK7U 176,532- 626- 94-C- 20
KA6V/7 10,152- 94- 36-C- 20
W7EJ 701,784- 2052-114-C- 15
NI7T 312,438- 1211- 86-C- 15
W7TRE 7,035- 67- 35-C- 15
K5MM/7 173,010- 730- 79-C- 10

Utah

WE7B 367,632- 851-144-C
W7HS 234,330- 535-146-C
KE7NS 183,060- 452-135-B
NT7Y 104,532- 281-124-C

Western Washington

N7TT 1,093,716- 1482-246-C
K7GEX 148,104- 363-136-C
NN7L 116,532- 332-117-C
W7WMU 105,090- 226-155-C
N7KZN 76,896- 288- 89-B
W7QN 71,823- 269- 89-C
NX7K 56,019- 263- 71-C
W7BAY 48,462- 197- 82-C
K7NW 47,784- 181- 88-C
N7LOX 46,860- 220- 71-B
W7IIT 34,371- 171- 67-C
K7LZJ 33,000- 125- 88-C
K7LXC 20,520- 114- 60-B
W7KT 19,116- 108- 59-C
KO7G 14,859- 127- 39-C
W7VIH 11,766- 106- 37-B
K7WA 1,200- 25- 16-B
K7CW 2,079- 33- 21-C- 40
W7ODQ 25,311- 143- 59-C- 20
W7WA 685,160- 1928-115-C- 15
WA7STA 19,680- 160- 41-B- 15
K7QQ 184,800- 770- 80-C- 10
NB7N 54,780- 415- 44-C- 10
W7LVI 22,419- 159- 47-C- 10
WB7VUB 1,296- 27- 16-B- 10

Wyoming

K7MM 475,383- 751-211-C
NQ7Q 31,833- 131- 81-B
WC7S 13,572- 78- 58-C
KB7M 3,162- 34- 31-A
WB7I 969- 19- 17-B- 10
WB7K 36- 4- 3-B- 10

8

Michigan

W8TWA 747,474- 962-259-C
WB8SFF 55,332- 174-106-C
K8KUH 44,892- 174- 86-C
K8CV 36,450- 150- 81-C
K8OSF 31,257- 151- 69-B
W8EGI 4,950- 50- 33-B
N8CXX 253,200- 844-100-C- 15
NE8T 251,328- 748-112-C- 10
KE8NH 19,278- 126- 51-B- 10
W8TJQ 4,950- 50- 33-B- 10
N8JCQ 3,480- 40- 29-B- 10

Ohio

WB3KKX 1,516,311- 1527-331-C
N8ATR 557,837- 661-269-C
KD8JN 175,950- 391-150-A
NC8V 148,680- 354-140-C
W8ZCQ 134,505- 305-147-C
W8UPH 134,493- 353-127-C
KW8N 119,400- 398-100-C
N8AGU 99,840- 260-128-C
WA8AGH 87,420- 235-124-A
W8NPF 86,184- 252-114-C
N8IJC 58,203- 223- 87-C
W8DWP 51,450- 175- 98-B
W8RHY 38,808- 154- 84-C
W8XT 29,337- 127- 77-B
WA8Y 24,300- 100- 81-C
KF8K 22,236- 109- 68-B
NG8T 17,822- 89- 66-C
WD8LLD 17,490- 106- 55-C
W8FN 17,424- 88- 66-C
W8IMF 17,136- 102- 56-C
KB8AKW 14,040- 104- 45-C
WD8AJF 13,860- 105- 44-B
WB8MIP 12,015- 89- 45-C
W8CGG 10,290- 70- 49-C
AF8C 4,320- 45- 32-B
W8IDM 1,980- 33- 20-B
W8IQ 663- 17- 13-C- 40
KA8WEO 77,190- 310- 83-C- 10
KA8ZEP 4,263- 49- 29-B- 10
WD8KTM 924- 22- 14-B- 10

West Virginia

W8TN 142,080- 370-128-C
K8OOL 4,500- 50- 30-C- 80
KB8AOB 900- 25- 12-B- 15

9

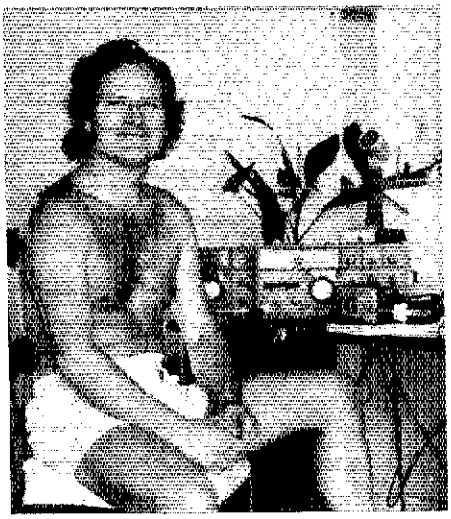
Illinois

WB9Z 571,692- 781-244-C
W9IL 369,981- 639-193-B
WD9GIG 264,012- 449-196-C
KC9UM 159,120- 340-156-C
N9JF 148,680- 354-140-B
W9LNQ 146,916- 318-154-B
KA9YMV 109,200- 280-130-B
N9AEJ 105,090- 310-113-C
K4XU 45,045- 165- 91-C
NG9R 37,062- 142- 87-B
N9FWM 29,016- 124- 78-B
KE9MJ 13,200- 80- 55-C
W9CA 7,134- 58- 41-C
K9PNG 5,700- 50- 38-A
WD9GGY 4,704- 49- 32-B
WB9GKA 2,916- 36- 27-B
WB9OTW 840- 20- 14-B
KR9G 4,371- 47- 31-C- 80
KG9Z 576- 16- 12-C- 80
KK9L 9,963- 81- 41-C- 40
W9NB 79,272- 387- 72-C- 15
K9MDO 164,160- 576- 95-C- 10
W9YYG 94,221- 361- 87-C- 10
NM9C 24,360- 140- 58-B- 10
W9WJR2AMZ 14,868- 118- 42-B- 10
W9NUB 1,386- 33- 14-A- 10
KA9RTV 765- 17- 15-B- 10
N9GXW 324- 12- 9-B- 10
W9REC 147- 7- 7-B- 10

Indiana

W9RE 2,010,060- 1718-390-C
KB9C 444,150- 705-210-C
WA9NPM 311,952- 536-194-C
N2BVJ/9 275,094- 493-186-C
AG9S 193,814- 399-162-C
NX9T 101,625- 271-125-B
KD9HT 99,036- 252-131-B
WB9WN 80,343- 237-113-C
K9CLO 126,520- 420-102-C- 20
W8UD/9 45,696- 224- 68-C- 20
K9VQK 26,727- 151- 59-C- 15
KB9BGV (N/T) 15,696- 109- 48-B- 10
NX9B 7,308- 58- 42-B- 10
N9HOV (N/T) 2,079- 33- 21-B- 10

Oscar, LU5DVO, operated 10-meter single-band CW to score first-place Agentina.



Rick, KJ8G, gave St Lucia out as a multiplier as KJ8G/J6L on CW and J6LSN on phone.

Hiromi, JA7FWR, poses at his Asia plaque winning station.

Wisconsin

W9OP	255,840-	520-164-C			
K9OSH	253,980-	498-170-C			
WE9R	206,349-	407-169-C			
NG9L	181,929-	407-149-B			
W9GXR	172,956-	406-142-C			
WE9V	130,788-	348-126-C			
W9XT	117,450-	290-135-B			
NI9C	102,870-	270-127-B			
W9BCV	57,888-	201- 96-C			
WB9CXY	52,364-	174- 62-C			
W9YCV	7,350-	50- 49-B			
WA9TZE	5,741-	43- 29-B			
K9YNF	58,160-	234- 80-C-	20		
K9CAN	112,491-	431- 87-C-	15		
W9AIH/9 (N9BSH,op)					
	252,054-	737-114-C-	10		
KQ9L	132,588-	508- 87-C-	10		
WA9CDY	112,050-	450- 83-C-	10		
W9GIL	63,525-	275- 77-C-	10		

Ø

Colorado

KØCS	584,057-	1091-205-C			
WØGOQ	182,118-	478-127-C			
KØGAS	92,313-	263-117-C			
WØGOR	88,623-	229-129-C			
K9BQL	65,793-	241- 91-B			
WØBWJ	39,880-	160- 81-C			
NYØR	29,400-	140- 70-C			
KVØQ	74,880-	416- 60-C-	40		
KØZX	279,282-	1046- 89-C-	15		
K9MWM/Ø	94,185-	483- 65-C-	10		
NØENI	49,980-	245- 68-C-	10		
KAØFPJ	30,912-	184- 56-B-	10		

Iowa

WØEJ	366,030-	581-210-C			
KZØC	239,220-	443-180-C			
WØPPF	81,396-	228-119-C			
WØMJN	42,705-	195- 73-C			
KØGT	31,647-	137- 77-A			
NYØV	17,400-	100- 58-B			
WAØDCB	16,677-	109- 51-B			

Kansas

WEØA	339,066-	621-182-C			
KBØG	295,680-	440-224-C			
WBØYJT	124,362-	328-126-B			
NØVXU	55,125-	175-105-C			
KØIEW	20,862-	114- 61-C			
WØWPL	13,311-	87- 51-B			
NØFMR	9,120-	76- 40-B			
NØHYG	5,376-	56- 32-B			
WOØE	1,710-	30- 19-B			
KØBXF	624-	16- 13-B			
KBØU	101,100-	337-100-C-	10		
WD9FTZ/Ø (N/T)	4,410-	49- 30-B-	10		

Minnesota

NØAT	816,627-	1051-258-C			
ACØW	240,975-	459-175-B			
WØUC	86,346-	246-117-B			
KBØCWV	77,832-	276- 94-C			
KEØUI	60,609-	227- 89-A			
WØNGB	51,606-	183- 94-B			
KSØT	45,402-	161- 94-B			
NZØR	29,346-	134- 73-C			
WØML	25,764-	113- 76-C			
WØRXL	22,116-	97- 76-C			
WØLP	6,552-	56- 39-C			
KIØF	16,207-	119- 51-C-	20		
KAØZPP	42,066-	342- 41-B-	10		
WBØGGM	32,538-	187- 58-B-	10		

Missouri

WOØG	2,481,042-	2126-389-C			
WØPKO	105,735-	265-133-C			
WJØI	82,476-	234- 89-B			
KMØL	49,020-	172- 95-C			
NSØB	8,307-	71- 39-C			
NØCEE	1,218-	29- 14-B			
NØJMT	756-	18- 14-B			
KAØP	243-	9- 9-B			
WBØGFV	15,120-	105- 48-B-	10		
WAØOUI	3,975-	53- 25-B-	10		

North Dakota

NMØN	87,579-	263-111-C			
KAØZFX/M	17,304-	103- 56-B			

Nebraska

KØSCM	419,430-	682-205-C			

South Dakota

KEØDV	184,704-	416-148-B			
KDØEE	151,686-	318-159-C			
WØACT	102,600-	300-114-C			
NØCVF	33,660-	170- 66-B			
WØWUU	25,515-	135- 63-C			
WRØO	16,380-	105- 52-B			

VE

Maritime-Newfoundland

VO1MP	2,212,995-	2021-365-C			
VO1AW	42,768-	176- 81-C			
VE1DX	5,040-	56- 30-A			
VE1GJ	85,293-	351- 81-C-	20		

Quebec

VE2AYU	457,632-	681-224-C			
VE2GMT	5,841-	59- 33-C			
VE2FU	18,720-	120- 52-B-	40		
VE2FUR	882-	21- 14-B-	20		
VE2EW	22,185-	145- 51-C-	15		
VE2WAT	40,808-	223- 61-C-	10		

Ontario

VE3BXY	147,798-	306-161-C			
VE2AEJ/3	11,040-	80- 46-A			
VE3TJL	10,575-	75- 47-B			
VE3OMU	2,088-	29- 24-C			
VE3NYT	4,437-	51- 29-B-	20		
VE3ICR	250,266-	787-106-C-	15		
VE3GRA	21,686-	157- 46-B-	15		
VE3ACB	5,226-	67- 26-C-	15		
VE3ST	36,600-	200- 61-C-	10		
VE3NXQ	28,560-	170- 56-C-	10		
VE3EVZ	9,006-	79- 38-C-	10		
VE3VET	8,364-	82- 34-B-	10		

Manitoba

VE4JK	150,288-	496-101-C			

British Columbia

VE5RA/7	457,662-	919-166-C			
VE7XQ	131,544-	406-108-B			
VE7FPT	792-	22- 12-C-	60		
VE7EIK	244,098-	1146- 71-C-	15		
VE7EKS	270-	15- 6-A-	10		

Multioperator
Single Transmitter

1

K1YR (+KB1WH,N1DYI)
2,681,775- 2055-435-C
K1TO (+KA1CI,NJ2L)
1,858,200- 1630-380-C
K1IU (+NS1I) 1,614,222- 1503-358-C
K1KA (+W1HNZ)
1,049,388- 1114-314-C
AK1A (+NET) 829,056- 1016-272-C
KA1XN (+NET) 694,035- 795-291-C
KA1TWF (+AD1C,N1CKN,NB1Y)
519,030- 790-219-C
K1ZZJ (+ops) 459,360- 696-220-C
N1TZ (+NET) 374,415- 545-229-C
NO1I (+NET) 350,460- 708-165-C
W1BK (+NET) 213,108- 413-172-C
AI3E (+NET) 210,120- 412-170-C
KC1EO (+NET) 181,386- 565-107-C
KB1W (+NET) 126,096- 296-142-C
K1GW (+NET) 125,532- 317-132-C
W1AQ (KA1SFJ,KM1X,NI1S,NO1U,W1WAC,
WA1VEK,WA1VPC,WA2KFE,ops)
116,160- 320-121-B
W1YK (+N1FGX) 28,689- 131- 73-B
K1IN (+NET) 22,311- 111- 67-C
K8LT/1 (+NET) 15,228- 94- 54-B
NK1F (+NET) 3,741- 43- 29-C

2

K2NJ (+KQ2O,KU2C,NR2H)
1,886,904- 1752-359-C
N2SS (+NET) 955,956- 1189-268-C
WB2K (+NET) 906,607- 883-343-C
N2VW (+WB2R)
565,911- 681-277-C
WM2S (+WM2V)
385,605- 627-205-C
WA2IKL (+NET) 322,080- 610-176-C
W2UI (+N3KR) 313,431- 547-191-C
K2TD (+NET) 136,746- 321-142-C

3

AA1K (+W3XU)
2,972,025- 2331-425-C
W3BGN (+N2NT)
2,869,590- 2333-410-C
K3NZ (+KA3MND,KU3X)
1,341,324- 1406-318-C
NN3Q (+ops) 963,540- 1010-318-C
K3ZA (+NET) 804,465- 885-303-C
N3ARK (+K3IE,KB3MM)
751,917- 953-263-C
K3ANS (+K2BPP,K3YD)
660,348- 884-249-C
WA3LFY (+KA3NJA,KD3LC,N3s CHL,FTI,
GLZ,WB3EPW,WC8R)
624,912- 752-277-C
K3ND (+NET) 297,660- 451-220-B
N3RW (+KD3HX,N3HW)
288,036- 508-189-C
K3YGU (+NET) 251,550- 430-195-C
NA3K (+K3IE) 200,772- 396-169-C
W3MA (+NET) 132,192- 272-162-C
WA3UZ (+NET) 113,544- 249-152-B
NK3U (+NET) 52,323- 163-107-B
KQ3F (+NET) 46,305- 147-105-C
AA3B (+NET) 36,736- 155- 79-C

4

N4KG (+KC4ZV,KU4J,NE4L,WA4DPU)
2,124,000- 1886-375-C
AB4MG (+KB4ZOW,KC4s EFI,HER,N4OWL,
WF2G) 329,940- 585-188-C
W4JVN (+NET) 171,108- 388-147-C

5

N3BB/5 (+N5s GM,TR,WD5N)
2,425,776- 2084-388-C
K5RVK (N5EA,G4GEE,GWØECO,ops)
1,222,263- 1581-261-C
N7KA (+AI9X) 499,284- 804-207-C
KG5ND (+NET) 346,365- 537-215-C
W5EHM (+AA5BT,KA5WSS,CE3LAR)
117,015- 269-145-C
NØIDR (+WØVX)
110,700- 300-123-B

6

W6REC (+N6TIB,W6FAH)
944,379- 1179-267-C
W6QHS (+KA8HSM)
327,072- 1332-232-C
K2ITG/6 (+NET)
646,272- 1056-204-C
KE6WL (+KD6NT)
561,800- 936-200-C
WA6AHF (+W6BSY)
556,470- 810-229-C
N6JV (+NET) 341,682- 682-167-C
AA4M (+NET) 238,221- 458-173-C
N6CCL (+NET) 177,606- 414-143-C
KG6MY (+NET) 150,060- 305-164-C
N6CDA (+NET) 141,240- 535- 88-C
W6UJX (+NET) 95,319- 267-119-C
AF6S (+NET) 95,175- 423- 75-C
KB6HW (+NET) 87,840- 244-120-C
WA8LLY/6 (+NET)
58,430- 198- 95-B
AJ6V (+NET) 55,296- 192- 96-C
W6AOT (+K6KLY)
40,992- 122-112-C
KD6LV (+NET) 37,584- 144- 87-C
WB2CHO (+NET)
31,500- 175- 60-B
WC6I (+NET) 21,384- 108- 66-C
K6LRN (+NET) 9,717- 79- 41-C
KJ6V (+NET) 1,638- 26- 21-C
WW6D (+NET) 1,638- 39- 14-B
NT6G (+NET) 1,200- 20- 20-C

7

WR7D (+N7JXN,NØJO)
969,075- 1475-219-C
NO7F (+KF7DO)
388,773- 847-153-C

8

WB8K (W8s CZN,JGU,WA8s BIN,MEM,
RCN,ops)
1,970,202- 1943-338-C
KD8B (+KB8DLH,N8CC)
1,627,552- 1632-312-C
WB8VPA (+NET)
346,731- 553-209-C

9

KD9ST (+KA9s SQR,SQS,SQT,KB9BAT)
632,808- 944-294-C
WB9WQG (+WD9FEN)
61,632- 214- 96-C

Ø

KRØB (+AF9T,KØII,KJØB,NØBIL,
NØBKL,WJØM) 722,916- 934-258-C
NØBNG (+KØET,KA8s JZV,YFN,KB9LC,
WJ9L) 507,144- 748-226-C
NØZA (+NNØM) 393,390- 705-186-C
W4NIM (+KØVM, NBØH)
227,424- 412-184-C
KCØLX (+KØQNS)
153,786- 361-142-B
WØWGZ (+WBØWII)
1,479- 29- 17-B

VE

VE7SZ (+VE7ON)
934,185- 1435-217-C
VE6AO (+VE6s AMR,ANL,AXB,CG,CIZ,
CJZ,EFP,EY,JO,KC,LES,SWM,YES)
291,018- 574-169-C
VE4XX (VE4s AJO,ALN,EF,FF,FR,GH,GR,
HQ,RI,RV,SF,SI,TM,UT,WS,ops)
165,459- 383-144-C
VE2UMS (+VE2s AYH,FUR,HMB)
7,830- 58- 45-B

Two Transmitter

KC1F (+K1s AR,DG,EA,KM3T)
5,390,900- 4050-526-C
N5AU (+KS1G,KM5X,KY5N,WB5VZL)
5,354,536- 3703-482-C
K1RX (K2SS,KA1s HGY,ION,N1EPU,ops)
4,864,500- 3450-470-C
N6RO (+K3EST,K6TMB,N6s IG,KT)
4,696,314- 3607-434-C
N2MG (+KD2RD,NO2I,NQ2D)
4,343,808- 3232-448-C
N3RS (+N3s NA,RD,WB3RTX)
4,128,348- 2891-478-C
N2FB (+K3YDX,KC3X,N3CBJ,WA3LJP,
WB8VGI) 3,674,880- 2816-435-C
K8CC (+ops) 3,626,280- 2878-420-C
KO7N (+NØXX,W7IL,WZ8Z,WJ7s
R,S,WA7TDS)
2,880,119- 2829-337-C
W7ZR (+AG1J,N7BSB,N7ZZ,W7GJS)
2,015,175- 2425-277-C
NE9O (+KA9s AND,OIH,VQB,N9s AZD,
HSG,JR,W9SU,WB9CEP)
1,918,872- 1838-348-C
NJ3A (+N3s FOB,GOB,GPK,LR,
NJ3C,NT3F) 1,868,408- 1876-332-C
N5RZ (+K5MR,KN5M,W5FO)
1,836,450- 1590-385-C
KB1RI (+ops)
1,426,629- 1549-307-C
N7RO (+KB7GSM,KC7GX,W7EKM,
WA7ZWG,WB7CLU)
1,321,650- 1602-275-C
AK6T (+K4UVT,K6ZM,KI6EZ,
NB6L,WB6MZC)
1,251,360- 1580-264-C

KQ1F (+K1XM,K9HI)
1,141,056- 1132-336-C
W3NX (+KN5H) 521,196- 676-257-C
KB6RXF (+W6TMD)
406,107- 801-168-C
WB8PHI (+KB8FPC,W8SJU)
196,182- 378-173-C
KA1QNC (+N1s EFX,FWC)
13,248- 92- 48-B

Unlimited

W3LPL (+K1s DQV,RZ,K3s RA,ZZ,KA3ITJ, KC3EK,KC8C,KF3P,N3GB,NM3U,NW5E, N8,KT,WA8MAZ,WB3JRU)
8,965,758- 5074-589-C
WM5G (+AA5DX,K5s RX,SXO,KC5DX, KM5R,KM9P,KR9Y,N5IWA,WG5J,WQ5W)
7,343,838- 4387-558-C
NB1H (+K1s FWE,MNS,ST,NI8L,N1s ACH, ELN,W1/JA2EZD,W1IHN,WA1TFH)
6,467,310- 4227-510-C
KK4S (+AA4s,GL,K3RZR,KB4DI,KI4GM, N4s DCY,EHJ,W4s DR,MYA,WA4HOT, WB4BVY,WD4BBD,WK4Y,WU4G)
5,943,672- 3931-504-C
K5NA (+K5MA,KA2s TIP,VQY,KB2GHW, KU2Q,N2s EK,GQS,NA2N,NG2X,W2s JU,XL,WB2Q,WM2s P,Q,WA3AFS)
5,677,890- 3571-530-C
KY1H (+KA1RE,KM1P,KR1R,NJ1F,NS1M, NT2X,WA1ZAM)
4,783,887- 3261-489-C
K2TR (+K2XA,N1CC,N2DU, WA2SPL,WB2KMV)
4,460,910- 3085-492-C
N2RM (+K2s JF,OWE,KB2BF,N2NU, W2GSN,WA2IVO,WM2H)
4,062,600- 3050-444-C
W3GM (+AB2E,K2RD,K3s ND,UEI,KA3PLS, N2EA,NK3U,W3FV)
3,335,796- 2412-461-C
N3AD (+NET) 2,292,147- 1859-411-C
K3WW (+NET)
2,255,988- 1757-428-C
NE3F (+K3NW,KA3SHT,N3WGR,NS3F, W3UM) 2,114,796- 1711-412-C
N2MM (+K2ZSY,KY2T)
1,971,945- 1623-405-C
NF2L (+KY2T,N3RGI)
1,922,496- 1984-323-C
N6DX (+AC6T,AD6C,K6s HMA, SVL,KI6QR,KJ6HC,N6s HLS,IC,NW, TPN,VR,ZZ, WA6HEU,WK6V,WT7F)
1,830,441- 1889-323-C
N3EC (+K3KNH,KA3s NED,ROF,W3FW, WA3YOB) 1,818,558- 1698-357-C
K3IPK (+NET)
1,715,292- 1643-348-C
WB2P (+NET)
1,637,508- 1396-391-C
K3ZJ (+K4YT)
1,605,690- 1710-313-C
W3YL (+K3PA) 746,800- 832-300-C
K8MR (+NET) 747,600- 890-280-C
K3RL (+NET) 99,000- 264-125-C

DX Phone

Africa

Botswana

A22RA 938,448- 2128-147-B
A22AA 39,600- 240- 55-A

Morocco

CN8FC 966,861- 2163-149-B
CN8EK 291,720- 715-136-B

Madeira Islands

CT3DL 28,767- 223- 43-C- 80
CT3BD 60,606- 518- 39-B- 20
CT3BM 105,696- 734- 48-B- 15

Ceuta and Melilla

EA9NN 25,074- 199- 42-B- 10

Gabon

TR8SA 764,748- 1746-146-B

Chagos

VQ9CQ 67,584- 256- 88-B

Republic of South Africa

ZS6HO 211,968- 768- 92-C

Mauritius

3B6FP 98,028- 389- 84-B

Senegal

6W7QG 894,642- 1666-179-B

Zambia

9J2AL 51,183- 363- 47-B- 10

Zaire

9QSNW (N4NW,op)
2,968,208- 4414-224-C

Asia

China

BY1QH (NS7Z,op)
52,515- 389- 45-C- 20

Korea

HL9TF 291,738- 666-131-C
HL9FN 47,436- 268- 59-B
HL9CA 5,673- 61- 31-B
HL1LW 25,740- 220- 39-B- 10

Japan

JH1AEP 1,373,130- 2190-209-C
JH7DNO 1,338,750- 2125-210-C
JR3BOT 465,723- 1101-141-C
JH4NMT 386,629- 901-143-C
JE7DOT 126,360- 390-108-B
JA2JSF 103,005- 327-105-A
JL1MWI 97,230- 463- 70-B
JE1AER 52,461- 261- 67-B
JA8NFP 51,240- 260- 61-B
JA3UWB 43,164- 218- 66-C
JA1IZ 38,709- 187- 68-C
JA1ASO 37,908- 162- 79-B
JE4VVM 33,507- 163- 73-A
JA1BUI 28,728- 171- 56-B
JA5IP 25,116- 161- 52-B
JA1AOD 21,504- 128- 56-B
JA7VSO 19,716- 124- 53-B
JA7JHT 18,020- 89- 60-B
JA1JMF 15,255- 113- 45-A
JR7LVK 14,145- 115- 41-B
JA6BWH 13,653- 123- 37-B
JH1TEB 9,945- 85- 39-B
JA2MFF 9,324- 64- 37-B
JG1DUN 9,324- 84- 37-A
JA5EO 7,740- 86- 30-B
JF6JQM 7,200- 80- 30-B
JH1PXY 6,975- 75- 31-B
JA2QVP 5,400- 50- 36-C
JH6IOM 4,950- 66- 25-B
JE4VRF 4,224- 44- 32-B
JA6AKV 3,654- 58- 21-B
JG1RDV 2,970- 45- 22-B
JG6ONY 2,679- 47- 19-B
JE6GGE 2,565- 45- 19-B
JA6JXO 2,340- 39- 20-B
JI6OWY 2,115- 47- 15-B
JG7JBZ 1,938- 38- 17-B
JA7DRM 10,971- 158- 23-C- 80
JM1OIA 4,071- 59- 23-A- 80
JA2BAY 76,464- 531- 48-B- 40
JH7WKQ 16,236- 164- 33-C- 40
JA7RXU 7,056- 112- 21-C- 40
JH7QXJ 88,086- 554- 53-C- 20
JA8QNJ 73,080- 435- 56-C- 20
JE1GZB 3,105- 45- 23-B- 20
JA8GZ 2,160- 40- 18-B- 20
JA4PA 1,386- 33- 14-B- 20
JA1YXP 248,646- 1429- 58-C- 15
JH7AFR 200,925- 1175- 57-C- 15
JR3NZC 200,241- 1171- 57-C- 15
JA7BJS 198,408- 1181- 56-C- 15
JK1OLT 185,640- 1105- 56-C- 15
JA7YAB 171,855- 1005- 57-C- 15
JK3GAD 83,430- 515- 54-B- 15
JA2YAU (JE7MAY,op)
20,538- 163- 42-B- 15
JA8RJE 15,336- 142- 36-A- 15
JH8XUP 13,608- 126- 36-B- 15
7J1AFZ 9,912- 118- 28-B- 15
JR3WXA 9,408- 112- 28-C- 15
JL1KUH 5,544- 66- 28-A- 15
JL2RQH 4,410- 70- 21-A- 15
JA6QDU 2,736- 48- 19-B- 15
JA8BPY 1,008- 24- 14-B- 15
JA2BPY 1,008- 24- 14-B- 15
JK6FYB 864- 32- 9-B- 15
JF4ETK 576- 16- 12-B- 15
JR2IGV 360- 15- 8-B- 15
JI1TML 360- 20- 6-B- 15
JA3COA 108- 9- 4-B- 15
JR3KAH 72- 6- 4-B- 15
JA6JHA 280,728- 1671- 56-B- 10
JH1AGU 156,123- 913- 57-B- 10
JH1XUZ 118,773- 747- 53-B- 10
JA8RWU 118,092- 757- 52-B- 10
JA8NFV 100,926- 623- 54-B- 10
JA7WME 100,329- 631- 53-B- 10
JJ1VRO 88,722- 558- 53-B- 10
JA6BIF 84,525- 575- 49-B- 10
JH1IED 80,550- 537- 50-B- 10
JA4AYU 77,904- 541- 48-B- 10
JA1KFX 76,146- 518- 49-B- 10
JA2AXB 69,690- 505- 46-B- 10
JA1PUK 59,700- 398- 50-B- 10
JG2TSL 54,924- 398- 46-B- 10
JR7CDL 26,664- 202- 44-B- 10
JG1GGF 25,389- 217- 39-B- 10
JH1UUT 23,985- 195- 41-B- 10
JI1JVG 23,736- 184- 43-A- 10
JA1HWO 22,218- 161- 46-A- 10
JA2DLM 18,252- 156- 39-B- 10
JF2GYH 13,932- 129- 36-B- 10
JA6EFT 13,176- 122- 36-B- 10
JA1BNW 11,346- 122- 31-B- 10
JG1GZN 9,090- 101- 30-B- 10
JG7LBN 8,010- 89- 30-B- 10
JN1CAK 3,420- 57- 20-B- 10
JH8DHV 3,417- 67- 17-A- 10
JH6TYD 3,381- 49- 23-B- 10
JA1OP 3,096- 43- 24-B- 10
JE6EHE 2,880- 40- 24-B- 10
JA1VZM 1,386- 42- 11-B- 10
JO1MCC 12- 2- 2-A- 10

Ogasawara

JG2CLS/JD1 6- 2- 1-B- 40
JQ1XAQ/JD1
5,481- 87- 21-B- 15
JM1MYG/JD1
2,679- 47- 19-B- 10

Jordan

JY9SR 56,592- 262- 72-B

Asiatic RSFSR

UA9QA 58,832- 296- 64-C
UA9MR 32,760- 185- 56-C
UW9CM 25,758- 159- 54-C
UA9ABK 102,300- 620- 55-C- 20
RA9SU 12,138- 119- 34-C- 20
UA9XAK 67,392- 432- 52-B- 15
UA9FS 10,290- 98- 35-C- 15
UA9SME 4,536- 63- 24-B- 15
UA9MFN 2,160- 48- 15-B- 15
UA9SNT 780- 26- 10-B- 15
UA9SR 630- 21- 10-C- 15

Georgia

UF6QAC 5,796- 69- 28-C- 20
UF6FAL 390- 13- 10-B- 20

Armenia

UG6JJ 4,758- 61- 26-B- 40

Kazakhstan

UL8LWZ 94,824- 439- 72-C
UL7DA 45,276- 308- 49-C- 20
RL7RL 42- 7- 2-B- 15
UL8LWF 336- 14- 8-C- 10

Kirghizia

UM8DX 32,535- 241- 45-C- 20

Israel

4X6UU 46,230- 280- 67-B
4Z4TA 13,200- 100- 44-A
4X6RA 4,992- 64- 26-B- 20

Europe

Portugal

CT1QF 45,969- 199- 77-B
CT1TM 1,170- 26- 15-C- 160
CT1BOP 934,080- 1920- 58-C- 20
CR6AHU 4,050- 50- 27-B- 20
CT4HA 42,018- 298- 47-B- 15
CT1DTH 312,963- 2129- 49-C- 10
CR5CQK (CT1CQK,op)
90,864- 631- 48-B- 10
CT1BBJ 39,975- 325- 41-B- 10

Azores

CU2BR/CU8 123,552- 792- 52-C- 80
CU2AF 111,210- 674- 55-C- 20
CU2AK 312,648- 1861- 56-C- 10

Federal Republic of Germany

DK1FW 378,750- 1010-125-C
DL2GAR 259,200- 720-120-C
DL8PC 87,327- 313- 93-B
DL0KB (SP3SFM,op)
48,720- 290- 56-C
DK4IO 16,497- 141- 39-B
DJ3GE 10,413- 89- 39-C
DL5SAY 8,586- 105- 27-C
DK8AX 390- 13- 10-B
DL3YDY 231- 11- 7-B
DL7XR 27,090- 215- 42-C- 15
DL8AAE 14,097- 127- 37-B- 15
DF5XN 5,175- 75- 23-C- 15
DF0SSB (DF9ZP,op)
258,552- 1596- 54-C- 10
DJ3HJ 115,830- 715- 54-C- 10
DJ1ZU 75,072- 544- 46-C- 10
DL3ME 5,250- 70- 25-B- 10
DJ0BX 2,052- 38- 18-B- 10
DA1IQ (KA2QFK/N,op)
540- 18- 10-B- 10

Spain

EA7BHO 237,765- 655-121-B
EA4CQT 195,657- 539-121-C
EA7GTF 187,974- 531-118-B
EA5CPH 36,432- 178- 69-B
EA4CXF 33,858- 142- 56-B
EA5AEN 11,907- 81- 49-B
EA5JC 10,650- 71- 50-C
EA5EFV 9,216- 64- 48-B
EA2CR 8,733- 71- 41-B
EA5FYJ 6,432- 67- 32-B
EA3EXW 3,900- 50- 26-B
EA5WA 2,178- 33- 22-B
EA3ELM 812- 17- 12-C- 40
EA1CCN 41,175- 305- 45-C- 20
EA4EHQ 4,140- 60- 23-B- 20
EA1CIJ 3,000- 50- 20-B- 20
EA3FHT 2,793- 49- 19-B- 20
EA7FUR 11,520- 120- 32-C- 15
EA7FTR 131,859- 897- 49-B- 10
EA7AVU 67,662- 537- 42-B- 10
EA7LM 64,650- 431- 50-C- 10
EA7BHO 42,312- 328- 43-C- 10
EA3DZZ 19,872- 184- 36-B- 10
EA3NA 17,343- 141- 41-C- 10
EA7CD 5,964- 71- 28-B- 10

Balearic Islands

EA6ZS 14,688- 102- 48-B
EA6WY 1,920- 40- 16-B- 10

Ireland

EI8GT (W2ORA,op)
260,205- 1045- 53-B
EI8AU 35,295- 181- 65-A

France

F6AOJ 1,457,799- 2303-211-C
FV9NDX (F9RM,op)
675,675- 1575-143-C
F1BEG 86,940- 345- 84-A
F6EXQ 58,905- 231- 85-B
F6ENT 30,810- 130- 79-B
FE6FNA 15,840- 120- 44-B
F6CTT 66,780- 530- 42-C- 80
FE6DRP 19,980- 180- 37-B- 20
F6FYA 169,974- 994- 57-C- 15
F6EPO 13,464- 132- 34-C- 15
F6CLM 6,048- 84- 24-B- 15
F6EMT 381,864- 2273- 56-C- 10
FS/N 90,884- 631- 48-C- 10
F6FNL 47,232- 384- 41-B- 10
F1JDG 18,144- 168- 36-B- 10
F6GZC 2,655- 59- 15-B- 10

England

G3SJX 1,024,884- 1743-196-C
G2QT 832,142- 1211-174-C
G4BUO 135,792- 492- 92-C
G4CNY 352,431- 2061- 57-C- 15
G4MET 97,431- 691- 47-C- 10
G8/W3FTG 33,696- 288- 39-C- 10

Isle of Man

GD3ZND (EI2BB,op)
46,368- 224- 69-B

Northern Ireland

GI0KOW 83,352- 604- 46-B- 10

Scotland

GM3BCL 259,869- 841-103-C
GM4HOF 89,628- 308- 97-B

Wales

GW4BLE 283,176- 1748- 54-C- 10
GW0ARK 269,664- 1695- 53-C- 10

Hungary

HA8XX 652,050- 1242-175-B
HA4XX 112,464- 426- 88-B
HA1DRR 48,024- 276- 58-B
HA6KNX 1,716- 44- 13-B- 20
HA8KZO 924- 22- 14-B- 15
HA8NNN 150,732- 948- 53-B- 10
HA8MK 58,266- 498- 39-C- 10

Switzerland

HB9ASJ 36,966- 202- 61-B
HB9BOU 43,920- 366- 40-C- 40
HB9FG 46,500- 310- 50-C- 15
HB9DX 2,976- 32- 31-C- 10

Italy

IO9GSF 1,886,967- 2953-213-C
IO0KHP 75,945- 305- 83-A
IN3XUG 55,596- 226- 82-C
K3LM/I8 51,027- 233- 73-C
IK8LWA 26,250- 175- 50-B
IK4HLV 23,166- 234- 33-B
I4CSP 19,008- 132- 48-B
IK2LCY 16,848- 117- 48-B
IK8FEC 10,602- 93- 38-C
IN3PEE 6,720- 80- 28-B
IK4CBM 3,105- 69- 15-B
IK5BAF 77,238- 613- 42-C- 80
I8SAT 14,790- 170- 29-C- 40
IK4FNF 1,386- 33- 14-B- 20
IB8A (IK8DOI,op)
255,816- 1496- 57-C- 15
IK4AUY 226,575- 1325- 57-C- 15
I4FYF 195,552- 1164- 56-C- 15
I5FCK 242,838- 1499- 54-C- 10
IK2DUU 215,490- 1306- 55-C- 10
IO4ABF 204,951- 1289- 53-C- 10
I8BYG 146,280- 920- 53-C- 10
IK2DZM 141,000- 940- 50-C- 10
I4EWH 97,344- 624- 52-C- 10
IV3BMV 34,650- 275- 42-C- 10
IK0FUX 15,444- 156- 33-B- 10

Sardinia

IS0WON 37,962- 342- 37-C- 40
IS0AEQ 49,128- 356- 46-C- 20
IS0QDU 26,976- 281- 32-C- 15
IS0CPU 64,722- 469- 46-C- 10

Norway

LA1T (LA6OV,op)
69,069- 253- 91-B
LA9HW 135- 9- 5-C- 40
LA3KY 10,710- 105- 34-C- 15
LA1QDA 3,402- 54- 21-C- 15
LA5JX 16,128- 168- 32-B- 10
LA3JT 5,772- 74- 26-B- 10
LA5KK 5,550- 74- 25-B- 10

Luxembourg

LX2QR 15,444- 143- 36-B- 10

Bulgaria

LZ2WM 127,575- 405-105-B
LZ1KNP 47,499- 223- 71-C
LZ1HP 23,220- 129- 60-B
LZ2QV 16,200- 100- 54-B
LZ1KWZ 14,652- 111- 44-B
LZ1V (LZ1ZO,op)
1,050- 25- 14-C- 40
LZ1KDP 216,456- 1244- 58-C- 20
LZ1W (LZ1YE,op)
275,310- 1610- 57-C- 15
LZ1KXA (LZ1A-1228,op)
211,338- 1194- 59-C- 15
LZ1KAZ (LZ1NG,op)
162,021- 1019- 53-C- 10
LZ2ES 45,144- 342- 44-C- 10
LZ1YG 9,744- 112- 29-B- 10

Austria

OE3KRA 4,410- 70- 21-B

Finland

OH6YF 373,932- 884-141-C
OH6NEV 25,404- 146- 58-C
OH6SU 12,540- 95- 44-B
OH1AF (OH1NOA,op)
194,706- 1119- 58-C- 20
OH1ZAA 90,972- 532- 57-C- 20
OH5OL 897- 23- 13-C- 20
OH6AC (OH6CS,op)
123,291- 721- 57-C- 15

Czechoslovakia

OK1RI 2,422,380- 3436-235-C
OK1DKS 25,992- 152- 57-A
OK1DXW 12,420- 90- 46-B
OK1KRJ (OK1ANN,op)
5,376- 64- 28-B
OK3CTX 5,358- 47- 38-B
OK3CXS 3,024- 42- 24-B
OK2BHM 5,616- 72- 26-C- 20
OK2PCL 4,248- 59- 24-B- 20
OK3CMW/P 3,234- 49- 22-B- 20
OK2SPJ 2,499- 49- 17-B- 20
OK2KOD 2,394- 42- 19-C- 20
OK2PEM 76,806- 502- 51-C- 15
OK8AGG 41,445- 307- 45-B- 15
OK3YCA 17,433- 149- 39-B- 15
OK2BTC 2,652- 52- 17-B- 15
OK3CBU 25,560- 213- 40-C- 10
OK2BGQ 8,613- 99- 29-B- 10
OK1KZ 5,700- 76- 25-B- 10
OK3CTX 3,402- 63- 18-C- 10

Belgium

ON4YN 281,916- 764-123-C
ON8WN 180- 10- 6-A- 40
ON4XG 23,520- 196- 40-B- 10

Denmark

OZ5EV 80,898- 278- 97-C
OZ3PE 9,225- 75- 41-A
OZ1FTE 38,016- 288- 44-C- 40
OZ1INN 18,252- 169- 36-C- 20
OZ7HT 630- 21- 10-C- 20
OZ1BUR 14,256- 132- 36-B- 15
OZ1HXQ 9,282- 119- 26-B- 15
OZ1CLG 18,315- 165- 37-C- 10
OZ1AXG 13,056- 128- 34-C- 10
OZ7AX 1,170- 30- 13-B- 10
OZ8T 600- 20- 10-B- 10

Netherlands

PA0EHF 48,351- 227- 71-C
PA0KDM 24,648- 158- 52-B
PA0IA 22,185- 145- 51-A
PA3BRD 22,176- 132- 56-B
PA0DJ 13,110- 95- 46-B
PA3EMN 12,222- 97- 42-B
PA3DWA 10,440- 87- 40-A
PA0YN 4,134- 53- 26-B
PA0QX 28,080- 234- 40-C- 15
PA3BZV 11,811- 127- 31-B- 10

Sweden

SM3EP 4,557- 48- 31-B
SM0BDS 3,456- 48- 24-B
SM3CER 2,415- 35- 23-C
SM3PHM 7,719- 83- 31-C- 20
SM7KIL 62,244- 399- 52-C- 15
SM6BSK 13,299- 143- 31-B- 10
SM6DER 12,000- 125- 32-C- 10
SM5IWC 11,439- 123- 31-B- 10
SM6MC 1,968- 41- 16-C- 10
SM5CAK 80- 5- 4-C- 10

Poland

SP6DVP 29,055- 149- 65-C
SP9AKD 27,336- 134- 68-C
SP5LCT 10,320- 80- 43-B
SP6CZ 6,195- 59- 35-B
SP3DWQ 28,188- 261- 36-C- 40
SP1EOI 4,686- 71- 22-B- 20
SP9AVZ 126- 7- 6-B- 20
SP3GEM 223,740- 1356- 55-C- 15
SP9EMQ 10,092- 116- 29-B- 15
SP2ASJ 9,765- 105- 31-B- 15
SP2FAP 4,554- 66- 23-B- 15
SP6FBD 1,722- 41- 14-B- 15
SP3KEY 159,600- 1064- 50-C- 10
SP6LTF 39,420- 292- 45-C- 10
SP5ALV 14,229- 153- 31-B- 10

Greece

SV1UG 2,280- 38- 20-B

European Russian RSFSR

UZ4FWD 103,464- 479- 72-C
UA3DRB 56,772- 249- 76-C
RV3ZA 27,735- 215- 43-C
UA3TEG 14,280- 138- 35-C- 20
RA3VV 8,265- 95- 29-C- 20
UA6XT 8,091- 87- 31-C- 20
UA4RL 2,244- 34- 22-C- 20

UA6ADC 14,880- 155- 32-C- 10
UA6LQ 8,424- 104- 27-C- 10
UA6BPM 2,280- 40- 19-B- 10
RV6ACZ 897- 23- 13-B- 10

Ukraine

RB5DX 685,080- 1384-165-C
UB5QKC 34,104- 198- 58-C
UB5IFN 6,540- 109- 20-C- 80
RB5LQ 55,440- 330- 56-C- 20
UB5IJG 82,773- 541- 51-B- 15
RB5WA 77,550- 470- 55-C- 15
UT4UX 47,256- 358- 44-C- 15
RB5TK 10,137- 109- 31-C- 15
UB4JDM 6,605- 105- 27-C- 15
UB4TXL 5,244- 76- 23-B- 15
RB5FQ 2,958- 58- 17-C- 10
UB4JFV 684- 19- 12-B- 10
UB5LRS 90- 6- 5-A- 10

Byelorussia

RC2AR 80,028- 494- 54-C- 15
RC2AZ 19,092- 172- 37-C- 15
UC2AGY 360- 12- 10-A- 10

Moldavia

RO4OA 41,814- 202- 69-C
UO5ODA 2,793- 49- 19-B- 20

Lithuania

UP2OU 25,281- 159- 53-C
UP1BYC 200,448- 1152- 58-C- 20
UP3BH 40,506- 314- 43-C- 10

Estonia

UR2RIY 11,088- 88- 42-C
UR2RJ 8,400- 100- 28-C- 40
UR2RRR 104,988- 673- 52-C- 15

German Democratic Republic

Y23EK 1,945,944- 3003-216-C
Y22JJ 593,514- 1137-174-C
Y41YM 407,664- 912-149-C
Y44UI/A 167,883- 523-107-C
Y45RN 75,240- 330- 76-C
Y53ED 57,564- 234- 82-C
Y27YH/A 32,025- 175- 61-C
Y67UL 29,160- 180- 54-C
Y22TO 25,230- 145- 58-C
Y51XO 18,792- 116- 54-C
Y25BL 16,524- 108- 51-B
Y59UJ 11,088- 84- 44-C
Y23TN/A 9,450- 90- 35-C
Y62QH 7,392- 77- 32-B
Y41JH 6,930- 66- 35-C
Y22SC 6,912- 72- 32-A
Y41SN 2,376- 44- 18-B
Y62XG 105- 7- 5-C
Y33UL 10,611- 131- 27-C- 40
Y23KF 3- 1- 1-B- 40
Y25HL 18,650- 150- 37-C- 20
Y28UN 2,679- 47- 19-A- 20
Y58UA 1,224- 24- 17-C- 20
Y25PE 360- 12- 10-B- 20
Y32VI 11,124- 103- 36-C- 15
Y74ZG 2,256- 47- 18-B- 15
Y66YF 1,887- 37- 17-B- 15
Y34KL 840- 28- 10-B- 15
Y65LN 390- 13- 10-B- 15
Y22EK 30,840- 257- 40-B- 10
Y38YK 11,040- 115- 32-B- 10
Y21WM 6,075- 75- 27-B- 10
Y38YE 4,356- 66- 22-B- 10
Y25DA 1,008- 28- 12-B- 10
Y54ZO/Y54NL 27- 3- 3-B- 10

Romania

YO8CQQ 50,451- 251- 67-C
YO3FBK 23,688- 168- 47-B
YO3DCO 8,664- 76- 36-C
YO6JN 7,626- 82- 31-B
YO9FEH 945- 21- 15-B
YO9HP 11,700- 130- 30-C- 20
YO2LAM 9,339- 53- 21-B- 20
YO9HT 11,187- 113- 33-C- 15
YO7LDL 65,008- 368- 77-B- 10
YO2DDM 5,528- 56- 21-B- 10

Yugoslavia

YU7KM 18,705- 145- 43-C
YU4CC 47,640- 397- 40-C- 40
YT7A (YU7OA,op) 25,920- 240- 36-C- 40
YT3T (YU3BQ,op) 223,326- 1306- 57-C- 20
4N2V (YT2ER,op) 193,388- 1151- 56-C- 20
YZ1E (YU6AR,op) 301,388- 1732- 58-C- 15
YZ4I 276,192- 1644- 56-C- 15
4N3E (YU3XJ,op) 248,820- 1508- 55-C- 15
YU3AI 162,450- 950- 57-C- 15
YU7FT 25,200- 200- 42-B- 15
4N1W (YU2EU,op) 217,308- 1393- 52-C- 10
YZ3A (YU3WE,op) 200,088- 1191- 56-C- 10
4N3M (YU3AY,op) 149,550- 997- 50-C- 10
YT7WW 133,569- 873- 51-C- 10
YU2QU 34,200- 285- 40-B- 10
YU7SF 26,751- 241- 37-C- 10

North America

Bahamas

K2PS/C6A 2,339,778- 3277-238-B

Guadeloupe

FG5/KA3DSW 2,562,210- 3486-245-C

Dominican Republic

HI3AMF 352,182- 743-158-B
HI8LC 7,425- 99- 25-B- 80

Honduras

KI4KF/HR1 428,022- 903-158-B

St Lucia

J6LSN (KJ8G,op) 1,524,000- 2032-250-C

Alaska

NL7GP 2,231,040- 3320-224-C
AL7CQ 367,821- 2151- 57-C- 15
NL7PK 132,048- 786- 56-B- 15
KL7RA 211,035- 1279- 55-C- 10
NL7DU 97,308- 612- 53-C- 10

Puerto Rico

NP4CC 606,879- 3549- 57-C- 15
KP4FP 333,983- 1953- 57-B- 10
NP4P 179,025- 1085- 55-C- 10
KP4EKG 48,504- 344- 47-C- 10

Greenland

OX3ZM 19,440- 120- 54-B

Costa Rica

TE1L 200,925- 1175- 57-C- 80
TI2SW 292,923- 1713- 57-C- 15
TI2DU 382,552- 3348- 58-C- 10

Belize

V31C (KE5CV,op) 9,047,040- 9424-320-C

Montserrat

VP2MBA (W7FP,op) 4,311,780- 5170-278-C

Turks & Caicos Island

VP5T (NM2Y,op) 6,313,692- 6833-308-C

Bermuda

VE3PE/VP9 1,584- 33- 16-B- 20

Mexico

XE2NQ (AA5B,op) 4,362,240- 5120-284-C
XE2TCQ 917,217- 1477-207-C
XE1THR 181,278- 1119- 54-C- 10
XE2HWH 83,490- 605- 46-B- 10

Cayman Islands

ZF2MJ 488,784- 1198-136-B
ZF2MV 312,076- 1825- 57-C- 40

Barbados

8P6SH 344,223- 2013- 57-B- 10

Oceania

Philippines

DU1NH 67,338- 261- 86-C
N7BRJ/DU3 36,288- 216- 56-C

New Caledonia

FK8AW 71,487- 507- 47-B- 10

Guam

KD7P/NH2 1,041,624- 1987-184-C

Hawaiian Islands

K6GSS/KH6 3,188,010- 4465-238-C
WL7E/KH6 684,216- 1326-172-C
KH6FKG 339,996- 1954- 58-C- 20
KH6IMB 105,612- 677- 52-C- 15
WR6R/KH6 469,104- 2698- 58-C- 10
AH6IM 92,061- 579- 53-B- 10
N4EQS/KH6 46,305- 315- 49-B- 10
KH6VP (N/T) 27,183- 221- 41-A- 10

East Kiribati

T32AF (KH6UR,op) 420,831- 2461- 57-C- 20

Australia

VK1RJ 109,746- 469- 78-B
VK3YH 26,865- 199- 45-C- 40
VK2PWS 60,066- 426- 47-B- 10
VK5NVW 14,175- 135- 35-B- 10

Indonesia

YB3ASQ 337,431- 821-137-C
YC8RBG 18,060- 172- 35-B
YC1IOI 12,672- 128- 33-B- 15
YB2CR 7,878- 101- 26-C- 15
YB8EMJ 2,967- 43- 23-B- 15
YC2IKI 43,680- 364- 40-B- 10
YC8SQT 35,910- 285- 42-B- 10
YC3OSE 18,768- 184- 34-B- 10

New Zealand

ZL1IM 52,200- 232- 75-B

South America

Chile

CE5NCX 7,569- 87- 29-C
CE6EZ 328,149- 1919- 57-C- 20
CE6JOE 148,068- 914- 54-B- 10
CE4ETZ 54,774- 358- 51-B- 10
CE3AEZ 49,767- 313- 53-C- 10

Bolivia

CP1BA 15,927- 131- 39-B- 10

French Guiana

FY4FC 151,686- 954- 53-B

Ecuador

HC1OT 191,349- 1119- 57-C- 40
HC1HC 541,728- 3168- 57-C- 15
HC2G (HC2CG,op) 773,946- 4526- 57-C- 10

Colombia

HK3DFT 18,495- 137- 45-C- 160
HK1LDG 23,868- 221- 36-C- 80
HK3MAE 250,734- 1441- 58-C- 40
HK7MQC 1,701- 27- 21-B- 15

Argentina

LU3F 1,004,550- 1850-181-C
LU8DWN 40,110- 191- 70-B
LU1BAB 128,154- 806- 53-C- 15
LU1YU/D 50,631- 527- 51-B- 15
LU6FN 35,370- 262- 45-C- 15
LU1HM 177,240- 1065- 56-C- 10
LU1QCK 151,140- 918- 55-B- 10

Peru

OA4ZV 212,040- 1240- 57-C- 15

Aruba

P40V (AI5V,op) 7,711,680- 8033-320-C
P40T (KB2HZ,op) 887,301- 5013- 59-C- 10

Netherland Antilles

PJ9JT(W1BIH,op) 4,839,039- 5543-291-C
PJ4/AD8J 417,150- 1030-135-B

Brazil

PT7WA 11,997- 129- 31-C- 40
ZV5A (PY5EG,op) 809,796- 4654- 68-C- 10
ZZ1NEZ 72,828- 476- 51-C- 10

Fernando de Noronha

PY0FF 233,688- 1391- 56-C

Venezuela

YV6BTF 97,785- 615- 53-C- 80
4M5T (YV5JBI,op) 413,232- 674- 56-C- 40
YV6EDA 27,588- 209- 44-C- 20
4M1G (YV1CLM,op) 91,728- 824- 49-B- 15
YV6BFE 24,000- 250- 32-B- 15
YV6PM 579,861- 3391- 57-B- 10
YV5IAL 172,208- 1053- 54-B- 10
YV5MBX 159,579- 1043- 51-B- 10
YV5LAS 127,215- 771- 55-B- 10

Paraguay

ZP5JCY 798,138- 4587- 58-C- 10

Multioperator

Single Transmitter

Africa

T5GG (+I2VXJ) 1,027,650- 2210-155-C

Asia

HL9USA (HL9s BA,JZ,OMT,UTT,ops) 258,326- 718-119-C

JA7YAA (JE7HFL,JH8ORW, JJ3CNL,ops) 1,556,940- 2359-220-C

JA3YDS (JE4MHL,JF4LIR,JH9LYC,JI2KKY, JI3s GAB,QPT,JJ3s JBM,TWT,JK2CVN, JM2GZX,JM3KGV,ops) 821,100- 1610-170-C

JA7YFB (JG7HMD,JQ1NBV, JR8NUZ,JA7-36262,ops) 305,406- 722-141-C

JA6YBR (JF6CVW,JG6CVO,JI6BRB,ops) 75,465- 387- 65-B

TA2AO (+TA1AZ,TA2s AU,BK,DA,FL) 120,246- 409- 98-B

UZ8CWA (UA6s CCD,CDI,CDX,RW6CA, UW6s CA,CN,CW,ops) 770,700- 1468-175-C

UZ9QWT (UA6s QBS,QGL,QIU,ops) 175,536- 552-105-C

UZ9YXI 44,220- 335- 44(6ops)

UZ9IWE (UA6IAU,UA4-094-388,UA6-138-198,ops) 19,800- 132- 50-B

UZ8ZWD (UA6s ZDD,-126-071,-128-131,ops) 4,200- 56- 25-C

UZ0SXF (UA6s SNR,-124-489,ops) 2,448- 48- 17-B

UI9AWH (UI8s AAY,AGH,UI9ADH,ops) 94,500- 450- 70-C

UL8CWW (UL7s GC,GT,ops) 10,692- 108- 33-C

UL8FWA (RL7s FGP,FGV,UL7FCP,ops) 600- 20- 10-C

UM9TWA (+ops) 76,254- 358- 71-C

Europe

DF0RR (DL7s ADL,AEN,AKC,ALM,ANR, SI,UX,ops) 1,090,086- 1873-194-C

EO3QD (EA3s BOW,BOX,DBQ,ops) 697,296- 1592-146-C

EI7M (EI3DP,EI4s BZ,DQ,EI5F I,EI6BT,EI8s EI,GS,09,ops) 1,838,424- 2824-217-B

F6BEE (+F6ARC) 3,017,884- 4056-248-C

G4SDP (+G4s WTD,ZIG,G8NGD,G0EVQ) 2,356,392- 4178-188-C

G0KBB (G3XMZ,G4VMM,ops) 1,004,400- 1674-200-C

GB5DX (G8s CLY,FWG,JWI,ops) 131,100- 475- 92-C

G4XOM/P (+G4IEB,G7BVV) 38,700- 215- 60-B

HG1S (HA1s AG,AH,DAC,DAE,TJ,ops) 2,297,742- 3389-226-C

HG0D (HA0s DR,DU,HG,NAR,ops) 847,671- 1511-187-B

HG4P (HA3PD,HA4s XH,ZZ,HA9CD,ops) 706,761- 1331-177-C

HA8KCK (HA8s FT,FW,KH,ops) 448,424- 979-152-B

HB9AUS (+HB9s CIP,CXZ,SFD,STL, HE9s ASD,EEX,T77V) 1,145,643- 1919-199-C

IO4JMY (I4s JMY,UFH,USC,YSS,IK4IEE,ops) 2,260,725- 3505-215-C

IK2CFH (+I2EOW,IK2s EGL,FCZ,9J2EZ) 1,607,724- 2627-204-C

I5JHW (+I5s ECW,NHG,IK5s BSC,FTO,JRY) 725,598- 1493-162-C

W9LT/8 (+N4QIV) 415,998- 1146-121-B

I4MJQ (+I4s GOC,MKN) 921,657- 901-119-C

LT2KSO (LZ1F-156,LZ1O-304,ops) 480,240- 1104-145-C

OH2PM (+OH1WZ) 421,743- 1057-133-C

OK3KAG (+ops) 33,495- 203- 55-C

OK1OFM (OK1s DRQ,-199/3,ops) 15,750- 125- 42-B

OK2KYC (+ops) 2,451- 43- 19-B

SM5GMG (+SM6LRR,SM0NSJ) 597,600- 1700-176-C

SK5DB (SM5s CXN,LRM,OOT,PAS,PAX, PEY,SYO,ops) 164,268- 468-117-C

SK6AW (+SM6s CMU,EHY,ops) 118,800- 360-110-C

SP9PEY (SP9s FKQ,HMC,ops) 125,460- 410-102-C

SP1PBW (SP9s EMI,-4315KA) 62,244- 273- 76-C

SP9ZHR (SP9EMI,SP9-4315KA,ops) 19,668- 149- 44-B

UZ4HWS (RA4PF,UA4HVV,ops) 220,848- 688-107-C

UZ6LWZ (UA6s LUQ,LV,-158-1336,ops) 82,560- 344- 80-C

UZ3AZO (UV3s ACS,GM,RA3-170-1 ops) 71,928- 324- 74-C

UZ8HXK (UA6s-168-1838,-188-1876,-189-1873,ops) 29,760- 155- 64-C

UZ3AWR (RA3ARI,UA3-179-158, UV3AEV,ops) 22,005- 163- 45-C

UB3IWA (RB5II,UB5s IOK,-673-1151,ops) 798,286- 1427-188-C

UB2JWS (+ops) 348,421- 737-111-C

UT4UXW (RA3QLK,UT4UGR,UT5UGR,ops) 58,104- 269- 72-C

UB4TWL (RB5TN,UB5TBS,UK5-679-2,ops) 17,145- 127- 45-C

UB4WXA (+ops) 9,396- 87- 36-B

UP1BYL (+ops) 5,643- 99- 19-C

UQ1GXJ (UQ2GIF,UQ2-837-291,ops) 2,553- 37- 23-B

Y54CO (Y54s NL,-18-L,ops) 3,630- 55- 22-B

YU2CCJ (+ops) 492,270- 1945-122-C

4N4C (+ops) 361,500- 984-125-C

North America

KI4IW/C6A (+KE3C) 2,543,904- 3212-284-B

J88A (J6LMV,K3OMI,K4LTA,N4FKO,ops) 5,027,616- 5819-288-C

KL7CQ (AL7s JZ,KK,KS,KL7IOL,NL7s HP,JZ, KN,NF,NN,QA,ops) 456,633- 1347-113-C

VP2MU (AA4s GA,NC,WB6SHD,ops) 8,687,040- 9049-320-C

VP5V (W4OVU,WD4JNS,WS4E,ops) 5,153,031- 6201-277-C

XE2EBE (AA6DP,N6RW,ops) 2,635,584- 3392-259-B

Oceania

DX9HT (+ops) 133,056- 504- 88-B

KX6QI (N2PC,AB5K,KS5H,WB5SQR, WB8SBH,WA6LOZ,ops) 3,103,866- 4122-251-C

Two Transmitter

Asia

JA8YBY (JE8s BRO,KLL,JF8TMI,JH8s GFB,PNE,XVT,JJ2VX5,JO1DFS,JR8s KET, NMX,ops) 2,082,710- 3198-215-B

JE3ZFS (JK3HZH,JL3MCM,JO3NZW,ops) 319,620- 761-140-C

North America

XE2FU (+AK5B,KB5FU,KC5M,K5LZO, NT5D,N5RP,WB5N,XE2s AAM,AKN,FU, KB,ops) 9,813,063- 10127-323-C

South America

ZY4BA (PY4s BA,OY,VD,ops) 885,432- 1868-158-C

Unlimited

Asia

JA9YBA (JA9s NFO,LNJ,VDA,-18148, JH8VSF,JJ3URK,JR8AOU,JO1RUR,ops) 2,658,003- 3869-229-C

JE2YRD (JF2s DOJ,EOC,VZU,JH2KTA, JI2KVW,JI3s ERV,JGJ,JK2CZL,JR2SCJ, JR7OMD,ops) 2,211,900- 3650-202-C

JH1YDT (JK1PIV,JO1IDL,JP1JFG,JQ1BRW, JJ3OLZ,JE7WBI,ops) 1,392,144- 2231-208-C

JA7YRR (JH7MEV,JF8NKV,ops) 135,564- 572- 79-C

Europe

I3MAU (+I3s FIY,JSS,KVW,ON, QJZ,IV3YYK) 4,381,503- 5839-259-C

YT2R (YT2FT,YU2s DQ,HO,IQ,LJ,MP,MY, OG,OH,ops) 3,172,554- 4578-231-C

LX150L (DA1s DW,KM,DF8WO,ops) 54,273- 229- 79-C

North America

6D2DX (KC7LZ,KF7NR,NI7Y,N7BSA,N7DD, VE7RG,WA8NNC,WB7A,W8YOY, XE2s ABB,ACU,CRN,FEF,JL,JRV,JSL,LF, RNC,SJE,SPN,UMV,WZ,ops) 10,313,550- 10578-325-C

Checklogs

4M3B, DJ6PC, DK3GI, DK3OI, DK9EA, EA5BK, EA5GEO, EA7AKW, EA7BUD, EA7DXR, EA7EL,EA7GBD, EC3CPT, FE5AI, HA2MJ, HA4XG, HA5FA, HA6KZS, HA8IY, HA8LG, HA8LM, HG7JBN, HJ3MCM, HK3MAH, I7PXV, IK6JMS, JR1XKU, K3APM, K4AMC, K6FM, K6IM, K7IJP, K9MDO, KA1FW, KA7FEF, KB7KN, K7SZ, LA2LV, LA8BN, LA8CE, LZ1DF, LZ1KAZ, LZ1KVZ, LZ1OR, LZ1RU, LZ1UH, LZ2KKK, LZ2RS, N1EUK, N7IR, NO9M, NR8E, NW2I, OH3WR, OH4RR, OH5FA, OH6EI, OH8NH, OH7NGM, OK1AWC, OK1DQT, OK1FNV, OK1US, OK3KJF, ON5FV, OZ1ACB, OZ1CBW, OZ1DPW, OZ1FTE, OZ1JLX, OZ1LTB, OZ4UN, OZ4XX, OZ7SM, OZ8CW, OZ9SN, PA2REH, PA3OCS, PA3ESG, PA8PHK, PA8TV, PA8UV, PY2YP, RA1QX, RA1WA, RA1WT, RA3ATM, RA3DGP, RA3DN, RA3EF, RA3GJ, RA4NBG, RA4SAE, RA6AF, RB5CL, RB5GW, RO4OW, RT4UA, RV9US, RZ1OA, RZ1OWO, SM4GL, SM5ARL, SM5GA, SM5MLE, SM5PPS, SM8APB, SM8BWQ, SM8BZE, SM8CDN, SM8LJP, SM8OLL, SM8RFJ, SM9BGM, SM9GSX, SP1DMD, SP1MVW, SP2BRN, SP2EFU, SP2FZJ, SP2ZT, SP3JIA, SP5KVW, SP8AUI, SP8FER, SP8FVQ, SP8GSC, SP8JUX, SP9CTW, SP9DBA, SP9JPA, SP9NSV, SP9PRO, TF3EJ, UA1OLL, UA2FU, UA3AB, UA3ACJ, UA3DAM, UA3DAT, UA3DFV, UA3DLU, UA3DPX, UA3EDH, UA3IAK, UA3OBX, UA3UAR, UA3XGM, UA3YBG, UA4AMT, UA4HTB, UA4NBD, UA4NBH, UA4NC, UA4PJA, UA4RC, UA4YBR, UA6HNU, UA6HPK, UA6LCT, UA8LF, UA9OS, UA9UIX, UA9FZ, UA9KBC, UA9QEZ, UA9SME, UB1RR, UB5GHG, UB5IJW, UB5IPN, UB5KAF, UB5LST, UB5PS, UB5QNH, UC1AWZ, UG6GG, UL7CC, UL7LDR, UT4UH, UT4UN, UT4UWL, UV3ACQ, UW3DF, UV6AGF, UV6ARL, UW1OF, UW3RR, UW6HS, UW9CZ, UW9YM, UZ1CXF, UZ1NWQ, UZ3DWV, UZ3ECQ, UZ3PB, UZ3XWM, UZ4AXQ, UZ4LWZ, UZ4WWB, UZ4WWG, UZ9CL, UZ9CWA, UZ9CXA, UZ9MZZ, UZ9UZL, UZ9XXM, UZ9QWA, UZ9QXU, UZ9SWA, VE1ACK, VE1FW, VE1RH, VE3SGC, VE4AAU, VE7COP, VK5GN, VO1CA, W2HAZ, W2KTF, W2WOE, W7TVL, W8ILH, WB2FUJ, WB6HGH, WW7M, Y21UD, Y22TD, Y22YJ, Y22YO, Y23IL, Y23PF, Y24WJ, Y24XA, Y24XD, Y26FO, Y28IUL, Y27HL, Y28FL, Y35RK, Y37JO, Y38YK, Y38ZM, Y39RE, Y44WB, Y48YN, Y48ZLI/Y49MH, Y49RF, Y51XM, Y64XH, Y65ZM, Y71VG, Y86YL, YO5AML, YU2BQR, YU2WJ, YU4FDE, ZL2AFY, ZL4GB, ZS6GB

Disqualifications

CW: N8AFW
Phone: N8AFW

56th ARRL November Sweepstakes Announcement

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 US and Canadian stations as possible on 160 through 10 meters, excluding 30, 17 and 12 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.

(C) *QRP, single operator.* QRP is defined as 5 watts output or less.

4) **Exchange:** A consecutive serial number, precedence ("A" if you run 150-W output or less, "B" if more than 150 W, or "Q" if 5-W output or less), your call sign, check (last two digits of the year you were first licensed) and your ARRL Section. For example, KB1BE answers W1AW's call by sending W1AW NR178 A KB1BE 79 CT for QSO number 178, less than 150 W, first licensed in 1979 and Connecticut Section.

Do not write above this line.

ARRL November Sweepstakes

License Class: ( ) Novice ( ) Technician (X) Other

CALL USED: KB1BE CW ( ) PHONE (X) ARRL SECTION (P. 8 QST): CT

Note: *Separate logs must be submitted, with separate summaries, for each mode.*

SCORING: 710 QSO points × 72 sections = 51,120 claimed score.

Count 2 points per complete QSO. [Cross out sections worked on the list below.]

51,120 Claimed Score	355 QSOs	72 Sections	100 Power Output	18 Hrs of Op

(X) Single Operator Station (operator's call *if different* from call used) _____

( ) Multioperator Station (shows call of **ALL** operators, loggers) _____

Club participation? Yes X No ___

If yes, print the name of your ARRL Affiliated Club: Connecticut DX Assn.

Equipment Description:

Rigs: TS940

Antennas: 80-40 Dipoles, TB5EM

"*I have observed all competition rules as well as all regulations established for amateur radio in my country. My report is correct and true to the best of my knowledge. I agree to be bound by the decisions of the ARRL Awards Committee.*"

Date: 12/2/89 Signature: Paul R. Shafer Call: KB1BE

Note your soapbox and other comments. Enclose your photos, as well as your SS logs and check sheets and mail promptly to: **ARRL Contests,** 225 Main St, Newington, CT 06111

MULTIPLIER CHECK-OFF LIST

(Cross off each new section as worked.)

1	2	3	4	5	6	7	8	9	0	VE
~~CT~~	~~ENY~~	~~DE~~	~~AK~~	~~AR~~	~~EB~~	~~AZ~~	~~MI~~	~~IL~~	~~CO~~	~~MAR~~
~~EMA~~	~~NLI~~	~~EPA~~	~~GA~~	~~LA~~	~~LAX~~	~~CMA~~	~~OH~~	~~IN~~	~~IA~~	~~PR~~
~~ME~~	~~NNJ~~	~~MDC~~	~~KY~~	~~MS~~	~~ORG~~	~~ID~~	~~WY~~	~~WI~~	~~KS~~	~~ONT~~
~~NH~~	~~SNJ~~	~~WPA~~	~~NC~~	~~NM~~	~~SB~~	~~MT~~			~~MN~~	~~MB~~
~~RI~~	~~WNY~~		~~NFL~~	~~NTX~~	~~SCV~~	~~NV~~			~~MO~~	~~SK~~
~~VT~~			~~SC~~	~~OK~~	~~SBC~~	~~OR~~			~~NE~~	~~AB~~
~~WMA~~			~~SFL~~	~~STX~~	~~SF~~	~~UT~~			~~ND~~	~~BC~~
			~~TN~~	~~WTX~~	~~SJV~~	~~WWA~~			~~SD~~	~~YT/NWT~~
			~~VA~~		SV	~~WY~~				
			~~PR~~		~~PAC~~	~~AK~~				
			~~VI~~							

Print or type:

NAME: PAUL SHAFER CALL: KB1BE

ADDRESS: 225 MAIN STREET

NEWINGTON, CT 06111

1. Check log for duplicate QSOs.
2. Copy ALL QSO info carefully. A penalty is assessed for incorrectly copied QSO info.
3. Observe mailing deadline
4. Dupe/check sheet must accompany all entries of 200 or more QSOs

MCS-87A (5/89) Printed in USA

Contest Branch now accepts entries on disk!

The Contest branch can now accept entries for the ARRL November Sweepstakes and other ARRL sponsored contests on floppy diskettes. The disk must be an MS-DOS formatted disk, either 5¼ or 3½ in, and the log information must be in a true ASCII file. The summary sheet may also be in a true ASCII file, but paper summary sheets are preferred. The log file should take on the layout of the official forms (containing band, date, time on/off, time in UTC, number received, precedence received call of station worked, check received, section received, multipliers and points). Do not forget to include your "report sent." Each entry should be on a separate diskette.

ARRL Sweepstakes

Call Used: KB1BE ARRL Section: CT

SENT: PREC A | CALL KB1BE | CK 79 | SEC CT

CW ( ) PHONE (X)

Separate logs and summary sheets required for each mode.

Band	Date	Time On/Off	Time	NR	NR	Prec	Station Worked	CK	*Section	Points
7	Nov 18	2318	2321	151	107	A	W2IYL	52	SNT	2
			2324	152	210	A	W5LXG	57	STX	
			2325	153	128	A	KE1V	82	NLI-NJ	
			2327	154	11	B	KA1MES	83	CT	
			2331	155	329	B	K9NA	60	SD-WI	
			2334	156	17	B	KA1QV	67	CT	
			2336	157	102	A	W1AFK	70	NTX	
			2341	158	154	A	KA1IU	79	WMA	
			2346	159	37	A	N1CC	54	CT	
			2347	160	128	A	N1EX	56	CT	DUPE
			2347	161	211	B	WA1ZAM	78	WMA	2
			2348	162	79	A	W1EN	87	ENY	
			2352	163	138	A	W1ED	61	ENY	
			2353	164	184	A	KA1LKS	53	MDC	

Suggested Frequencies (kHz)

CW	Novice CW	Phone	Novice Phone
1800-1810		1855-1865	
3530-3600	3710-3730	3850-3950	
7030-7080	7110-7130	7200-7250	
14,030-14,060		14,250-14,300	
21,050-21,080	21,110-21,130	21,300-21,400	
28,050-28,080	28,110-28,130	28,550-28,650	28,350-28,400

Contest Period

	Starts	Ends
CW	Saturday, Nov 4 2100 UTC	Monday, Nov 6 0300 UTC
Phone	Saturday, Nov 18 2100 UTC	Monday, Nov 20 0300 UTC

Explanation of Exchange

	Number	Precedence	Call	Check	Section
Exchanges	Consecutive serial number	Power output less than 150-W PEP	Send your station call	Last two digits of year first licensed	Your ARRL Section
Sample	NR178	A	KB1BE	79	CT

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 of this issue) and CRRL Section plus VE8/VY1—maximum of 77. KP4 is the Puerto Rico Section, KV4/KP2 and KG4 stations are in the Virgin Islands Section, and KH6 and other US possessions in the Pacific count as the Pacific Section.

(C) *Final score.* Multiply QSO points (two per QSO) by the number of ARRL/CRRL sections (plus VE8/VY1).

6) **Miscellaneous**

(A) A transmitter used to contact one or more stations may not be subsequently 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.

(D) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

7) **Reporting:** Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL HQ for an SASE with two units of First Class postage. Official forms are recommended. Any entry claiming more than 200 QSOs must submit duplicate-checking sheets (dupe sheets). Incomplete or late entries will be classified as check-logs. Logs must include dates, QSO times in UTC, exchange sent/received, band and mode. Postmark your entry within 30 days after the phone portion of the contest (December 21, 1989).

8) **Club Competition:** ARRL-affiliated clubs for club gavels and awards in the local, medium and unlimited categories as described in January *QST*.

9) **Awards:** Certificates to the top single operator CW and phone scores in "A", "B" and "Q" categories in each ARRL/CRRL Section, and the top multi-operator entry in each ARRL Division and Canada.

10) **Condition 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 *QST*.

Hamfest Calendar

(continued from page 66)

Ohio (Marion)—October 29. *Sponsor:* Marion ARC. *Time:* 8 AM-3 PM. *Place:* Marion Co Fairgrounds Coliseum. *Features:* large parking area, refreshments. *Talk-in:* 146.52, 147.90/30. *Admission:* advance $3, door $4. *Tables:* $6. *Contact:* Ed Margraff, KD8OC, 1989 Weiss Ave, Marion, OH 43302, 614-382-2608.

Oklahoma (Enid)—November 4. *Sponsor:* Enid ARC. *Time:* 8 AM-5 PM. *Place:* Convention Hall. *Features:* flea market, refreshments, dealers, VE exams (walk-in). *Talk-in:* 144.69/5.29, 444.400/9.400. *Admission:* free. *Tables:* free by reservation. *Contact:* Tom Worth, PO Box 261, Enid, OK 73702, 405-233-8473, or Fred Selfridge, 405-242-3551.

†**Pennsylvania (Bensalem)—October 22.** (rain or shine) *Sponsor:* Penn Wireless Assn. *Time:* vendors 6:30 AM, public 7 AM-2 PM. *Place:* I-95 to PA 132, west on PA 132 to PA 513, south on PA 513, 1 mile to Yezzi Field (on right). *Features:* refreshments, auction, VE exams, computers, test equipment. *Talk-in:* 147.60/00, 146.52, 146.37/97. *Admission:* advance $7 per carload, door $3 each. *Tables:* spaces $5, premium or double/triple wide spaces available in advance. *Contact:* Steve, 215-752-1202, for advanced ticket sales, send checks with SASE to PWA Tradefest '89, PO Box L-734, Langhorne, PA 19047.

Pennsylvania (Carlisle)—October 15. *Sponsor:* Cumberland County ARS. *Time:* 7 AM-2 PM. *Place:* Carlisle Fairgrounds, from exit 17 off I-81 or exit 16 off the PA Turnpike (I-76), follow US Rte 11 south (Hanover St) to Clay St, turn right and go 1/4 mile to fairgrounds gate, look for signs. *Talk-in:* 144.67/5.27, 146.52 and 443.3/8.3. *Admission:* $3. *Contact:* SASE to C-CARS, PO Box 448, New Kingstown, PA 17072.

Pennsylvania (Sellersville)—October 29. *Sponsor:* RF Hill ARC. *Time:* sellers 6 AM, public 8 AM-2 PM. *Place:* Pennsylvania National Guard Armory, PA Rte 152. *Features:* refreshments, indoor and outdoor displays. *Talk-in:* 144.71/5.31, 146.28/88, 146.16/76. *Admission:* no advance, door $4. *Contact:* Bob Buonfiglio, KA3POV, 361 School House Rd, Souderton, PA 18964, (N) 215-723-1016.

†**Tennessee (Chattanooga)—October 28-29.** *Sponsor:* Chattanooga ARC. *Time:* Saturday 9 AM-5 PM, Sunday 9 AM-3 PM. *Place:* Chattanooga-Hamilton Co Convention and Trade Ctr, take Martin L. King Jr Blvd exit off Hwy 27. *Features:* exhibitors, flea market, forums, refreshments, VE exams (Saturday 9 AM, Sunday 9:30 AM, send Form 610, check or money order for $4.75 to Dave Bennett, WQ4B, Rte 3 Box 1490, Chickamauga, GA 30707 by October 25, bring original license and positive ID, walk-ins will not be accepted for either exam). *Talk-in:* 146.19/79. *Admission:* no advance, door $5. *Tables:* $10 per day/$15 per weekend; electricity is $15 extra. *Contact:* for additional info write Hamfest Chattanooga, PO Box 3377, Chattanooga, TN 37404, for exhibitor info Barbarra Gregory, WA4RMC, (N) 615-892-8889; for flea market info, Frank Gray, KC4TV, 615-894-9559 after 6 PM, no calls after 10 PM.

Tennessee (Gray)—October 21. *Sponsor:* Bristol, Kingsport & Johnson City ARCs. *Time:* 8 AM-5 PM. *Place:* take exit off I-181 at Gray, and follow signs. *Talk-in:* 146.16/76, 146.37/97, 146.19/79. *Admission:* $5. *Contact:* for preregistration Wendell Messimer, 512 W Poplar St, Gray TN 37604, 615-928-4407, for dealers Gerald Cardwell, 113 Neal Dr, Bristol, TN 37620, (D) 615-229-6795, (N) 615-764-7900.

†**Tennessee (Memphis)—October 14-15.** *Sponsor:* Mid-South ARA. *Time:* Saturday 9 AM-5 PM, Sunday 9 AM-2 PM. *Place:* Mid-South Fairgrounds, Pipkin Bldg. *Features:* flea market, ARRL forum, Army, MARS forum, VE exams (Saturday 9 AM, preregistration only, send a Form 610 a copy of your current license and a check for $4.75 made out to ARRL VEC, to Maxine Balentine, WD4LFD, 4155 Sevalla, Memphis, TN 38128 by October 12, 1989). *Talk-in:* 146.28/88. *Admission:* $5 per person, $7 per family. *Contact:* for flea market info Clayton Elam, K4FZJ, 20 So Cooper, Memphis, TN 38104, (D) 901-274-4418, (N) 901-743-6714, for exhibitor info Nita Wofford, N4DON, 2966 Cordell, Memphis, TN 38118, 901-363-4971.

Texas (El Paso)—October 21-22. *Sponsor:* El Paso ARC. *Time:* Saturday 8 AM-5 PM, Sunday 8 AM-2 PM. *Place:* Western Playland Amusement Park, 6900 Delta Dr, Ascarate Park. *Features:* Contests, seminars, refreshments, VE exams (Saturday 9 AM), equipment dealers, tailgate space $5. *Talk-in:* 146.10/70, 147.76/16. *Admission:* advance $4, door $5. *Tables:* dealers $10, swap tables $5. *Contact:* Clay Emert, K5TRW, 109 Pasodale, El Paso, TX 79907, 915-859-5502.

Wisconsin (Waukesha)—October 15. *Sponsor:* Kettle Moraine RAC. *Time:* 7 AM-1 PM. *Place:* Waukesha Co Exposition Ctr, Hwys J and FT. *Admission:* advance $2, door $3. *Tables:* reserved tables are $3 for each 4-ft length (admission ticket required in addition to table reservation, reservations accepted until October 11). *Contact:* for reservations send a check payable to KMRA Club, PO Box 411, Waukesha, WI 53187, SASE required.

Contest Corral

Conducted By Mark R. Burke, KA1MIS
Contest Assistant

OCTOBER

1

OMARC Midnight Special, sponsored by the Overlook Mountain ARC from 0300Z until 0500Z Oct 1. First hour, 20-meter phone, second hour, 40-meter CW. Work stations once per mode. Exchange name and current countries confirmed. If you don't know, send 001. For example, K2UR would send George 318. Final score equals the total number of QSOs. No multipliers. The results will be listed in the *National Contest Journal.* Mail entries by Nov 1 to W2XL, 133 Clifton Ave, Kingston, NY 15238.

3

West Coast Qualifying Run, 10-40 WPM at 0400 Oct 4 (9 PM PDT Oct 3). W6OWP prime, W6ZRJ alternate. frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

7

AGCW-DL Straight Key Party, sponsored by the AGCW-DL, from 1300Z until 1600Z Oct 7. Frequencies: 7.010-7.040 MHz. Only straight keys (no bugs). Classes: A = 5 W output, B = 50 W output, C = 150 W output, D = SWL. Exchange RST, serial no., class, name, and age (XYLs use XX), example 579001/A/John/32. Scoring: class A with class A = 9 points, A with B = 7 points, A with C = 5 points, B with B = 4 points, B with C = 3 points, C with C = 2 points. Certificates. Send logs (include SAE plus IRC for results) by Oct 31 to Friedich Fabri, DF1OY, Wolkerweg 11, D-8000 Munich 70, Fed Rep of Germany.

7-8

California QSO Party, see Sep *QST*, p 85.

Columbus Contest, see Sep *QST*, p 85.

VK/ZL/Oceania DX Contest, phone, see Sep *QST*, p 85.

Wyoming QSO Roundup, sponsored by the University of Wyoming ARC, from 0000Z Oct 7 until 2400Z Oct 8. 160, 80, 40, 20, 15, 10-meter bands and all VHF/UHF bands. No crossmode/crossband QSOs. Work stations once per band/mode. Non-WY stations exchange RS(T) and state/province/DXCC country; WY stations send RS(T) and county abbreviation (first three letters). Non-WY stations multiply total WY counties per band/mode by total WY QSOs for final score; WY stations multiply total number of states/provinces/DXCC countries by total contest QSOs for final score. Awards. Logs and entry forms (available for SASE to address below) should be postmarked by Nov 8 and sent (with SASE for certificate) to Bill Stacy, K7EY, 1912 Custer Ave, Laramie, WY 82070.

8

W1AW Qualifying Run, 10-40 WPM at 0200Z Oct 9 (10 PM EDT Oct 8). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 21.0775 28.0775 50.08 147.555 MHz. See Oct 3 listing for more details.

8-9

Illinois QSO Party, see Sep *QST*, p 85.

14-15

ARRL International EME Competition, see Sep *QST*, p 84.

Kentucky QSO Party, sponsored by the Kentucky Colonel's ARC from 1500Z Oct 14 until 0300Z Oct 15 and 1500Z-2400Z Oct 15. Phone and CW. Work stations once per band and mode. No repeater, crossband, crossmode, or satellite QSOs. Mobile/portable stations may be worked once per band/mode as they change counties. Categories: KY fixed; KY portable; KY mobile; non-KY. Exchange RS(T) and state/province/country (KY stations send county). Frequencies: 10 kHz up from General phone and CW; 28.430. No WARC QSOs. Score 2 points for CW, 1 for phone. Multiply points by total number of KY counties, states, provinces, and DXCC countries. Stations running under 200-W input multiply score by 1.5. Awards. Plaques. Send summary sheet, logs, dupe sheet (if more than 200 QSOs) by Nov 30 (SASE for results) to Kentucky Colonel's ARC, PO Box 9781, Bowling Green, KY 42102-9781.

Pennsylvania QSO Party, sponsored by the Nittany ARC, from 1600Z Oct 14 until 0500Z Oct 15 and from 1300Z-2200Z Oct 15. Classes of entry: Single-op; mobile (multiop is OK); multioperator, single transmitter; multioperator, multi-transmitter; QRP (max 5-W output). Novice and Technicians must identify with /N or /T and must operate in Novice frequencies. Phone and CW. CW contacts in CW subbands only. Work stations once per band and mode. No repeater QSOs. Work mobiles again as they change counties. Exchange serial number and QTH (county for PA stations, ARRL Section for others). Suggested frequencies: CW—40 kHz up from low end and 1.810 MHz, SSB—1.850 3.980 7.280 14.280 21.380 28.580; Novice—10 kHz up from low end; mobile window—5 kHz below listed frequencies. Try 160 around 0300Z Oct 15. Count one point per phone QSO, 1.5 points per CW QSO and 2 points per 160/80-meter CW QSO. PA stations multiply by total ARRL sections plus PA counties, plus maximum of one DX country. Others multiply by total PA counties (max 67). Stations on county lines count for 1 QSO credit but multiple county multipliers. Multiply total QSO points by total multipliers for final score. Mobiles add 500 bonus points for each county from which ten or more QSOs are made. QRP entries multiply final score by two. Novice/Tech entries multiply final score by three. Entries with more than 100 QSOs must include dupe sheet. Official summary sheet is available (from K3SO). Awards. Mail entry by Nov 15 to James Trennepohl, K3SO, 1763 Princeton Dr, State College, PA 16803.

VK/ZL/Oceania DX Contest, CW, see Sep *QST*, p 85.

15

RSGB 21/28 MHz SSB Contest, sponsored by the Radio Society of Great Britain, from 0700Z-1900Z Oct 15. 21-MHz and 28-MHz phone only. Single operator and multioperator. Exchange signal report and serial number starting with 001. Suggested frequencies: 21.150-21.350 28.450 29.000. Non-European stations count 3 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of call areas worked per each G prefix. Awards. Logs must be received before Dec 5. Mail entries to RSGB Contest Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, England.

21

9V QSO Party, sponsored by the Singapore ARTS, 0000Z-2400Z Oct 21. Phone and CW (and possibly SSTV, RTTY and packet). 80-10 meters (except 30 and 12). 9V stations send RS(T) and serial number. Others send RS(T) and CQ Zone. Awards. Send log extract to Organizing Committee, SEANET 89, Maxwell Rd, PO Box 2728, Singapore 9047.

21-22

ARCI QRP Fall CW QSO Party, sponsored by QRP ARC International, from 1200Z Oct 21 until 2400Z Oct 22. Operate max 24 hours. Work stations once per band. All-band or single-band entries. Send signal report, state/province/country and ARCI number if member, power output if nonmember. Suggested frequencies: 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110 50.060. Count 5 points for QSO with ARCI member. Others count 2 points for same continent and 4 points for different continent. Multiply QSO points by states/provinces/countries worked per band and by power multiplier (1-5 W output ×7; 0-1 W output ×10). More than 5-W output counts as a checklog. If 100% natural power, multiply final score by 2; if 100% battery, by 1.5. Bonus points: add 2000 pts for each band a home-brew TX is used; add 3000 pts for each band a home-brew RX is used; add 5000 pts for each band a home-brew TCVR is used (max 5000 bonus points per band). Team competition: Teams consisting of 2 to 5 members will be listed as individuals, and the team score will be the total of the members' scores (Team captains must send a list of its members to the contest manager postmarked at least one day prior to the QSO Party). Awards. Postmark entry no later than 30 days after the contest and mail to QRP ARCI Contest Chairman, Red Reynolds, K5VOL, 835 Surryse Rd, Lake Zurich, IL 60047.

Jamboree on the Air (JOTA), sponsored by the World Scout Bureau from 0000 local Oct 21 until 2400 local Oct 22, although some activity will flop over from Fri to Mon. Scouts exchange name, QTH, Scout rank and other hobbies. Look for K2BSA, the BSA HQ station in Dallas, Texas, and HB9S, the World Scout HQ in Switzerland. Suggested frequencies: CW—3.590 7.030 14.070 21.140 28.190; phone—3.940 7.290 14.290 21.360 28.350. No logs are necessary, but activity reports including Scout unit number, number of participants and interesting incidents are appreciated. Interesting photographs with captions are especially needed. Send reports to ARRL HQ.

Simulated Emergency Test, sponsored by the ARRL Amateur Radio Emergency Service and the National Traffic System, Oct 21-22. The SET weekend provides an opportunity for ARES units to test plans, and capabilities of moving emergency and health-and-welfare traffic in and out of disaster areas via the National Traffic System. The event is conducted by the Emergency Coordinators, so be sure to contact your local EC for involvement. If you do not know who your EC is, contact your Section Manager (see this issue, p 8). SET guidelines were published in July 1989 Field Forum and mailed to all ARRL Field Organization Officials, station appointees and affiliated clubs. Contact the Field Service Department at ARRL HQ for more details.

22

RSGB 21 MHz CW Contest, sponsored by the Radio Society of Great Britain, from 0700Z-1900Z Oct 22. CW only. Single operator and QRP single operator (less than 10-W input). Exchange signal report and serial number starting with 001. 21 MHz only. Avoid 21.075-21.125. Non-European stations count 3 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of call areas per G prefixes worked. Log must be received before Dec 31. Mail entries to RSGB Contests Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, England.

28-29

CQ World-Wide DX Contest, phone, sponsored by *CQ Magazine,* from 0000Z Oct 28 until 2400Z Oct 29 (CW contest 0000Z Nov 25 until 2400Z Nov 26). 1.8 through 28 MHz. Entry classes: single op, all bands; single op, single band; single op, QRP; multiop, single transmitter; multiop, multi transmitter. QRP is defined as 5-W output or less. Multi-single: Only one transmitter and one band permitted during a 10-minute period. Exception: one, and only one, other band may be used during the same 10 minute period if, and only if the station worked is a new multiplier. Stations found in violation of the 10-minute rule will be reclassified as multi-multi. Multi-multi stations are allowed one signal per band maximum. All transmitters must be located within a 500-meter-diameter circle, or within the limits of the licensee's address property, whichever is greater. All antennas must be physically connected to the transmitters by wires. Exchange signal report and CQ zone number. A station in a different zone or country than indicated by its call sign must sign portable. QSOs between stations on different continents count 3 points. QSOs between stations on the same continent but in different countries count 1 point. Exception: QSOs between North America stations in different countries count 2 points. QSOs with your own country count for multiplier credit, but not for QSO points. Multipliers: Count one multiplier for each different CQ zone worked per band (max 40 per band). Count one multiplier for each different country worked per band (DXCC and WAE lists). Multiply QSO points from all bands operated by multipliers (zones plus countries) from all bands operated for final score. Single-band logs eligible for single-band awards only. Single ops must operate at least 12 hours (multiops, 24 hours) to be eligible for awards. Dupe sheets required for any

band with more than 200 QSOs. Entry forms are available from the sponsor for an SASE, and all entrants are encouraged to send for a set. Each dupe removed by the CQ Contest Committee also carries a 3-QSO penalty. Phone logs must be postmarked by Dec 1, 1990, and CW logs must be postmarked by Jan 15, 1990. Mail logs to *CQ Magazine*, 76 North Broadway, Hicksville, NY 11801.

29

W1AW Qualifying Run, 10-35 WPM at 2400Z Oct 29 (7 PM EST Oct 29). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 21.0775 28.0775 50.08 147.555 MHz. See Oct 8 listing for more details.

NOVEMBER

1

West Coast Qualifying Run, 10-35 WPM, at 0500Z Nov 2 (9 PM PST Nov 1). See Oct 3 listing for more details.

4-5

ARRL November Sweepstakes, CW, this issue, p 83.

QST QSO Award Party, phone, sponsored by the Canadian Radio Relay League, Nov 4-5, 1500Z-2200Z each day (CW—Nov 11-12). The award is available to any amateur who makes phone, CW or mixed contacts with 8 of the 11 *QST* stations in Canada. To receive the award send SASE or IRC to Garry Hammond, VE3XN, 3 McLaren Ave, ON N4W 3K1, Canada.

Ten-Ten International Net, from 0000Z Nov 4 until 2400Z Nov 5. Open to all amateurs but only paid-up 10-10 members are eligible for awards. Single operator only. CW and RTTY. Work stations once on 10 meters only. CW contacts must be in the CW subband. Exchange call, name, state and 10-10 number (if member). Count 2 points for each QSO with a member, count 1 point for each QSO with nonmember. Final score is total QSO points. Awards. Send logs along with cover sheet and dupe sheet postmarked before Dec 1 to Boomtown Chapter, c/o Ed Neal, N5EBA, 1414 Hiawatha, Burkburnette, TX 76354.

6

W1AW Qualifying Run, 10-35 WPM at 0300Z Nov 7 (10 PM EST Nov 6). See Oct 8 listing.

10-12

Japan International DX Contest

ALARA Contest

European DX Contest

Montana Centennial QSO Party

OK DX Contest

QST QSO Award Party

YO DX Contest

18-19

ARRL November Sweepstakes, phone, this issue, p 83.

International EME Competition, see Sep *QST*, p 84.

25-26

CQ World-Wide DX Contest, CW, see Sep 28-29 listing.

28

W1AW Qualifying Run

Computer Diskette Media: Items for this column can now be sent on a standard 5 ¼- or 3 ½-in *MS-DOS formatted floppy disk* to ARRL HQ. The file *must* be in an ASCII format and must contain all information as listed below. The file can also be sent via modem to the ARRL Buletin Board at 203-665-0090.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **November 1** to make the **January** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Special Events

Conducted By Mark R. Burke, KA1MIS
Contest Assistant

Duluth, Minnesota: The Arrowhead RAC will operate **WØGKP Oct 14-15** to celebrate the club's 60th year. Operation will be the lower SSB portion of the 80-10 meter General bands and 10-meter Novice SSB. For certificate, send QSL and large SASE to Randy Welsald, WJØL, 6319 Sherbourne St, Duluth, MN 55807.

Southington, Connecticut: The Southington ARA will operate **W1ECV Oct 6-8** to commemorate the fall's Apple Harvest activities. Operation will be in the middle portions of the General and Novice bands. For certificate, send QSL and 9- × 12-in SASE to SARA, PO Box 873, Southington, CT 06489.

Ault, Colorado: NØJQP and **NØDLW** will operate **Oct 7** to commemorate "International Days." Suggested frequencies: 14.250 21.350. For QSL, send SASE to John Dahlgren, Box 489, Ault, CO 80610.

Las Cruces, New Mexico: The Billy the Kid Chapter of Ten-Ten International will operate **WM5Q** 1500Z-2200Z **Oct 7** from the Whole Enchilada Fiesta. Primary operation will be on 28.365. For certificate, send QSL and SASE to Billy the Kid Chapter of Ten-Ten International, PO Box 274, Fairacres, NM 88033.

Dothan, Alabama: The Wiregrass ARC will operate **WB4ZPI** 1500Z-2100Z **Oct 7** to commemorate the 7th anniversary of the Wiregrass Antique Car Club. Suggested frequencies: phone—7.240 14.260 21.325 28.425; CW—7.130 21.130. For commemorative QSL, send SASE to Wiregrass ARC, PO Box 958, Dothan, AL 36302.

Clinton, Iowa: The Clinton ARC will operate **WØCS** 1400Z-2200Z **Oct 7** from Beaver Island. Suggested frequencies: phone—3.875 7.275 14.260 21.375 28.400. For certificate, send no. 10 SASE by Dec 30 to Ed Shaw, PO Box 329, Camanche, IA 52730.

St Clement's Island, Maryland: The Capitol Hill ARS will operate **W3USS Oct 7-8** to coincide with the 22nd Annual "Blessing of the Fleet." Suggested frequencies: phone—3.825 7.220 14.240 21.300 28.405 146.550; packet—145.030. For QSL, send QSL and SASE to W4WG via *Callbook* address.

Clarksburg, West Virginia: The Stonewall Jackson ARA will operate **WB8ZVS** 1200Z-2300Z **Oct 8** to commemorate National Fire Prevention Week. Operation will be the lower portion of General 80- and 40-meter phone. For certificate, send QSL, contact number and SASE to SJARA, PO Box 752, Clarksburg, WV 26302.

Westminster, Maryland: The Carroll Co ARC will operate **K3PZN Oct 8-14** to celebrate Fire Prevention Week. Operation will be 30 kHz from the bottom of General 80-15 phone and Novice 10-meter phone. For certificate, send QSL, contact number and SASE to Carroll Co ARC, PO Box 2099, Westminster, MD 21157.

Norfolk, Nebraska: The Elkhorn Valley ARC will operate **KEØJI** 1500Z-0300Z **Oct 14** to commemorate Amateur Radio Sell Nebraska Day. Suggested frequencies: 3.870 7.270 14.270 21.320 28.470 50.270 146.730. For certificate, send QSL and 9- × 12-in SASE to Roy Barkhuff, KEØJI, 1701 Skyline Dr, Norfolk, NE 68701.

Topeka, Kansas: The Kaw Valley ARC will operate **WØCET** from 1400Z **Oct 14** until 2300Z **Oct 15** to celebrate the 50th anniversary of the movie "The Wizard of Oz." Operation will be 75 and 20 meters and Novice 10 meters. For special QSL, send QSL and SASE to Sherry Langston, KAØBNL, 1919 Adams #62, Topeka, KS 66607.

Cambridge, Massachusetts: The Harvard Wireless Club will operate **W1AF** from 0000Z **Oct 14** until 2400Z **Oct 15** to celebrate the 80th anniversary of the club. Operation will be in the General portions of 80-15 meters and Novice 10 meters. For commemorative QSL, send SASE to Harvard Wireless Club, 6 Linden St, Cambridge, MA 02138.

Harlingen, Texas: The South Texas ARS will operate **N5CAF Oct 14-15,** 1500Z-2400Z each day, to celebrate the Confederate Air Force's annual Air Show. Suggested frequencies: 14.260 21.360 28.460. For special QSL, send QSL and SASE to David Woolweaver, K5RAV, 2210 S 77 Sunshine Strip, Harlingen, TX 78550.

Athens, Georgia: The Athens RC will operate **N4ALE Oct 14-15** to commemorate the 125th anniversary of the world's only double barrel cannon. Operation will be the lower portions of the General 80-15 bands and Novice 10 meter. For QSL, send QSL and SASE to Ed Riddle, N4ALE, F-24, Country Corners, Hwy 29, Athens, GA 30606.

Fort Payne, Alabama: The DeKalb Co ARC will operate **WD4EIZ Oct 18** in observance of the city's 100th anniversary. Suggested frequencies: 7.240 14.260 21.325 28.350. For commemorative certificate, send QSL and no. 10 SASE to Ray Goggans, WD4EIZ, 1612 Fruit Farm Rd, Fort Payne, AL 35967.

Providence, Rhode Island: The Providence Radio Assn will operate **W1OP** 0000Z-0400Z **Oct 18** to celebrate its 70th anniversary. Operation will be on 14.040. For commemorative certificate, send SASE to PRA, 1 Ludlow Street, Johnston, RI 02919.

Panola County, Texas: The Carthage ARS will operate **AA5HF** 1400Z-2200Z **Oct 21** from the hometown of music star "Gentleman" Jim Reeves. Operation will be General phone and 14.028 and 28.400. For certificate, send QSL, contact number and no. 10 SASE to Mark Hulsey, AA5HF, Rte 4 Box 166-X, Carthage, TX 75633. For CW contact, send to Lee Chapman, W5QLA, 106 S Gaston St, Carthage, TX 75633.

Beltsville, Maryland: The Laurel Maryland ARC will operate **K3IOG** 1300Z-2100Z **Oct 21** to celebrate the achievements of The Center. Suggested frequencies: phone—7.240 14.240 21.340 28.340 147.540; CW—14.055. For special certificate, send QSL and no. 10 SASE to Laurel ARC, Box 3039, Laurel, MD 20708.

Durant, Iowa: The Davenport Radio Amateur Club will operate **WØBXR** from 0000Z **Oct 21** until 2000Z **Oct 22** from Cedar County. Operation will be primarily 80-10 meters SSB. For QSL, send QSL and SASE to WØBXR via *Callbook* address.

Hamlet, North Carolina: The Richmond Co ARC will operate **K4JUG** 1300Z-2200Z **Oct 28** as part of the annual Seaboard Railroad Festival. Suggested frequencies: 7.235 14.265 21.315 28.345. For certificate, send SASE to RCARC, Seaboard Festival, PO Box 132, Hamlet, NC 28345.

Brevard, North Carolina: The Transylvania Co ARC will operate **K4AIF** from 2100Z **Oct 31** until 0500Z **Nov 1** to celebrate Halloween. Suggested frequencies: 3.860 14.295 50.150 144.200 223.500 432.150. For certificate, send 9- × 12-in SASE to Dick Gustafson, K4AIF, 302 Wilson Dr, Brevard, NC 28712.

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Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Walt Dabell, KD3GS—ASM: Bill Ryan, WA3DPJ. Congratulations to all on the great field day scores. I had reports of best-ever scores from several clubs. Missing this year were the reports of fried ("... I thought all that smoke was from my cigarette. . .") radios, thank goodness. The Delaware Section Manager election will be this December. If you need qualification / nomination forms, let me know. June net rpt: DTN stns 310 tfc 40 in 22 sessns, DEPN stns 43 tfc 19 in 4 sessns, SEN stns 57 tfc 3 in 4 sessns. June Traffic: W3QQ 67, WA3WIY 44, WB3DUG 39, KA3GRQ 29, K3JL 19, W3FEG 18, K3YBW 12, W3PVO 11, KD3GS 11, TOTAL 250. The New Castle County ARES group participated in emergency operations with the Red Cross in July. Several Volunteers spent several hours escorting Red Cross officials through flood stricken areas of New Castle County. The damage was minimal, but the help was still appreciated. Keep up the good work! With hurricane season nearing its midpoint, the first potentially threatening storm in early August had the Sussex ARES group scrambling to get a 20-meter dipole in the air. KC3JM spent a good part of his birthday at the EOC in Georgetown working on that antenna. Sussex County stands to lose the most in the event a hurricane does strike, hope the antenna isn't needed. Halloween is right around the corner. This may be a good opportunity for the ARES groups to get a workout. July net rpt: DTN stns 318 tfc 38 in 21 sessns, DEPN stns 55 tfc 10 in 5 sessns, SEN stns 58 tfc 1 in 4 sessns. July Traffic: WA3WIY 31, WB3DUG 27, K3JL 26, KA3GRQ 23, K3YBW 20, KD3GS 20, W3FEG 12, W3PVO 7. TOTAL 166.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZFD. SEC: KB3YS. ACC: KC3QB. OOC: W3IS. SGL: WA3IAO. STM, BM: KB3UD. PIO: W3ZXV. TC: W3FAF. Get out your calendar, because October is stuffed full of Amateur Radio activity. Explore "the world above 50 MHz" with the Pack Rats at their annual VHF conference on the 7th. This is a part of the spectrum we should all know more about. Both experts and newcomers will enjoy the presentations at this conference. On the 8th is the Pack Rats hamfest—please carpool! October 14-15 is the Pennsylvania QSO Party weekend. To bring those awards home to EPA again this year, we're going to need some eye-popping scores. Even if you don't do the contest in a big way, please get on the air and give a few points and county multipliers to others. The exchange is easy, just your county and a serial number. Again this year KC3LM is sponsoring the Novice/Tech plaque. Former QSO Party chairman W3HDH was tracked down in Missouri and sent an ARRL Certificate of Merit from EPA Section in gratitude for his work on the contest. He's now writing a state QSO party column in National Contest Journal. Many thanks to K3SO and Nittany ARC for sponsorship of the PA QSO Party. Good luck in the contest! Is that all there is in October? Not hardly, friend. On the 15th, C-CARS has their hamfest in Carlisle, the Penn Wireless has their hamfest in Bensalem on the 22nd, and on the 29th, RF Hill has theirs in Sellersville. Wow! Apparently not having enough to do this month, KC3LM will visit the Endless Mts. ARC meeting in Tunkhannock. Shifting to the Field Organization roster, add W3QFK to the list of OO's. Traffic handlers are reminded that your station activity reports should be in the SM's hands by the 5th of the month. Reports received later must be deferred to the next month's QST. It's unnecessary to dupe a copy of your SAR to STM KB3UD, since the SM already forwards all the data to him for analysis and record-keeping. As always, your activity and reports are very much appreciated. Even if the ink on your license is good and dry, you can still honor your Elmer with a certificate from ARRL's Educational Activities Branch. Just write and ask for one, so you can fill it out and present it. What a special holiday gift this would make for someone who helped you 'way back when! Traffic (July): N3AZW 636, N3DRM 228, N3CD 146, AA3B 104, KD3AO 76, KA3DLY 50, N3COY 33, N3EFW 26. KU3R 24, KA3QYH 24, W3DP 23, W3NNL 22, W3KOD 20, KA3MVM 20, WB3EVL 19, KA3SKT 15, W3CL 15, W3ZID 13, KA3RGF 12, N3FGC 12, W3FAF 10, W3AON 10, W3BNR 9, W3GJC 8, W3ADE 7, K3ARR 5, W3IPX (June) 27. Nets (July QNI/QTC): SEPATN 79/7, D6ARES 89/14, D8ARES 156/0, EPAEPTN 455/157, EPA 491/161, PTTN 203/46. MARCTN 143/54, MARCNET 68/2. @PBBS: K3RLI 399, WA3TSW 345, N3ET 6.

MARYLAND-DC: SM, Ken Cohen, NI3F—ASM/PKT: KJ3E. ASM/ACC: WA3YLO. BM: NB3P. PIO: N3BMB. SEC: KN3U. TC: W3VVN. STM: N3EGF. SGL: KW3X. OOC: WB3EFG. The MMARC repeater was hit by lightning in June. It is hoped that full coverage will be restored in August. In May, there was a special-event operation aboard the submarine USS Torsk in Baltimore's Inner Harbor—over 350 QSOs in 31 states. Packeteers known to be unloading NTS traffic are K3RXK, K3ORW, KB3NL, KN1K, KJ3E, and N3EGF. W3IWI continues work building multi-channel digital receivers for the AMSAT launch slated for Nov. 10. Tom was the featured speaker at the Central States VHF Society annual dinner, which was held in Chicago. AG3L started his second solo cruise to Grenada on July 21. . . he will return May '90; KJ3E and K3NNI are his contacts. We need EC's badly, contact KN3U. Also needed, hams with DF'ing experience to become OOs—contact WB3EFG. All appointees are gently reminded that regular reporting is a condition of continuing their appointment; we will soon trim the Section roles of inactive troops. Glad to meet so many of you at the BRATS hamfest. Keep those cards, letters, bulletins and packetgrams (@ W3IWI) coming! CU next month! WITH THE NETS: NET/MGR QND/QTC/QNI: MSN/KC3Y 30/30/220, PON/WB3BFK 26/22/197, MDD/W3FA 62/244/459 (MDD TOP BRASS W3FA/129, K3GHH/88. KC3Y/61) MEPN/K3RXK 30/134/599, HOCARES/WA1QAA 2/0/8,MAVEN/W3YVQ 0/0/0. Traffic: W3IWI 864(BPL), KJ3E 315, NB3P 198. NC3V 183, KC3Y 169, K3GHH 166, K3RXK 154, W3FA 147, NR3Q 121, K3NNI 68, W3DQI 60, K3USO 56, W3YVQ 51, KK3F 46, W3FZV 37, K3ORW 36, WB3BFK 30, KD8M 27, N3EGF 26, K1BGT 20, W3SWD 16, WA2WDT 12, N1FJW 9, KA3DXX 3, WA1QAA 2. PSHR: W3FA 95, KJ3E 94, KC3Y 91, K3RXK 82, NC3V 75, NR3Q 72, K3GHH 68, W3YVQ 67.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QIJ. STM: WB2UVB. ACC: N2BQT. PIO: KA2RAF. SGL: vacant. BM: WB2UVB. OOC: WA2HEB. ATCs: K2JF, KA2RJA and WB2MNF. VE testing will be given in Bellmawr on Oct. 19. See Jan. 1989 QST column for full info on this session. Congratulations go to Victoria Gruen, KA2VHR, of Runnemede on receiving a $750 scholarship from the YLRL. The weekend of Oct. 21-22 marks the annual Simulated Emergency Test. At this point, I don't know what the section has planned, but if you're interested, please contact your County EC. If you need names/addresses, please don't hesitate to contact me. This column in August's QST contained the wrong Senate committee that has the "Scanner Bill" legislation. The Senate committee is the Transportation and Communications Committee and the committee chairman is Senator Walter Rand, 514 Cooper St., Camden 08102. Telephone (609) 541-1251. As of this writing, we still aren't getting a whole lot of support. Please re-read this column in the August QST and send off a letter or QSL card to your legislators. We need YOUR help! Any additional information that you might want can be obtained from me. Until next month, 73. Traffic: WB2ZJF 109, WA2CUW 14, WA2HEB 5.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—Affiliated Club Coordinator, N2EH. FB having 38 clubs filed for 1989—10 from 1988 are pending—5 from 1987 are urged to send their report. NOW, if we could contact someone for the following inactive listed affiliated clubs (wonder if they read this column?): Carlton Webster, Ft. Herkimer, Otsego, Syracuse U, Gleason, U of Rochester, Rockies, Clarkson College, RIT, Buffalo Repeater—all have not reported for at least three years. C'mon folks, support your League and let "it" keep your club informed.

NET	QNI/QSP/QND	NET	QNI/QSP/QND
NYSEMO	112/010/05	NYS/E*	303/203/31
NYSR	014/004/05	BLUE LINE	184/013/30
NYS/M*	311/295/31	JCARCN	377/011/28
WDN/M*	419/135/31	OARCN	057/002/04
NYP*	115/077/30	TIGARDS	033/003/05
NYPON*	405/290/31	VHF THIN	040/000/04
ESS	346/070/31	PATHFINDER	399/005/30
NYSPTEN	403/057/31	BLAK RVR lightning	
LCARES	046/000/05	ONEONTA R	023/000/04
OCTEN/E*	537/128/31	CNYTN*	266/077/30
Q NET	347/001/31	OCTEN/L*	266/054/31
STAR*	245/032/28	WDN/L*	453/144/31
WDN/E*	479/174/31	NYS/L*	295/249/31

*NTS Net. Section Packet Node Station WB2ACV reports 37 message handlings for July. BPL to N2EIA and WB2OWO. PSHR: KG2D N2EIA N2EVG WA2FJJ W2FR KC2HJ N2IKR N2IYA W2MTA WB2OWO KA2QOO ND2S NJ3V K2YAJ KA2ZNZ. Club officers: JCRAC WA2BZB KA2GCP WB2ACO WB2HBU; LARC WA2ISC K2QCX N2DMP KB2DIO W2GLN: LARA KB2CXM KE2NC KA2ZTO K2BXS WNYDXA WB2IVO WA2DSC WB2YQH (with hearty thanks to WB2CJL as he steps down as president). Appointments: (OO) N2FHT. Presently WNY has 168 stations holding appointments: ASMs 9, NMs 8, ECs 34. ATCs 6, PIAs 9, DECs 5, OOs 6, OBS 9, OESS 40, ORs 42 for a total of 168 appointments. Do you have one? Western New York's forty counties still have about 10,000 licensed hams, and over 3400 League members. Let the Section Manager know for which appointments you are interested in applying. OH BY THE WAY, did you know that the National Radio Association supports retaining the use of the Atwater Kent No. 47 receiver for use by the radio amateur for all modes including CW?! A long-time public service amateur became a Silent Key this month. Bill Goff, WA2HSB was the voice of Plattsburg and will be missed by many such as NYSPTEN and the Interstate SSB Net as well as by his Clinton County friends. Several folks are sending monthly station activity reports to W2MTA via packet radio; if you have this mode, my home mailbox is WB2ACV in New Berlin (W2MTA @ WB2ACV). OBS report received from N2JEU (formerly KB2ECI). Hope to see many of you at the RAGS Hamfest at State Fair Grounds on Oct 14. Traffic (July): N2EIA 507, WB2OWO 405, W2MTA 331, WA2FJJ 291, KC2HJ 275, NJ3V 264, K2YAI 204, ND2S 193, W2FR 143, N2IYA 137, KG2D 116, KA2OOO 98, WB2NLU 93, N2DLN 84, KA2ZNZ 84, NN2H 72, WB2QIX 69, AF2K 59, KA2DBD 48, WB2OEV 46, WB2ACV 37, W2PPS 36, N2EVG 24, N2IKR 24, KB2EOQ 20, KE2EA 12, KA2ZKM 8. (June) KE2EA 36, WB2IJH 33.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: NO3M. BM: KC3ET. TC: N3EFN. OOC: KX3V. ACC: AK3J. SGL: KA3OEM. NEED PIO.

NET	QNI	QTC	SESS	kHZ	T/D	MAN
WPACW	362	70	31	3585	7:00P/D	WA3UNX
WPAPTN	362	70	31	3983	6:00P/D	WA3HLN
KFN	113	49	28	3983	1:30P/D	N3EMD
PFN	180	169	31	3958	5:00P/D	WA3THT
WPA2MTN	268	56	31	28/88	8:00P/D	KA3BGC
NWPA2MTN	512	57	28	53/45.133	9:00P/D	KC3NY

I have the sad news of the passing of three amateurs in the section. They are W3NY, KB3O, KB3L, the founder of the United Airlines ARC and WA3BOH. A word about WA3BOH. Although suffering, Arnie was always ready to assist any and all amateur functions. He had his car prepared for his use to overcome his disabilities. He was a true amateur in giving his all without wanting any credit. Our condolences to their families. Now must say that I am resigning the SM position. I have no idea about who my successor will be as yet, but I hope we can find one. I am having problems with my eyes and back which must have treatments. I regret having to give up my appointment which I enjoyed greatly. I hope to be able to help for a long time to come. I want to thank all those in Newington for all their help during my term of office. August Traffic: N3EMD 305, KQ3T 299, N3FM 254, W3OKN 122, NO3M 114, N3AES 63, KQ3T 299, N3FM 254, W3OKN 122, NO3M 114, N3AES 63, K3SMB 55, W3KUN 36, WA3DBW 36, WA3HJC 28, KF3V 24, KA3EGE 16, KC3YE 15.

CENTRAL DIVISION

ILLINOIS: SM, Dave Carlson, AA9D—SEC: W9QBH. BM: K9EUI. ACC: WB9SFT. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIO: W9EWA. DEC: WD9EBQ.

NET	FREQ	TIME
ISN	3905	1800DAILY
ILN	3690	1830,2200DAILY
ITN	3705	1900DAILY
CTN	147.69/09	2100DAILY
ILARES	3905	1630 1ST, 3RD SUNDAYS
IEN	3940	0900SUNDAYS
ILPN	3855	1645M-F, 0830SUNDAY
NCPN	3915	0700M-SAT
NCPN	7270	1215M-SAT

The Lake County Regional Red Cross needs communications specialists to assist in providing emergency and disaster relief services. If you would be willing to help, contact Gene Rampale, KA9UNQ, who is the LAMARS (Libertyville and Mundelein ARS) Disaster Coordinator. Call him at (312) 356-0429 and tell him you are ready to "make a difference" the next time disaster strikes a Lake County family. Members of the WIARC (Western Illinois ARC) and some hams from the Keokuk, Iowa, area helped with the Keokuk cart races in July. Thanks to K9BD, KØRL, KAØOGI, WBØLKT and WB9OTW for their help. The Sangamon Valley Radio Club has voted to support a Boy Scouts of America Explorer Post. The Boy Scouts have asked that 5 members of SVRC act as advisors for the group and help guide it through the first years until the kids are able to take over the regular operations of the Post. Contact Ed, KA9ETP, if you can spend some time helping in this worthwhile activity. Members of BARS (Bolingbrook ARS) operated a special-event station during the NWTA Revolutionary War Re-enactment at the Naper Settlement on July 15 and 16. KE9BW, NW9K, NW9V, N9ABF, WD9HBG, NM9J, KA9CAI, NW9T, NO9D, W9ZDT, N9FRT, N9GUN, KB9CJQ, KB9CDV and WA9DIP all participated in the activity. Traffic: KA9FEZ 414, W9HLX 187, W9HOT 165, WA9VLC 163, W9HBI 126, K9CNP 90, NS9F 83, K9QEW 71, WD9HQW 50, WB9TVD 50, KA9QXI 46, NC9T 46, W9LWH 42, W9KR 36, KA9CTW/T 26, W9OBU 23, WV5Z 23, KA9TVU/T 17, KA9JNE 16, WD9CIR 13, WA9AXL 10, W9VEY/M 7, K9EHP 6, KA9UEX 6, W9LNQ 4.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WD9AVQ. STM: WA9OHX. ACC: K9ZBM. TC: WA9JWL. SGL: WA9VQO, BM, W9OCL. PIO: N9IPA. OOC: KJ9G. Net Managers: ITN KA9EIV. QIN KJ9J. ICN KD9ER. VHF W9PMT. IWN KA9ERC. July Net Reports:

NET	FREQ	TIME/DAILY/UTC	QNI	QTC	QTR	SES
ITN	3910	1330/2130/2300	2811	492	2072	93
QIN	3656	1430/0000/0300	367	137	898	62
ICN	3705	0100	53	19	317	21
IWN	3910	1310	1347		370	31
IWN VHF BLOOMINGTON			744		275	31
IWN VHF KOKOMO			1032		199	31
IWN VHF LIGONIER			798		320	31
HOOSIER VHF NETS (22)			5766	166	5081	243

DRN5 for July 366 QTC 62 ses. IN 90% by WA9OHK, K9ZLS, W9UEM, K9CGS, N9DWU, K9GBR. CAND 632 QTC in 31 ses. D9RN 100% by NR9K, K9ZLS, N9DWU. SILENT KEYS: H.A. McAlhany, WA9OKK, of Anderson, Lester A. Gilley, K9YFT of Oden, and William "Brooks" Clark, WB9EAP of Marion. Mac was active right up to his becoming a Silent Key. Both Les and Brooks had been active prior to their illnesses. They all will be missed. Appointments EC Ben Grimm, KA9KOG for Noble County. EC Robert Rinzer, KA9ZOR, Jefferson County. PIA John Marty, W9BTZ, Noble County. DARF, Disciples Amateur Radio Fellowship met in Indianapolis this month in connection with their church convention. Doc, W9KRV, was the host. They plan to activate the club station at the Missions Building. EC Reports: N9DUZ, WD9X, KA9RTD, WB9AHJ, KA9EIV, W9CNE, W9YDP, N9ENC, KA9DZM, KA9OOH, KD9HB, W9KGE, WJ9U, KD9ZN, N9DTG, WA9OQT, WA9HEE, WB9NCE, KC9CU, WD9HII, WB9AGT, W9CFI, N9ADS, N9GFX, KB9ACX, W9UNL, WB9RVN, N9DFU. Packet BBS Reports: W9ZRX 6038, WB9SYK 1826, KD9QB 1438, N5AAA 1058, KA9LQM 1045, WA9UXP 697, N9BAC 545. Public Service Reports: DeKalb County, K9ZBM Weather Net. St. Joseph County, W9EPT Firecracker Races. Vanderburg County, KA9EIV Drum & Bugle Corps competition. Cass County, W9CFI Weather Net. Tippecanoe County, WB9RVN Fiddlers Contest at Battleground also Weather Net. N9FOZ 146 10/70 monitor program. 317 hours reporting 5 accidents, 4 traffic signals, 6 stalled cars, 1 fire hydrant, 1 weather net, 1 drunk driver, 3 fires, 1 phone call, report boys on roof. KE9PR Lafayette 147.135: 2 vehicle emergencies, 2 car accidents, reckless driver, possible break-in. Traffic: NR9K 360, KJ9J 212, W9UMH 122, W9UEM 94, WA9OHX 69, WD9JAA 59. WA9QCF 54, K9ZLS 52, WB9QPA 51, N9DWU 43, W9OCL 42, K9FEI 32, K9GBR 31, WD9HII 29, K9ZBM 29, KE9PR 28, K9SBW 26, WB9IHR 25, W9PMT 24, WD9X 23, W9CNE 23, KA9QME 23, KA9LQM 23, W9PPO 22, NX9A 20, N9ENC 19, KA9ERC 19, N9HZ 18, NX9I 16, WB9OZZ 14, KA9ZOD 14, WD9CIV 12, KB9HH 12, K9OUP 12, KD9DU 11, K9ET 11, W9OZJ 11, WD9DWD 10, N9DTG 8, W9KHK 8, WB9JUV 8, K9DIY 7, KB9SU 7, KW9C 6, AB9A 6, W9BTZ 6, WB9NCE 5, KB9GK 5, W9RTH 4, W9XD 3, WB9AJY 2, NZ9S 2, W9CFI 1, W9YDP 1, WA9HEE 1, WA6OIZ 1, W9KMY 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9ZAG. STM: KC9CJ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. TC: K9GDF. Congratulations to Green Fox ARC for renewing as an ARRL Special Service Club. A beautiful wood plaque with QSL and nameplate was presented to KJ9I for furthering DX through operating at the Mellish Reef (VK9ZM) and Willis Island (VK9ZW) expedition. New Greater

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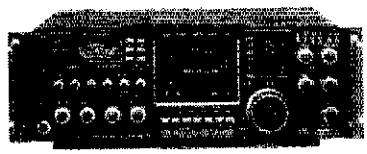

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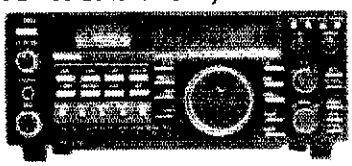

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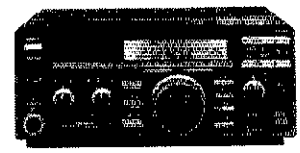

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Milwaukee DXA President: N9AW, Vice Pres.: K9GS, and Sec./Treas.: N9AU. New Wisconsin Novice Net Manager is KA9FVX, thanks for all volunteer NM work of KA9TTM. Badger Weather Net has premier newsletter called Pinholes, edited by N9GJI. VUCC for 6 meters was achieved by WB9YPY. October 4th, exams by the Milwaukee RAC 7:00 PM at Wauwatosa East High School. Quarter Century Wireless Association, Wisconsin Chapter 55, will meet October 7th with a lunch at noon, program and auction at Weissgerber's Golden Mast Inn at Okauchee Lake near Okauchee. Visitors and guests are welcome to join the QCWA fun. October 11th, Ozaukee Radio Club meets at Saukville Municipal Building at 7:30 PM. W9YCV will give a program on the latest Amateur Radio satellite operations including a demonstration on tracking with computers; I'll be present to answer ARRL questions. Refreshments will be available. Please bring a neighbor or a friend along. On October 14th, license exams will be held at the Facilities Management Building on the U.W.—Eau Claire campus, 9:00 AM until noon. October 15th is the date for the fall Ham and Computer Swapfest, Waukesha, starts 7:00 AM, sponsored by the KMRA. October 21st, exams at St. Nicholas in the Milwaukee area, contact WI9M. Sorry to report Silent Key KA9JPC. Thanks to communicators who worked hard, under the direction of EC WB9SMM, helped to make the Milwaukee City of Festivals and Circus Parades a success. Emergency Coordinator training and certification course completed by WD9FLJ, KA9YQH, and WB9SMM. Any volunteers for State Government Liaison or Affiliated Club Coordinator? Ask me for job descriptions. President of Rock River RC, W9BCV, has been talking about his two-month vacation travels in Alaska. Wisconsin Valley RA helped at World Cup Kayak Races, one of their operators was stationed right at the site of an emergency and was able to radio for an ambulance and safety personnel which arrived at the scene within seconds.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—It's interesting how a month with 31 days can pass so quickly, but that's what happened to July. That's called "Slip—Slid'n Away!" Traffic-wise July was an OK month totaling 1,695 traffic handled and 20 stations reporting. Thanks, Gang! We were all saddened to learn of the passing of Warren Koppy, WBØKIS, who became a Silent Key on July 26th. Warren was active one day, and gone the next. And, we will all miss him. I understand that the Marshall Repeater is now on 147.195 (+600) which brings that repeater in line with the current band plan. Congratulations to Sister Alverna O'Laughlin, WAØSGJ, of Courage Center, HANDI-HAMS for receiving the 1988 ARRL Humanitarian Award. That was an upbeat piece of news and I know we all share in thanking her for a great job and wish her all the best for continuing success. Congratulations also to Ray Anderson, KAØVQN, Brooklyn Park as the Minnesota Section Amateur of the Month for July. Nice work, Ray, and thanks to all MSN participants in MSN and for the great work they are doing. That's it for now...Until next time, 73 es GL. Jim Swisher, KAØEPY, STM.

NET	FREQ	TIME	QNI/QTC/SESS	NET MGR
MSN/1	3685	6:30P	324/60/31	KAØEPY
MSN/2	3685	10:00P	276/56/31	KDØNH
MSSN**	3710	6:00P	351/40/31	KABSBY
MSPN/N	3860	12:05P	no report	
MSPN/E	3860	5:30P	684/187/31	KCØT
PAW	3929	9:00A	2175/195/116	WDØBAC

*Additionally sent 37 Training Messages. Alt. Freq. MSN/1 and MSN/2-7070: MSPN/N-7232. Traffic: WAØTFC 330, KAØEPY 292, NØFOO 215, WØGRW 137, KT9I 119, KAØARP 85, KA0SBY 70, KAØPDM 69, NFØG 65, WDØGUF 56, NRØS 54, W9DM 48, KCØT 44, KDØNH 34, NØHWD 27, NØJP 15, WFØO 12, WØKYG 11, KØOGI 8, KDØCI 4. Total Traffic: 1,695.

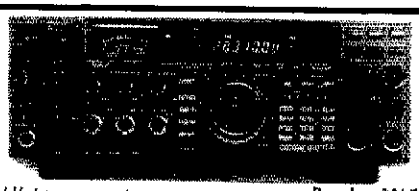
NORTH DAKOTA: SM, Bill Kurtti, WCØM—Not much activity for the SKYWARN Spotter this summer of continuing drought. However, Minot was called out on July 11 with 8 amateurs responding. Also at the Peace Garden Hamfest several Hams went out to watch a storm that developed over the Turtle Mts. Hamfest was a success again. WDØDAJ was elected ham of the year. Congratulations, Stan. KAØSLI took care of the VE4IHF ham station again. A good time was had by all 260+ registered. KAØCHX & NØCBV did an outstanding job in directing the communications for the Canoe Race from Fargo to Winnipeg, in all 25 hams helped in this project. Also, ND hams provided communication for the TransAmerica Bike Trek for the National Lung Assn. A Nord-Link Digi WCØM-8 NDPMB was installed at Pembina giving us a reliable path for Packet Traffic between the BBSs in MB & ND. I received a list of ARRL Affiliated Clubs today. If yours isn't, maybe it's time to get going on that.

NET	FREQ	TIME	QNI/QTC	MGR
GOOSE RIVER	1990KHZ	9AMSU	6/58/0	NTØV
DATA	3941KHZ	6:30DA	30/471/15	NØJR
WX NETS	3941KHZ	Resume in Oct		WØGFE
WINTER ONLY		9AM 12:30PM M-F		
STORM NET	3941KHZ	DURING STORMS ONLY		WCØM

SOUTH DAKOTA: ACM, R. L. Cory, WØYMB—Asst SM: NØABE, WAØFPR. SEC: KAØKPY. STM: KDØYL. NØIJQ is giving Amateur Radio lectures and demonstrations in the Rapid City area grade schools and following this, NUØF and KAØSEZ will have Novice classes at the SD school of Mines and Tech. Dakota Chapter 102 of QCWA held their annual meeting at Mobridge on Aug 5 and 6. An excellent program on the early history of Amateur Radio was put on by WØLX. Chapter President WØHOJ and wife were involved in a car accident in route to the meeting and was not able to attend. Present officers were re-elected for another two-year term. Area hams are sad about the passing of Ross Fenn, WØLXO, Sioux Falls, who died from injuries suffered in an airplane crash. Pierre ARC has received their certificate of ARRL affiliation. They are planning to put receiver voting on the repeater to improve their coverage area.

DELTA DIVISION

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. SEC: N5ADF. ACC: K5KR. SGL: KD5SL. TC: W5RWF. OOC: WB4ICV. Packet: WB5ASD. STM: WB4FDT. Shirl, K5OPL, reports that Amateur Radio coverage of the National Hot Air Balloon Championships in Baton Rouge Aug 4-13 was outstanding. Approximately 100 amateurs in South Louisiana participated and helped ensure the safety and welfare of the nearly 200 balloon pilots, crews and spectators. Coordination of amateur activities was handled by the Radio Amateur Service Club (RASC) of Baton Rouge using the KD5SL repeaters. A special-events station was set up at the



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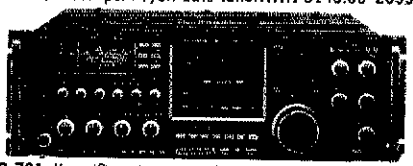
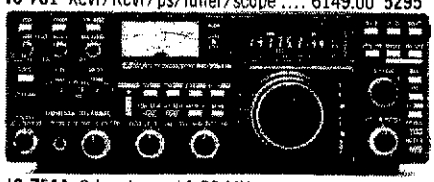


IC-781 Xcvr/Rcvr/ps/tuner/scope 6149.00 5295



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EX-627 HF auto. ant. selector (Special)	315.00	269.95
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PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
MB Mobile mount, 735/751A/761A	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A	79.00	
PP-1 Speaker/patch	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan	89.00	
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AT-500 500W 9-band auto. ant. tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	758.00	689.95
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IC-275H 100w 2m FM/SSB/CW	1399.00	1199
IC-375A 25w 220 FM/SSB (Closeout)	1399.00	799.95
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	1199
IC-475H 75w 440 FM/SSB/CW	1599.00	1369
IC-575A 25w 6/10m xcvr/ps (Special)	1399.00	1129
IC-575H 100w 6/10m xcvr	1699.00	1499
VHF/UHF/1.2 GHz Mobiles	Regular	SALE
IC-47A 25w 440 FM/TTP mic (Closeout)	549.00	369.95
PS-45 Compact 8A power supply	145.00	134.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25w 2m FM, TTP mic (Special)	469.00	379.95
IC-28H 45w 2m FM, TTP mic	499.00	439.95
IC-38A 25w 220 FM, TTP mic	489.00	349.95
IC-48A 25w 440-450 FM, TTP mic	509.00	449.95
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-228A 25w 2m FM/TTP mic (Special)	509.00	429.95
IC-228H 45w 2m FM/TTP scan mic	539.00	479.95
IC-448A 25w 440 FM/TTP mic	509.00	449.95
UT-40 Pocket beep function	45.00	
IC-900A Transceiver controller	639.00	569.95

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IC-900A Transceiver controller with **UX-29H** 2m/25W and **UX-39A** 220/25W band units.
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UX-59A 6m 10w unit	349.00	319.95
UX-129A 1.2GHz 10W band unit	549.00	499.95
IC-901 Fiber Optic 2m/440 xcvr	1199.00	1069
IC-1200A 10w 1.2GHz FM mobile	699.00	599.95
IC-2500A 440/1200MHz FM mobile	999.00	869.95
IC-3210A 25w 2m/440 FM/TTP	739.00	649.95
IC-2400A 45w 2m/35w 440 FM/TTP	899.00	789.95
AH-32 2m/440 Dual Band antenna	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount	24.70	
Larsen PO-MM Magnetic mount	24.70	
RP-1510 25w 2m repeater	1849.00	1649
RP-2210 220MHz 25w rptr (Special)	1649.00	1399
RP-1210 1.2GHz 10w 99 ch FM rptr	1529.00	1349

Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. All prices shown are subject to change without notice.

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IC-02AT/High Power	409.00	349.95
IC-04AT 440 HT	449.00	389.95
IC-u2AT 2m (Special)	329.00	279.95

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IC-u4AT 440 (Closeout)	369.00	199.95
IC-2SA 2m HT	419.00	369.95
IC-2SAT 2m HT/TTP	439.00	389.95
IC-3SAT 220 HT/TTP	449.00	399.95
IC-4SAT 440 HT/TTP	449.00	399.95
IC-2GAT 2m HT/TTP	429.00	379.95
IC-4GAT 440MHz, TTP Special . .	449.00	399.95
IC-32AT 2m/440 HT	629.00	549.95
IC-12AT 1w 1.2GHz FM HT/TTP (Special)	473.00	349.95
IC-12GAT 1w 1.2GHz HT/batt/cgr/TTP	529.00	469.95

Aircraft band handhelds	Regular	SALE
A-2 5W PEP synth. aircraft HT	525.00	479.95
A-20 Synth. aircraft HT w/VOR	625.00	569.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8	21.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.65
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs	25.99
LC-2AT Leather case for standard models	54.50
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10	24.50

For other HT Accessories not listed please CALL

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	$999.00	869.95
RC-11 Infrared remote controller	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	12.99	
MB-12 Mobile mount	25.99	
R-7000 25MHz-2GHz rcvr (Special)	1199.00	999.95
RC-12 Infrared remote controller	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	129.95
AH-7000 Radiating antenna	99.00	
R-9000 100KHz-2GHz all-mode rcvr	5459.00	4699

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festival site working most states and many foreign countries. Well done to the Shreveport Amateur Radio Assoc. (SARA) for winning the 1989 Louisiana Field Day Competition and an attractive plaque. The Springhill ARC was a close second. The ARK-LA-TEX Hamafest and ARRL Delta Division Convention at Shreveport was bigger than ever and an outstanding success. Larry Price, W4RA, ARRL President; Joel Harrison, WB5IGF, ARRL Delta Director and many other Delta Division Leadership Volunteers were on hand to discuss current events. Welcome aboard to Phil Sager, WB4FDT, of Ruston as Section Traffic Manager. He is aggressively revitalizing the Louisiana Traffic Nets. Traffic: DRN-5 July 89. 478 msg 62 sessions. LA rep 73% by K5WOD, WB4FDT, N5CNK, N5LRZ, KF5VW, WA5WBZ & WA5TQA. SAR: WB4FDT 54, K5EOD 19, K5CNK 19, 73 & GL de "Wondy," K5KR.

MISSISSIPPI: SM, Butch Magee, KF5DE--ASM: WD5GHW. SEC: N5DVR. SGL: KA5WRX. TC: W5VZF. STM: KB5W. BM: W5EPW. The Delta Division Convention was held in Shreveport, LA, 12-13 August. If you didn't attend, you missed a really great hamfest-convention. Make plans to attend the Mississippi State Convention in Biloxi. Promises to be an exciting event as always. The Hurricane season will be with us for a bit longer, so if you have a general coverage receiver, jot down these frequencies for aircraft hurricane surveillance. 3407, 5562, 6673, 8876, 10015, 13354, 17901, 21937. These are aircraft to Miami monitor. Air to air 123.050, 304.800, and 4701 hf for back up. Well, this has been a busy month for the traffic and section nets. I say a job well done. Special thanks go to the traffic handlers. The reports are: Fifth Region Day Time (RN5), WB5YDD Net Mgr. 62 sessions, 478 messages, MS. represented 100% by KT5Z, W5HKW, NS5M, WB7CQQ, and KB5W. Central Area Net Daytime, K5UPN Net Mgr. 31 sessions, 632 messages, Ms. Station NS5M. Mississippi Traffic Net (MTN) KB5W Net Mgr. 31 sessions, 57 messages, 197 QNI. Mississippi Section Phone Net, W5OXA Net Mgr. 31 Sessions, 1834 QNI, 31 QTC. Mississippi Slow Net, W5YRX Net Mgr. 18 sessions, 63 QNI, 7 QTC. Meridian ARC Emergency Net, KB5ASR Net Mgr. 4 Sessions, 81 QNI. That's all folks. See you on 3862.5. 73, Butch Magee, KF5DE, SM.

TENNESSEE: SM, Harry Simpson, W4MI—Eastern Assistant SM and PIO W4TYU, Central Assistant SM WA4GLS, Western Assistant SM and ACC K4CXY. STM: NG4J. SEC: K4UVH. OOC: K4LSP. SGL: N4PQY. TC: W4HHK. The TN Phone Net is on 3980 kHz with early sessions at 6:40 AM Eastern, Regular sessions at 7:45 AM Eastern Monday thru Friday, at 9 AM Eastern on Saturdays, Sundays and Holidays. Evening sessions are Monday thru Saturday at 7:30 PM Eastern. CW Net Sessions are on 3635 kHz at 8 PM Eastern, Monday thru Friday. It is with deep regret that I report the passing of five TN hams during July: Philip Ewald, W4EWR, of Knoxville (father of Steve Ewald, WA4CMS, of the ARRL staff), Joseph W. Lowe, WB4QZY, of Springfield, Lee Welch, K4YFF of Knoxville, Walt E. Gary, WB4FME, of Harriman and Billy C. Primm, WK4R, of Bruceton. The last three were Army MARS members and died on consecutive days—the 27th, 28th and 29th! All will be sorely missed by their friends in TN and the world. Some of the major hamfests this month (October) include Memphis on the 14th and 15th, Gray on the 21st and Chattanooga on the 28th and 29th. At this writing, I am unable to return to Gray this year because of my budget travel, but I know it will be a great success as usual. I will be in Memphis and Chattanooga and look forward to seeing you there. Traffic: WA4FMR 139 (he made BPL for the umpteenth time for originations plus deliveries!), WA4GZZ 43, KA5KDB 35, W4MI 30, WB4LAL 29, WA4HKU 28, W4PFP 25, W4TYV 21, W4DDK 19, K4CXY 12, WA4DSA 2.

GREAT LAKES DIVISION

KENTUCKY: SM, John Thames, WM4T—Asst. SM: KC4WN. SEC: WB4NHO. STM: KA4MTX. PIO: WA4SWF. (July) I am pleased to report that substantial progress has recently been made on the long-awaited Kentucky Emergency Response Plan (KERP). KC4WN and WB4NHO have been working closely with Frankfort DES and an agreement is near! Stay tuned for the latest update. A big thank you goes out to the Mammoth Cave ARC for their hospitality during my visit this month with VP Wilson. The Kentucky Colonels ARC has submitted an application for Special Service Club status. Hopefully, the good news on this can be reported in next month's column.

NET	QNI	QTC	SESS	MGR
MKPN	1423	131	31	WD4RWU
KTN	619	55	28	WD4RWU
KYN (BOTH)	254	102	61	K4AVX/KZ8Q
TSTMN	401	34	31	KZ8Q
KNTN	217	55	41	WA4EBN

SAR (July) WD4RWU 106, K4VHF 89, WA4EBN 48, KB4UJA 42, KC4WN 41, KI4QH 39, K4AVX 33, N4LAF 22, W4TPB 19, WB4AUN 16, N4PEK 12. PSHR: KI4QH 94, KC4WN 77, KA4MTX 65.

MICHIGAN: SM, George E. Race, WB8BGY (@N8FTY)—ASM: WA1LRL (@WA1LRL). STM: WD8KQC (@NT8R). SGL: N8CNY. TC: W8YZ. OOC: WA2AJQ. ACC: N8JVA. PIO: N8KBA. BM: WI8W. Silent keys, with deep regret, A.L. Baker, W8TZZ, and Harold Vincent, WA8PIM. On July 22, a train derailment put Saginaw Co. amateurs to the test. The accident, near Freeland, brought about the evacuation of several square miles around the area. Ruptured tank cars were allowed to burn out for several days. Genesee Co. ARES sent 10 volunteers. St. Clair and Oakland Counties had others on standby. 57 hours of continuous operation were provided. An overall operation of 109 hours in 8 days. Total manhours exceeded 425. The following operators participated; N8FAU, N8JAZ, WD8POK, WD8M, NY7F, N8GSS, N8ERF, N8JAT, N8JIT, N8JIO, N8JIS, KB8ATR, KB8BMZ, KB8DAC, W8OOI, WB8WJV, N8HSD, KA8PRV, N8JKQ, K8AQA, N8IOV, NK8Q, K8NOC, KA8OWR, KB8AUB, K8CQF, WB8PLO, W8CTY, K8OT, N8GVO, WB8I, AND AE8R. On July 29, a van carrying toxic medical supplies overturned near Gaylord. About 150 local residents were evacuated. Otsego Co. EC, N8JCL, reports the following were involved in the emergency net; K4IUH/8, N8KCK, N8JSP, KA8NCL, K8KWJ, KA8JWQ, KC9ON/8, KC8TS, N8HFN, N8ICN, N8JTZ, N8AYQ, N8JIM, NS8X. Otsego Co. ARES provided liaison to shelters, radio stations, and the mayor's office. This year, Della Carver, WD8EIB, has been named Michigan Radio Amateur Operator "YL" of the year. Della does an outstanding job as Net Manager of the MiTN. You can hear her friendly voice most any evening at 7:00 PM on the MiTN. Her participation in MI ARRL activities has been outstanding. Congratulations from all of us Della, on receiving this years YL award. John Sheldon, WA8MVH, has been voted the U.P. Net Ham Of The Year. John is one of the many very active U.P. net members and devotes much of his time to Amateur Radio and traffic handling. Congratulations John, well done. Duane, WI8J, Calhoun Co. EC, reports all went well at the International Balloon Championship held in Battle Creek. Named for outstanding contribution to the event are; WO8X, WD8BZV, NI8E, N8BDM, KB8DCC, WD8JOM, WB8USU, KA8MZM, and K8BWX. The Great Lakes Emergency and Traffic Net (GLETN) has new officers. NM—Al, NW8M, ANM—Tom, KA9WFW, and SEC/TREAS—Hut, K8ZRJ. Many ECs and DECs are reporting big plans are underway for the 1989 SET to be held on October 21st. If you have never been involved before, we invite you to take part in this yearly "On The Air" demonstration of our ARES, RACES, and NTS programs. Help us make Michigan the outstanding national leader again this year. Please support the following MI area Nets:

NET	FREQ	TIME/DAY	QNI	QSP	SESS	MGR
UPN*	3921	5:00PM Dy	1037	60	36	WA8DHB
MACS*	3953	11:00AM M-Sa	312	46	31	K8OCP
MiTN	3953	7:00PM Dy	515	195	31	WD8EIB
QMN*	3663	6:00PM Dy	524	111	61	WB8R
MNN*	3722	5:30PM Dy	289	122	62	KA8BBY
SEMTN	145.33	10:15PM Dy	396	112	31	N8HSC
GLETN	3932	9:00PM Dy	1126	64	31	NW8M
WSSBN	3935	7:00PM Dy	575	28	31	W8NDI
VHF Net Activity			No Report Received			
						NO8Q

*QMN Fast-6:30PM Dy; QMN Late-10PM Dy.; MNN Late-8:00PM Dy.; MACS-1PM Sun.; UPN-12PM Sun. Traffic for July: KA8BBY 307, KA8CPS 222, WD8KQC 105, N8IIC 88, NJ8S 82, WB8R 65, WB8YPG 61, N8FPN 61, WA8DHB 59, WB8YDZ 54, K6HAP 49, N8HSC 46, N8FTY/BBS 74, W8EOI 43, WD8MJB 38, N8CNY 38, KBUPE 37, K8CQF 36, WB8BGY 32, K3UWO 31, KA8BYK 30, K8OCP 29, W8YIQ 28, WD8EIB 25, W8IHX 24, W7LVB 23, K8ZJU 22, WA8MVH 17, NY8W 17, W8RNO 16, N8JAT/BBS 16, N8HHH 15, WT8J 12, KI8Q 11, N8HWO 11, KN8JDN 5, W8URM 2, N8EXS 2. June: NJ8S 72.

OHIO: SM, John Haungs, WA8STX Ph: (513) 563-7373—ASM: David Kersten, N8AUH, Ph: (216) 221-6740. SEC: WD9MPV. STM: KF8J. ACC: KJ3O. ACT.BM: W8PH. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK. PIO: K8QOE.

NET	QNI	QTC	SESS	TIME(LOCAL)	FREQ	MGR
BN(E)	193	100	31	1845 DY	3.577	WD8C
BN(L)	180	89	32	2200 DY	3.577	K8TVG
BNR	---	---	---	1800 DY	3.605	W8EK
OSSBN	1607	754	93	1030,1615, 18453	3.9725	N8IBS
OSSN	207	105	31	0645 M-F	3.577	KD8HB
OSSN	---	---	---	0800 S-SU	3.577	KD8HB
OSN	209	60	31	1810 DY	3.708	WD8KBW
O6MN	---	---	---	2100 M-W-F	50.16	WD8CTX
OHIO SECTION ARES NET				1700 SUN	3.875	WD8MPV
OHIO SECTION WX NET				A/R	3.875	WD8MPV

The Ohio Section Conference is scheduled for Sunday, October 8, 1989, at the Berliner Park in Columbus. The location is just off I-71 at the Greenlawn Ave. exit. The Conference will begin at 0900 and last until 1600. There will be a break for lunch. There are many fast food places close at hand or you may want to bring a picnic basket. Grills are available in the park for those who might wish to cook out. The Conference is open to all Radio Amateurs and interested parties. This is a chance to express your thoughts and ideas and find out what is going on in the Ohio Section. There will be a talk-in on the 147.66/.06 repeater. Watch for the Autumn issue of the Ohio Section Journal for final details or call N8AUH. Congratulations to Lake County ARA Amateur NX8R, Daniel Patterson of Painesville, who received the club's "Good Ducky" award for his work on the new towers and antennas. FCC EXAMS IN OHIO: Oct 14, Mentor, North Olmstead Maumee. Oct. 28, Akron. Nov. 11, Columbus, Maumee, Nov. 12, Independence. Nov. 25, Canton, Fremont, Dec. 2, Mentor, Columbus. DEC.9, Ravenna, North Olmstead, Zanesville, Cincinnati and Maumee. As listed by K3RC. The Columbus Amateur Radio Assn. (W8TO) is running a Special Event/Contest on Columbus Day weekend. Oct. 7/0000Z--Oct. 8/2400Z Freq. 7.240; 14.340; 21.375 and 28.500 MHz. Commemorative QSL. According to David Kersten, N8AUH, the Ohio General Assembly passed a law which makes it a felony for anyone to hinder or obstruct an Amateur Radio operator when he/she is undertaking ARES Public Service Duty. That's a good reason to make sure that you always carry your proper ARES/CD photo ID cards with you. Congratulations to the following Special Service Clubs on their renewals: The Mahoning Valley ARA, the Portage ARC, Tusco ARC, and the Warren RACES Club. Congratulations also to the Woodchuck ARC in North Ridgeville, where Joanne and Larry Solak presented a hand-lettered charter of affiliation. Make a point to get with your local club in Oct. and help out on the Simulated Emergency Test. Watch for your ARRL ballot which should be out not later than Oct. 1 and back in by noon Nov. 20. The election of a Great Lakes Director and Vice Director will be up to you. Traffic: WD8KBW 540, K8TVG 282, KD8HB 270, W8BI 250, KD8KU 215, W8BO 196, WD8IKC 189, K8JDI 175, W8PMJ/R 162, WA8STX 141, KA8OQF 132, KE8CV 126, WA8SSI 121, W8SKP 113, N8FWA 98, WD8FKN 94, W8JLW 94, KA8HBN 77, K8DHB 76, KA1S 74, KC8NM 68, W8QZK 62, WA8HED 58, KBES 54, WB8VNV 49, W8LDU 43, WD8REO 43, N8EFB 37, WA8EYQ 36, WB8DPZ 36, K8ALV 36, NE8X 35, WB8FSV 35, WD8QXT 34, K8IOW 33, NS8C 27, KB8FXG 27, WB8JGW 26, KA8SON 25, KA8BNQ 25, NW8E 24, WB8KWC 24, KA8CGF 23, N8HJB 23, KB8ABO 23, KA8YIT 20, K8WZX 19, W8GDQ 19, KC8JV 18, K8LQM 18, WD8JYE 18, KB8ESU 18, N8GOB 15, WB8HHZ 15, KA8LMO 14, W8LDQ 14, WD8REB 14, KA8GJV 14, N8INP 12, KB8RIX 11, N8JRV 11, KB8AKW 11, WD8CSP 10, NF8B 10, N2NS 10, K8WOQ 9, N8CB 8, N8FPH 8, K8DXE 7, W8RG 6, WB8GDM 6, N8CW 6, KA8RQF 5, N8JOC 4, WA8NJE 4, KA8ODX 4, WD8PWG 4, K8CKY 4, KA8VYD 4, W8FPA 3, W8PBX 3, KD8XL 3, N8KTU 2, N8GIO 2, W8XT 1. (Jun) WB8JGW 53.

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EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. STM: WB2EAG. SEC: WA2ZYM. BM: WB2IXR. SGL: KB2HQ. PIO: KB2TM. OOC: N2DVQ. ATC: WA2VGM. ACC: KV2A. ASM/PACKET: N2FTR. ASM/NWSLTR: WB2NHC. NET REPORTS FOR JULY(QNI/QSP): AESN 30/1

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CDN(JUNE) 564/48 ESS 346/70 HVN 326/69 NYPHONE 115/77 NYPON 405/290 NYSE 303/203 NYSL 295/249 NYSM 311/295. CLUB NEWS: Albany ARA were involved with two runs on 11 Jun with WA2YBM WB2BEJ N2AKR K2BST helping. In addition to FD, they worked on PORTFEST 89, Conrail picnic and Altamont Fair. WARA is working on plans for the fall season. WECA assisted with comm for concert at WCC and are running a successful Novice course during the summer. The W2SZ group had a successful FD. They are working on plans for rebuilding the antenna farm and a 220 repeater. Rensselaer RACES is beginning a Novice course at HVCC Sep 28. Many other groups are holding classes in the fall. Please help out if you can. Many comments have been made with regard to re-vitalizing our hobby. The only real way is by "marketing" our hobby, to coin a phrase of N2HIF. Promoting our classes in all forms of the media is the beginning step for a successful course. But a well taught course is not the end. We must follow it up with Elmers for the new hams. PLEASE! Get involved. Offer your expertise. Each one of us has something to contribute! We can be successful only if each of us helps. Don't forget the spring/fall fling. Contact WB2EAG for further info. Hope to see you all at the various club meetings in the fall. Don't forget to send your traffic reports into the STM no later than the 6th of the month. July BPL: N5MEA, WB1BTJ. July PSHR: N5MEA WA2JBO WB2VUK WE2G WB1BTJ WB2EAG KB2EPU WA2GYY.July TFC: N5MEA 593, WB1BTJ 554, WB2VUK 163, K2LYE 106, WB2EAG 97, KB2EPU 88, WD2K 75, WA2JBO 68, WA2GYY 49, WF2M 24, WE2G 13, W2CJO 12.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2RGI—ASM: N2GQR. ACC/PIO: KA2LCC. SEC: WA2UJI. STM: K2MT. OOC: NB2T. TC: W2QUV. BM: W2JUP. The following are traffic nets in and around the section that handle NLI:

NET	FREQ	TIME	DAY	MGR
BAVHF	145.350/R	2000	DLY	K2TWZ
NCVHF	146.745/R	1930	M-F	N2IMP
SCVHF	145.370/R	2000	S-F	KA2JMA
NYPON	3913 kHz	1700	DLY	KA2UBD
NYS/M	3677 kHz	1000	DLY	N2EIA
NYS/E	3677 kHz	1900	DLY	KU2N
NYS/L	3677 kHz	2200	DLY	KU2N
NLT	28450 kHz	2100	WED	N2IMP
ESS*	3590 kHz	1800	DLY	W2WSS

*Independent Net, recognized by NTS, local times.

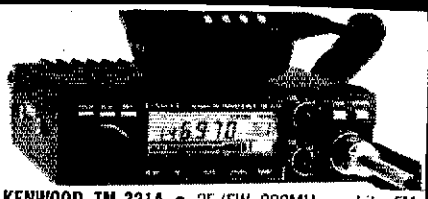
PACKET NODE STATIONS

N2MH	-4 Queens Village	145.010	New York City
AI2Q	-4 Freeport	145.010	Nassau, W. Suffolk
W2HPM	-4 Farmingville	144.970	Central Suffolk
NR2L	-4 Water Mill	145.090	Eastern Suffolk
WB2IBO	-4 Massapequa	145.030	Backup for AI2Q-4

VE LISTINGS: LIMARC—second Saturday of each month at 9:30 AM at Salten Hall, NY Institute of Technology, Old Westbury—contact Al Jones, W2ZDB 516-676-5790 SUFFOLK COUNTY VE TEAM—second Saturday of each month at 9:30 AM at the Suffolk County Community College, Islip Arts Bldg., Selden, NY—contact George Sintchek, WA2VNV 516-751-0894; GRUMMAN ARC—second Tues. of each month, at 5:00 PM at the Grumman Rec. Center, Bldg. 800, South Oyster Bay Road, Hicksville, NY—contact Howard Liebman, W2QUV 516-354-6861; GREAT SOUTH BAY ARC—fourth Sunday each month at 12 Noon at the Babylon Town Hall Office Annex, 281 Phelps Lane, North Babylon, NY— contact Walter Wenzel, KA2RGI 516-957-5726; MAARC—last Thursday each month at 6:00 except Dec., at the Robert Wagner JHS, Manhattan—contact Rubina Asti, KD2IZ 212-838-5995. If your group holds regularly scheduled license exam sessions and/or classes let me know so they can be added to this listing. REMINDER TIME: Don't forget that the Simulated Emergency Test is THIS month on the 21-22. We still need more people to participate with voice and packet contact your local EC or me for more details. There is still time to volunteer for the New York City Marathon which will be on November 5, contact Steve WA2DHF Suffolk County Hamfest at the Bingo Hall in Centereach, NY; Nov. 12 Ham Expo '89 (NYC-LI Section Hamfest for 1989) at Suffolk County Community College in Selden. Traffic: WI2G 334, N2IMP 147, N2AKZ 134, KA2VZX 110, K2MT 85, N2GPA 54, N2HLZ 52, K2TWZ 42, WA2UKM 35, K2JLD 33, NB2D 30, WB2KID 22, KA2UIU 18, KA2JMA 17, WB2ZIE 11. (June) N2AKZ 196, N2GPA 99, W2GKZ 63, KZ5LD 38.

NORTHERN NEW JERSEY: SM, Rich Moseson, NW2L (@KD6TH)—ASMs: KA2F/Recruitment. W2VY/Youth, NW2S/NW, KY2S/SE, KC2ZA/SW. ACC: WA2QYX. BM: K2ULR. OO/AAC: KA2BZX. PIO: NW2L. SEC: WB2HBZ. SGL: W2KB. STM: K2VX. TC: KA9Q. Ham Radio info line: 201-680-1585. Please note: This line is occasionally answered by a real person, sometimes even by a woman. If this happens, please don't hang up. It's rude. Try leaving a message instead. Tnx. By now, all clubs should have received basic information on the new NNJ HELPFUL AMATEUR MENTOR (H.A.M.) PROGRAM, coordinated by ASM/Recruitment John King, KA2F. Please sign up for this important program, and make sure there's someone in each club willing to serve as local H.A.M. coordinator. KA2F will be contacting each club with details. Welcome to new ASM Don Lawshe, NW2S, President of the Sussex Co. ARC. Don will be the local ARRL "presence" in northwestern NNJ. If you see a school with a ham antenna on the roof, whether or not it has a club or station, please tell ASM/Youth Tom Moulton, W2VY. Tom will try to rekindle interest among school administrators. (9 Rosalie Ave #1, Clifton, NJ 07011 or @KD6TH). Endorsements for 10/89: ORS: W2CVW, W2SQ, WB2KLF. DEC: W2ZEE/Monmouth. EC: NJ2Q/Springfield, WA2FPO/Bayonne. OES: AG2R, K2BE, K2GDD, K2OX, KA2AEH, KA2KWS, KB2QO, KN6X, KX2D N2BMN, N2CIA, N2ELC, N2WM, NJ2Q, NZ2Z, W2CC, W2LOP, W2ZEE, WA2ARP, WA2DHF, WA2FPO, WB2FTX, WB2MJC. OBS: N2DXP. OO: KJ2D, N2HOU. ATC: NR2H. Congrats to new licensees/upgrades in NNJ during July: NOVICE: W. Lenhardt, John Burke. TECH: KB2HVC, KB2TQU, Laura Fenick, Vito Lupo, Carol Sproul, R.L. Barnes, Keith Lohman, P. Mitchell, J. Vilanksi, Peter Rensen. GEN'L: KA2HVQ, N2JUN, KA1SFJ, N2ILF, KA3UYT, KA3TQQ, Frank Ready, ADV: N2IFJ, WA2QHA, N2JKY, WB2VRK, WA3TSK. Extra: KE2EO, WA3MVR, WB2PGC, W2WIY, V. Lupo. NTS News: Welcome to new NJVN/L Net Manager (NM) Paul Szarawarski, KA2KJF, and many thanks to outgoing NM Lee Storm, N2FGC, for her outstanding service. July Net Activity (all meet daily):

AES® / KENWOOD • Closeouts & Specials of the Month . .



KENWOOD TM-321A • 25/5W 220MHz mobile FM transceiver. Digital VFO, 14 memories with shift, scan and lockout. Prog. band scan, 38-tone encoder, 16-key up/down DTMF mic. 12V DC @ 6.5A, 1½"h×5½"w×7"d.

Regular $469.95 • ***Closeout* $299.95**

KENWOOD TM-421A • 35/5W, 440MHz FM transceiver. Looks like and features same as TM-321A above.

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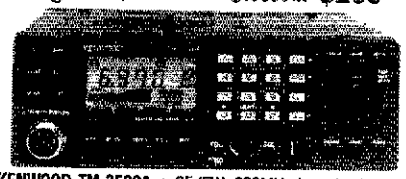

KENWOOD TM-3530A • 25/5W, 220MHz base/mobile FM transceiver. Keyboard entry, 16-key DTMF, DCL capability. 23 multi-function memories; linked to 15 telephone number memories. Frequency up/down control from microphone. 12V DC @ 6.5A, 2 ½"h×7"w×9¾"d.

Regular $519.95 • ***Closeout* $389.95**

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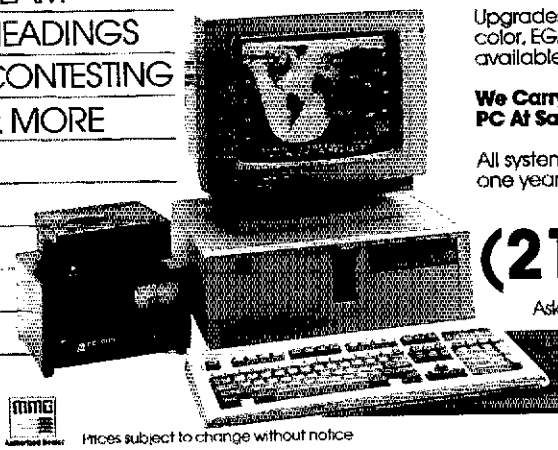

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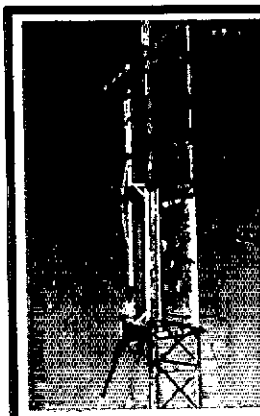

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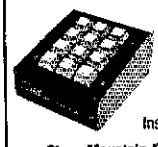

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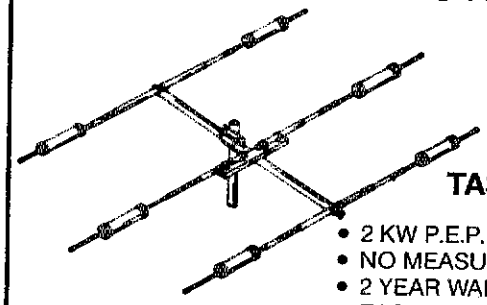

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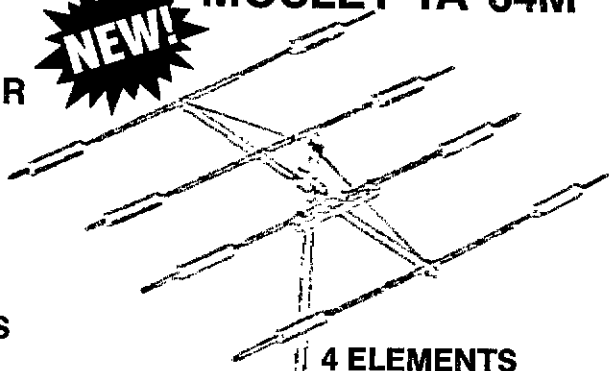

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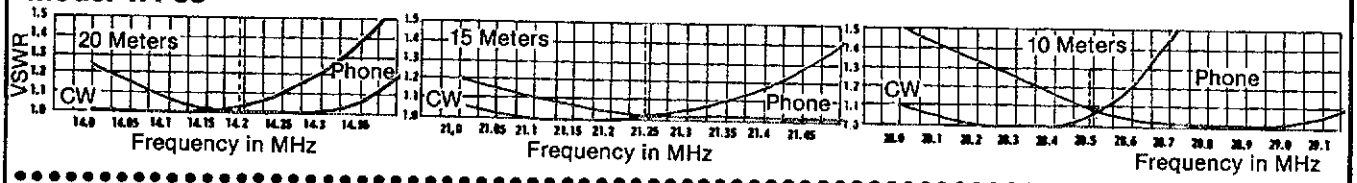
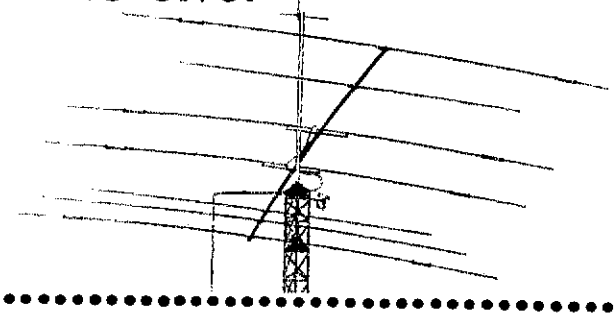


MOSLEY PRO-57/67



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NJN/L	3695	2200	31	142	47
NJPN	3950	1800	36	300	68
NJSN	3735	1830	31	144	28
NJVN/E	146.895	1930	31	527	72
NJVN/L	146.490	2230	31	295	60
QBTTN	147.120	2000	30	230	95
NJTTTN	223.880	2100	31	170	32

Packet NTS 24 hr/day via WA2SNA-A: 83 July Traffic: (Call/Traffic Total/PSHR Total): W2QNL 303/116, W2RRX 150/97, WB2FTX 146/62, N2XJ 113/98, WB2ZJF 109/111, N2DXP 89/61, KA2INE 49/72, KF2JX 45/62, KA2KJF 37/61, W2CC 22/-, N2DIY (T) 19/43, WA2CLP 18/-, W2XD 17/-, KB2WI 14/-, NW2L 12/-, WA2PAC (T) 10/58.

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—SEC: KDØBG. STM: WBØAVW. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. SGL: WRØG. The Register's Annual Great Bike Ride Across Iowa was its usual big success. WBØRSW again enlisted the help of many amateur radio clubs along the route to help with passing traffic and putting amateur radio before the general public. A lot of traffic was passed this year. 388 pieces of traffic were sent, received or delivered via the KØCNM repeater. 58 pieces were delivered and 87 forwarded from the WAØRJT-1 packet bulletin board. KEØGP originated enough to make the Brass Pounders League for July. Thanks to all involved in making this year's HAGBRAI amateur radio activity a great success! The Cedar Rapids Hamfest was another success this year. New upgrades at the VE Exams at Cedar Rapids were Extra: WB5MZY, K3BKW; Advanced: WB9MKT, NØJSU, NØHOF, KBØDAR, WDØGHF; General: KBØCHL, NØKMX; Technician: KBØEUS, KBØEYN, KBØERH, KBØEWI, KBØEHC. There were also several newcomers receiving their first licenses to Technician and Novice. Congratulations to all! A heartfelt THANK YOU to all of you who helped in the rescue and recovery following the United Airlines DC-10 crash in Sioux City! It was a very difficult job, but one well done! Traffic: KEØGP 356, WØSS 130, KØIPT 104, WØYLS 81, KEØWO 80, KØGP 76, KAØADF 69, WBØMCX 62, KØCNM 61, KCØKZ 60, WBØAVW 40, NØJL 11, KAØVBA 5, KØKQJ 4.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. Congrats to NØKOW, new YL ham in ARES zone 36. Suzi was put to work right away as NCS of the zone net and QNI has already picked up. WØMYM gave presentation on NTS etc to the BEARS June 3. Hiawatha hams in good attendance at the National convention. Net reports for June '89 as follows: KSBN QNI 1202 QTC 143. KPN 356/18. KMWN 571/475. KWN 845/566. CSTN 1804/64. QKS 147/52. QKS-SS 25/2. Still needing some good CW ops in the middle and western part of the state to QNI QKS and QKS-ss. NCS duties are available. 1989 FIELD DAY is over and reports were received from the following: NØIGE, NZØM, WAØGRM, KEØDK, WTØE, KBØEH, KEØWI, WØUY, KØEQH, WØPB, NKØV & WØERH. If your club/group is not represented through one of these calls listed, then perhaps you should start tracing your message sent to see where it bit the dust. I don't believe I lost any in the paperwork. WØSOE, Wichita ARC represented by KFØM, WDØL, NØFFO and NØFFO/XYL, shot the moon from a EXpedition to Riverton, NE during May of this year on 2 mtr EME. A number of Triathlon's taking place during June, July and August. Hope we receive lots of reports of HAM activity on these as well as other events. Traffic: KØBXF 251, KAØRCH 243, WØFIR 235, WØFRC 144, NZØM 135, WØOYH 73, WBØZNY 62, WØFDJ 61, WØQMT 55, WAØTJU 51, WTØE 25, WØCHJ 17, WØMYM 16, WØPB 10, WAØYXK 4, KXØI 4.

MISSOURI: SM, Bill McGrannahan, KØORB—During the July meeting of the Central Missouri Radio Assn.—with more than fifty members present, Ben Smith, KØPCK, the retiring Section Manager, was presented with a plaque in recognition of his outstanding services to the Missouri Section. Benny says, "Thanks to all for the beautiful plaque. It will always be a reminder of the enjoyable time I had serving as Section Manager." The CMRA also provided communications for the medical team of the Saddle Soars Cross Country Trials. The 51 horses and riders in this event were served by WMØY, NDØN, WAØR, KAØNBM, KBØATZ and WBØTEG. Vice Director Chuck Miller, WAØKUH, attended the Annual Volunteer Examiner Coordinator Meeting in Gettysburg. Several Missouri hams will go to the Central VHF Society Conference in Chicago this month. The Washington Hamfest was blessed with ideal weather this year. The figures aren't in yet, but the crowd was large and having a great time! Midwest Director Paul Grauer, WØFIR, conducted an ARRL forum. Also your SM met with the Asst. SM, Roger Volk, KØGOB. My PBBS KØORB—1 V KCMO.

NAME	MGR	FREQ	TIME (cdt)	DAY	SES	QNI	QTC
MON	AIØO	3.585	7:0?45	D	62	192	132
MEOW	WDØELL	3.963	5:30	D	31	608	91
MOSSB	WBØWLU	3.963	6:00	D	31	724	88
HSN	KØOSQ	3.880	12:05	M-F	21	333	24
KCARC	WAØITU	146.82-	6:30	Th	3	68	11
HARC	KAØSXY	146.94-	9:00	Th	4	90	9
SLARES	KØWEX	146.91-	8:00	M	5	272	3
LOZFM	NØHVO	146.73-	9:00	F	4	104	3
SEDARES	WØENW	147.03-	9:00	Tu	4	43	3
OMEN	KØPCK	146.76-	9:00	W	4	67	1
ZAEN	WDØELL	147.24 +	8:00	Tu	4	42	1
ARESN	KBØACG	147.255+	9:00	Th	4	36	1
LOZBC	NØHVO	146.73-	6:30 AM	M-Sa	21	422	0
P.REVERE	WBØEJJ				½	255	0
JCRC	WBØRI	147.00-	8:00	W	4	62	0
ELDON	NØHIZ	146.895-	8:00	M	4	62	0
CARL	WRØWLU	146.46s	8:30	W	4	42	0
RBBN	WØNFI	146.79-	8:00	D			
SWMSWN	KØKXC	146.91-	7:00	Tu			
QCWA35	KØQIQ	146.97-	8:30	Th			
MOPAC-1	WAØUFT	145.01s					
KCARES	KØUAA	146.97	9:00 AM	Sa			
PHD	WAØKUH	146.43s	9:00	M			

Traffic: NØFBW 1248, NQØG 216, NDØN 198, WAØHTN 167, AIØO 123, WAØYJX 116, WØOUD 52, KØORB 52, WBØWLU 43, KFØBM 28, WØBMA 26, WRØR 19, KEØAH 17, KØPCK 6.

NEBRASKA: SM, Vern Wirka, WBØGQM—The Ak-Sar-Ben Amateur Radio Club and the Midlands ARES have combined resources to install a packet radio system at the Omaha National Weather Service Office. The system operated during this past severe weather season and will be on 145.01 MHz with the call WØEQU anytime the National Weather Service

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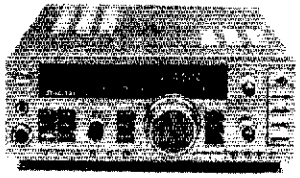
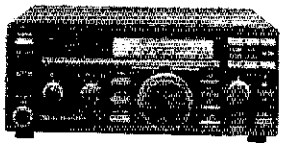
TS-440S TS-140S



TH-75A
2M/70CM DUAL BAND HT

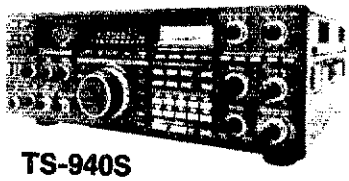
OMNI V

IC-2GAT
IC-4GAT



IC-725

IC-765



TS-940S

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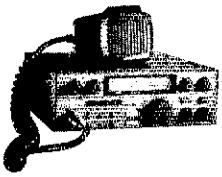

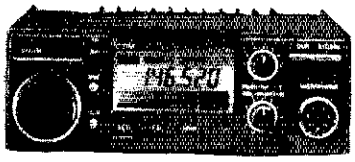

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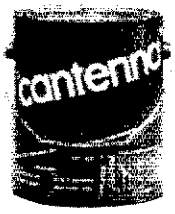
RCI-2950 10-Meter Mobile Transceiver

Remote coax switch

Switch antenna from inside your station with the Remote Coax Switch. Remote and indoor control unit connect through your coax cable to eliminate multiconductor control cable. Tower- or mast-mounted remote operates up to four antennas. Handles 2000 watts PEP and has a VSWR of 1.15: or less. Frequency range is from 1.8 to 54 MHz with impedance of 50 to 70 ohms and loss at 54 MHz of less than 0.2 dB. Uses 120 VAC Control: 2⅝" H x 5½" W x 7½" D. Remote: 7⅛" H x 8¾" W x 4½" D.
Kit HD-1481

Heath Company

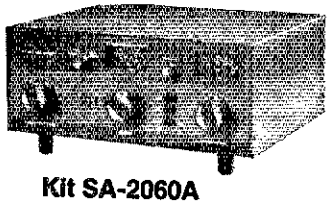


Heath cantenna dummy load

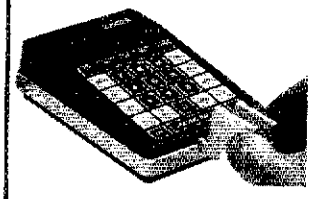
Eliminate unnecessary QRM during tune-up and minimize mistakes while performing hot gear maintenance or alignment. Handles 1 kW or RF with VSWRs less than 1.5:1 up to 450 MHz. Requires 1 gallon mineral or transformer oil.
Kit HN-31-A (3 lbs.) $24.95

DeLuxe antenna tuner

Power inputs up to 2000 watts PEP on SSB and 1000 watts CW.



Kit SA-2060A



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Assembled HWS-24-HT

Pocket packet TNC

Assembled HK-21

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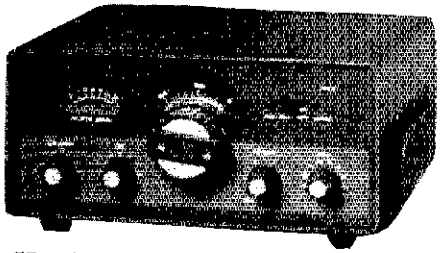

Heathkit deluxe QRP CW transceiver **Kit HW-9**

Kit SB-1000

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H. STM: K1EIC. SEC: N4GAA. OOC: NA1I. ACC: NK1J. BM: N1API. PIO: WA1CMF. TC: W1HAD. SGL: K1AH. The kids are back in school, and we're on our way towards winter. Now's the time to get that outside work done. I hope *everyone had a safe and enjoyable summer. And don't forget SET* time is here. We have had a couple of opportunities this year to test our skills in disaster type situations. Did we perform to our expectations? SET time is the time to brush up. For those of you still looking to brush up on your CW skills, don't forget Meriden ARC 80 meter informal slow speed CW get together. It happens every Monday and Wednesday evening at 9 PM. Freq is 3.715 MHz. I see Shoreline ARC had a Hidden Transmitter Hunt. That type of event always proves to be very interesting. As you all know, KY1T has had to remove his BBS from the packet airways. I would like to thank Luck for his efforts and dedication in running his board. And I am pleased to announce that although KY1T's BBS is off, he will continue to serve as NM for the Connecticut Section Traffic Node. This node is housed by N1DCS-4 BBS with access ports on 145.05 and 145.07. Thank you, Luck, for your past and continued assistance to the traffic community. There is an upcoming meeting of the TRI-State AMATEUR REPEATER COUNCIL. At the time of this writing, a date was not set. ALL REPEATER OWNERS, please check your local BBSs or have someone do it for you, for further details. Let's go CT, get yourself represented. In addition, Chuck Notes, K1DFS, is now *a CT director for TSARC. You can contact him with questions* or problems at 747-6377. Congrats to the new officers of West Haven ARA. Well campers, that's all for now. 73. Caesar.

Net	Sessions	Stations	Traffic	NM	Liaison
WESCONN	32	456	123	KA1GWE	CPN
NVTN	31	508	189	NM1K	CSTN
CN	62	910	189	W1WCG	1RN
CPN	30	309	91	KY1F	FRN
RTN	31	231	59	WA1FCA	CN
TMRCN	4	80	4	NM1K	
CSN	30	75	21	N1FNN	

PBBS: N1DCS-4 BBS (KY1T NM) Received 309, Forwarded 276, Total 585. Traffic: NM1K 425, KA1JAN 269, W1WCG 249, K1EIC 167, W1EFW 153, KA1GWE 128, KY1T 111, KY1F 79, W1KYD 62, N1API 48, KB1ZC 40, WA1YUA 38, N1FNN 34, NX1Q 31, KA1ROL 26, N1GKJ 26, KC1OL 21, N1GBP 19, KA1UCU 16, KA1TBM 15, W1YOL 14, N1BOW 12, W1BDN 12, WB1ESJ 11, W1CUH 10, W1QV 8, KA1TMJ 8.

EASTERN MASSACHUSETTS: SM/SEC, Barry Porter, KB1PA—STM: WA1TBY. ACC: N1GTB. BM: KA1NOI. OO/AA: AG1F. SGL: K3HI. TC: KA1IU. PIO: K1HLZ. Mass Hotline: 617-437-0111

Net	Mgr	Freq	Time(EDT)	Day
EMRI	KA1GEP	3658	1900/2200	DY
EMRIPN	W1TC	3880	1730	DY
EM2MN	N1DUB	63/23	2000	DY
EPN	WA1FNM	3945	0830	SUN
HHTN	N1FLO	04/84	2230	DY
EMRISS	N1CVE	3715	2100	DY
CITN	KB1AF	745/045	1830	DY

The reasons there was no column last month were 1) space restrictions and 2) vacation. I only get so many lines a month and I have been going over my allocation, and have been catching heat for it, so I saw a chance to "catch up" and took a month off. The traffic handlers and their fearless leader Jim Hatherly have been the most visible victims of the space crunch. I have never seen a more dedicated bunch of hams as those that handle traffic. Every day 365 days a year the traffic nets meet. Jim, thanks for all you have done to keep everything running smoothly. The net manager is the ham that keeps the individual nets running smoothly. Due to job and family restraints, N1AJJ and WA1FCD have had to resign from their net managers post. Welcome to KA1GEP and W1TC who take over the nets listed above. Thanks also to the Official Bulletin Stations who keep us all up to date on the W1AW bulletins. I hope everyone had fun during field day and are now resting up for a busy fall club season. Your club needs your participation. I have received no inquiries from anyone interested in the RACES program. 70% of the towns in Eastern Massachusetts do not currently participate, which is unacceptable! We need to act now before we start to lose the right to erect antennas outside and to participate in our hobby/service. Don't assume the other ham will do it!! Become proactive not reactive!! To find out if your town participates or not, talk to your local Emergency Preparedness (CD) Director. This program is VITAL for the protection of life and property in your community, because in a real disaster, communication with the State and Federal Governments can speed assistance to your community. If you run into difficulty, let me know. Have you done anything to enhance ham radio's reputation this month?? Please express your opinion on Amateur Radio issues to your section or division staff. We appreciate your input. Traffic: K1UGM 1046, WA1TBY 435, KB1AF 316, KW1U 302, N1CVE 133, K1GGS 106, WA1FNM 95, N1FLO 89, KA1GEP 84, W1TC 83, N1AJJ 77, W1CE 53, KA1MDM 40, K1ABO 37, KA1PEP 24, KA1RSY 23, KA1DJV 20, KA1UXB 18, KA1EDY 16, N1EGN 16, K1BZD 15, KA1NOI 15, KA1AMR 13, K1SEC 10, KB1EB 7, KA1KCU 2.

MAINE: SM, *Ted Bonesteel, WA2ERT*—Rod Scribner, KA1RFD, replaced KA8UVQ as Section Emergency Coordinator on July 15th. Rod's address is: 19 S. Grove St., Augusta, ME 04330. Please contact him concerning emergency communications or if interested in a volunteer position. We

Club Coordinator, Public Information Officer, and Bulletin Manager. Please contact me if interested. Net activity: (Net/Manager, Sessions, Checkins, Tfc.) Sea Gull Net/K1GUP 26-714-81; Pine Tree Net/W1KX 31-277-112. Aroostook Emergency Net/WA1YNZ 4-65-5. Cumberland County ARES/KA1ODT 5-55-0; Central Maine Emerg Net/N1DZI 8-166-5; Kennebec County ARES/RACES/KA1LPW 5-94-1. Station Activity: W1KX 192, NR1F 64, K1UNQ 61, W1JTH 59, *KA1REB 54, WA2ERT 50, ND1A 44, N1BCF 30, WA1YNZ 15,* W1BMX 12, W1VEH 12, KA2ZKM 6, KA1ODT 2. Upcoming examinations: Oct 7, Sat, 9 AM, Rockland, KC1CG, 846-2536; Oct 11, Wed, 6:30 PM, Newcastle, KA1DAX, 563-8512; Oct 21, Sat, 9 AM, Bucksport, NT1A, 374-5475; Oct 26, Thurs, 6:30 PM, Augusta, N1BCF, 623-4249.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—TC: W1JY. SGL: N1AIX. Warren, WB1HBB, and I attended the Division Director's cabinet meeting together with other SMs, Asst Dirs and committee members. The dominant issue was the ARRL no-code proposal. Based on the small number of inputs from individuals and as a result of the cabinet discussions, it was agreed to recommend privileges from 6m up. It was generally recognized, however, that the real problem on growth is our own poor promotion of the hobby in the face of many other competing 'hi-tech" hobbies. Even with increased privileges (Novice enh) and reduced requirements (no-code), there is little evidence to suggest we will see growth. It is more likely that a continuous, focused campaign to recruit from selected segments of the population (and from the general population) will be the real key to reasonable, meaningful growth. And that involves us—you and me—as well as HQ and the directors. The real action and opportunity on growth is here in the trenches, not in the board room or the admin offices! It's still a one-on-one situation and I get evidence every week that whenever one of you makes a contact with an interested party and ties them into self-study, an instructor or a class, the probability is very high that we will have a new ham within 2-3 months! Moreover, I am seeing the 'sponsor" staying involved in getting them on the air and making sure that the new ham is comfortable with his/her station and operation. Just do more of that and we'll get the results we need! And speaking of promoting the hobby—Bo KA1OLM was featured in the front page heading story in the Derry News with pix and lots of enthusiasm! The final tally on the results of the GSARA Novice class is— 15 new Novices! And Mt Moriah RS had a very successful VE session with 20 of 30 applicants upgrading including 9 new Techs. *Twin State RC pres KA1CRP thanked club* members who assisted in the Norris Cotton Bikeathon to support Cancer research- another good example of visible public service. By the time you read this report, Hams in NH will have used the new ARRL handout and promo material at booths at the New England Escadrille in Manchester and the Governor's Walk. If your group wants to do a promotional effort, contact League HQ or check with me about the new material. Now let's look at the traffic situation. The newly formed VTNH net had 31 sessions in July with a total of 238 checkins and 291 messages for the month.VTNH had 100% on 1RN cycles 3 and 4 and the NH section had 100% rep on FRN in July! Clearly, not everyone is not on vacation!! SECTION TRAFFIC NETS:

Net	Freq	Day	Time
GSFM net (south)	146.84	Dy	2030
GSFM net (North)	146.475	Dy	2030
	147.475		
GSPN	3.943	Dy	1800
VTNH	3.539	Dy	1900

Traffic: Nets: VTNH 291, GSPN 149, GSFN 96.
Stations: W1PEX 2170, KB4N 957, N1CPX 325, W1FYR 245, K1TQY 207, W1ALE 90, KKL1E 77, N1ALM 34, KA1NX1 33, KA1ROH 29, NE1J 15, K1IM 12, KA1HPO 9, KA1LMR 5, KA1KFX 1. BSHR: W1PEX N1CPX KA1NXT W1ALE KA1HPO/T.
BPL W1PEX, KB4N.

RHODE ISLAND: SM, William M. Foss, KA1JXH—August 6th, RI had a mock disaster at T.F. Green Airport. Thanks to 40 hams from NCRC & NRIRC and to OSARG & VARS for the *use of their repeaters. Congratulations on a job well done.* E. BAY and NRIRC provided communications for 100-mile bike race on Sept. 10th. New repeater on Block Island on 441.15 with a CTCSS of 88.5 Hz and is tied into the New England network. Traffic: W1EOF 195, KA1JXH 114, PSHR 86, EMRI 2,658 MHz at 7 & 10 PM; EMRIPN 3.880 MHz at 5:30 PM; EMRISS 3.715 MHz at 9 PM; 1RN 3.602 MHz at 6:30, 7:45, 9:30 PM; FRN 3.948 MHz at 1:45, 3:30 PM.

VERMONT: SM, Jonathan P. Maguire, N1CQE—ASM (RFI): W1CTM. ASM (Education): WB2MIC. ASM (Packet): K1AUE. SGL: WB1AJG. STM: KT1O. TC: W1AIM. PIO: WA1YOY. Due to a relocation by my company, this is the last column that I will be writing as your Section Manager. I will be living in the Tampa, Florida area. I'd like to take this opportunity to thank the people who have worked on my staff for their efforts. Also, I'd like to thank the many amateurs I've had the opportunity to talk with over the last 11 months. I also apologize for the missing columns for the last two months. In other news, the Annual BARC Hamfest was held on August 12th at the Champlain Valley Fairgrounds in Essex Junction. Despite the rain, a large crowd gathered for the event. In other news, please call or write to your SM or League Headquarters with comments on the ARRL no-code porposal. Your input is needed!

WESTERN MASSACHUSETTS: SM, Bill Voedisch, W1UD—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. TC: KA1JJM. STM: W1KK. I have often wondered if anyone reads this section news. I sure found out the hard way. I mixed a couple of calls signs up in last month's article. *QST* was out a matter of hours when my phone started ringing. Jean (KA1IFC) not Joy (KA1EXJ) received the award for message handling at the HCARA annual dinner. In the traffic totals, KA1EXJ also received double credit. Her own totals plus KA1IFC's. Oh well, nothing like proofreading. Congratulations to Mark on his upgrade. His new call sign is NX1K. Our 2 meter weather net is in fine shape. On July 10, a severe storm front passed across the section and was in constant surveillance. 237 stations reported the track of the storm and its intensity. This information was relayed to the National Weather Service as well as MCDA Framingham. 38 NWS warnings resulted. The following stations were liaison stations between various repeaters that monitored the storm's progress. Congratulations to everyone. A job well done. A special thanks

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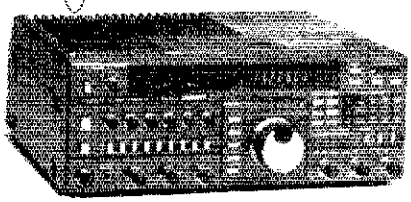
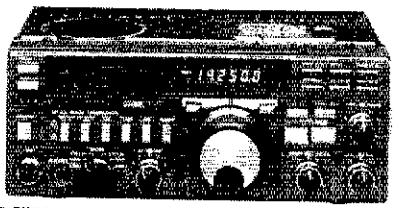
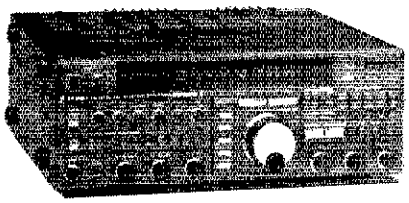


HF Equipment	LIST
FT-767GX 160-10m xcvr/.1-29.99 MHz Rcvr	$2299.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/phone patch	136.00
2M/767 2m module	239.00
6M/767 6m module	196.00
430/767 430-440 module	296.00
440/767 440-450 module	296.00



FT-757GX MkII 9-band Xcvr/SW Rcvr/mic	$1280.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FRB-757 External relay box	14.00
FC-757AT Automatic ant. tuner w/memory	429.00
MMB-20 Mobile mount	26.00
FIF-232C for VIC-20/TI/most RS-232	95.00



FT-747GX HF transceiver	889.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FM-747 FM unit	47.00
MMB-38 Mobile bracket	14.00

FL-7000 Auto. tune HF linear amplifier	2279.00
FT-70G* MANPACK HF xcvr (*Special Order)	$1070.00
FNB-70* Extra 12V, 4 amp-hour nicad	299.00

NC-70* Nicad battery charger/base sup	209.00
CSC-70* Canvas carrying case	90.00
FC-70M* Manual antenna tuner	154.00
FC-70P* Preset antenna tuner	154.00
RSL-70* Whip antenna for FC-70P	28.00
MH-17* Speaker/microphone	28.00
YA-70* Tripod antenna	270.00
YH-70* Telephone-type handset	63.00

Misc. accessories	LIST
MD-1B8 Desk microphone	$115.00
MH-1B8 Mobile microphone	29.00
YS-60 1.8-60 MHz 2kw PEP wattmeter	127.00
YS-500 140-520 MHz 200w wattmeter	99.00
YH-55 Lo-Z headphones	28.00
YH-77 Lightweight headphones	26.00

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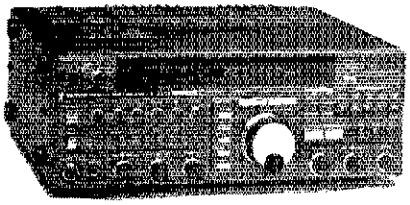

VHF/UHF equipment	LIST
FT-736R 25W 2m/430 full duplex xcvr	2025.00
FEX-736-50 6-meter module	294.00
FEX-736-220 220MHz module	322.00
FEX-736-1.2 1.2 GHz module	589.00
Other Accessories for FT-736R	Call
FT-212RH 45w 2m FM w/autodial mic	499.00
FT-712RH 35w 440 FM w/autodial mic	536.00
FT-290R MKII 25w 2m FM/SSB xcvr	610.00
FT-690R MKII 10w 6m FM/SSB xcvr	752.00
FT-790R MKII 25w 430-450 FM/SSB xcvr	681.00
FBA-8 Holder for C-cell Nicads	32.00
NC-26B Wall Charger for FBA-8	10.00
CSC-19 Soft case	16.00
MH-10F8 Speaker/Microphone	30.00
MH-10E8 Hand Microphone	24.00
FTS-7 Encoder/decoder	40.00
FT-4700RH/YSK 50/40W 2m/440 FM/TTP	960.00

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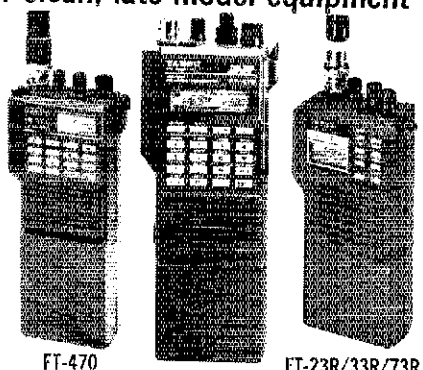
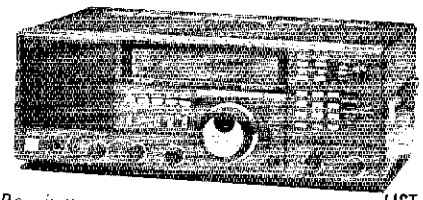
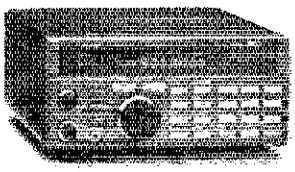


FT-470 FT-411 FT-23R/33R/73R

Handhelds	LIST
FT-411 2.5W 2m FM HT/TTP/batt/cgr	$406.00
FT-709R 4w 440 FM HT/TTP/batt/cgr	389.95
FT-811 440MHz FM HT	410.00
FT-470 2m/440 FM HT/batt/cgr/TTP	576.00
FT-23R 2.5w 2m HT	306.00
FT-23R/TTP 2.5w 2m HT w/TTP	351.00
FT-33R 5w 220MHz HT	328.00
FT-33R/TTP 5w 220MHz HT w/TTP	373.00
FT-73R 2w 440MHz compact HT	315.00
FT-73R/TTP 2w 440MHz compact HT w/TTP	355.00



Receivers	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$784.00
FRA-7700 Indoor active receive antenna	58.00
FRT-7700 Antenna tuner	77.00
FRV-8800 118-174 MHz VHF converter	107.00
FF-5 500 kHz low-pass filter for VLF	40.00
DC-8800 DC kit	4.00
FM-W/8800 FM-wide kit	21.00



	LIST
FRG-9600 60 to 905 MHz receiver	609.00

Antenna Rotors	LIST
G-500A Heavy duty elevation rotor	$249.00
G-5400B Azimuth/Elevation rotor combo	473.00

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Is R5 the world's best ham antenna?

June 1, 1989

Bill Carpenter ,WA8HFN
3934 Maidstone Drive
Gahanna, Ohio 43230 USA

President
Cushcraft Corporation
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108

Dear Sir:

I am compelled to write this letter to tell you how much I appreciate my R5 vertical antenna. Enclosed please find a copy of two pages of my logbook which represent about one month of activity. I have worked "four new ones". These are indicated by the orange marker. Should I get them to QSL my DXCC total will be 320 countries. The "new ones" of course were in "pileups" against hams with big antennas and great height. I don't get "20 over 9" reports but I work everything I go after.

My R5 is eight feet above the ground in my backyard. Beams are not allowed at this QTH. The R5 doesn't take up a lot of room and is not as visible as a beam antenna.

My wife convinced me to buy the R5. I didn't want to buy it as I thought I could not work DX without a beam. I also thought that I would have to bury a lot of ground radials. I had always used a beam at other locations, (A4).

The R5 has exceeded my expectations and I am delighted with the results that I have seen so far. I thought you would like to know how well your antenna is performing here at my location.

Keep up the good work and thanks again for designing and producing a quality product.

Sincerely,

Bill, WA8HFN

Bill, WA8HFN

R5 will open a new ham radio world for you too!

cushcraft CORPORATION

THE ANTENNA COMPANY

48 Perimeter Road • P.O. Box 4680 • Manchester, NH 03108 USA
Tele: 603-627-7877 • Telex: 4949472 • Fax: 603-627-1764

R5 10, 12, 15, 17, 20 METERS

Communicate From the Tight Spots

R5 is the antenna designed for space age living, on small city lots, apartments, condominiums or for travel in motor homes. If you have limited space, or galaxies of space, R5 will give the most performance from your transceiver.

R5 electrical halfwave, only 16′ 4″ tall design allows the antenna to be mounted virtually anywhere, without compromising performance. It easily handles 1800 watts of power with a solid state matching network giving full band coverage of 10-12-15-17-20 meters.

Easy set-up makes this antenna ideal for portable or fixed installations. It performs without a rotator, or tower. A simple support mast and 50 ohm cable is your connection to ham friends around the world.

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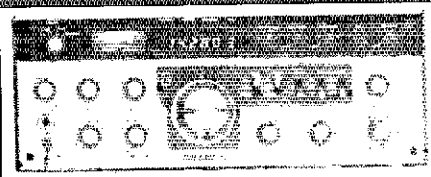
961 Deluxe 22A ps w/speaker	239.00	219.95
256 FM transceive module	65.00	
257 Voice synthesizer	89.00	
258 RS-232 interface	65.00	
282 250 Hz 6-pole CW filter	69.00	
285 500 Hz 6-pole CW filter	69.00	
288 1.8 KHz 8-pole SSB filter	69.00	
700C Electret hand microphone	37.00	
705 Electret desk microphone	69.00	
1140 18/24.3A DC circuit breaker	18.00	
562OMNI V 9-band xcvr/xtal mixed osc	2245.00	1899



CORSAIR II	List	SALE
561 9-band digital transceiver	1495.00	1289
961 Deluxe 22A ps w/speaker	239.00	219.95
263G Remote VFO	269.00	249.95
282 250 Hz 6-pole CW filter	69.00	
285 500 Hz 6-pole CW filter	69.00	
288 1.8 KHz 8-pole SSB filter	69.00	
603 KR-1B Dual keyer paddle	69.00	
700C Electret hand microphone	37.00	
705 Electret desk microphone	69.00	
1140 18/24.3A DC circuit breaker	18.00	
Other accessories	CALL	

TITAN	List	SALE
425 1.5KW linear (SN 1000 & up)	2995.00	2589
HERCULES II	**List**	**SALE**
420 1KW Solid-State linear	1195.00	1049
9420 100A 12V p/s for 420 (air)	795.00	699.95
	List	SALE
2510B Mode B satellite conv *(Special)*	695.00	569.95
239 160-2m 300w dry dummy load	32.00	
238 2KW PEP 1.8-30MHz tuner	367.00	339.95
3180 80m mobile 78" high	37.00	
3175 75m mobile antenna	37.00	
3140 40m mobile antenna	37.00	
3130 30m mobile antenna	37.00	
3120 20m mobile antenna	30.00	
3115 15m mobile antenna	30.00	
3110 10m mobile antenna	30.00	
3101 42" top section stinger	7.75	
3101L 49" top section stinger	7.75	
3001 80-20m mobile matcher	18.00	

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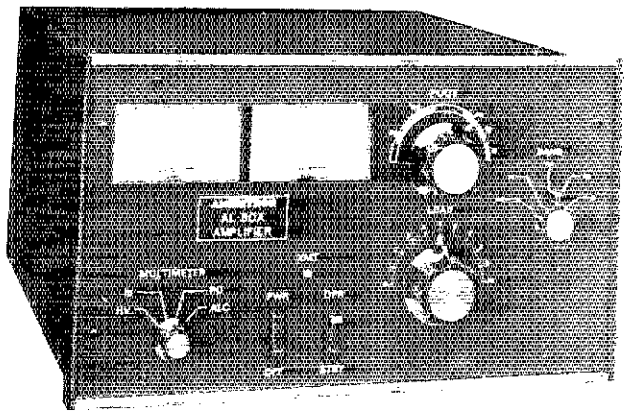
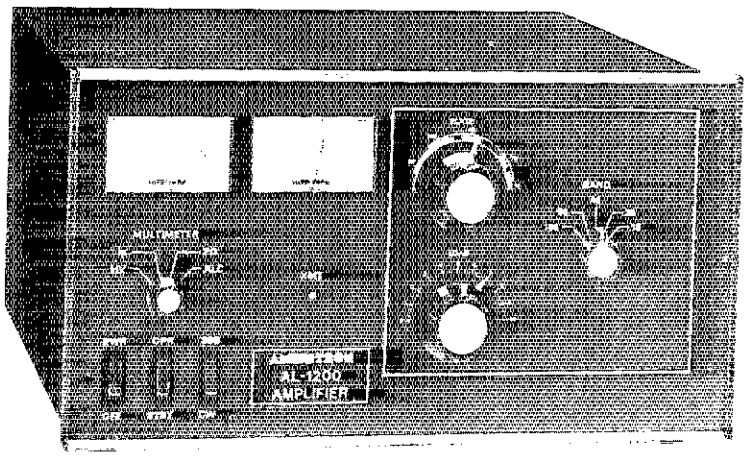


AL-80A LINEAR AMPLIFIER

The AL-80A will provide a signal output that is within 1/2 "S" unit of the signal output of the most expensive amplifier on the market—and at much lower cost.

The Ameritron AL-80A combines the economical 3-500Z with a heavy duty tank circuit to achieve nearly 70% efficiency from 160 to 15 meters. It has wide frequency coverage for MARS and other authorized services. Typical drive is 85 watts to give over 1000 watts PEP SSB and 850 watts CW RF output. A new Pi-L output circuit for 80 and 160 gives full band coverage and exceptionally smooth tuning.

Size: 15½"D. x 14"W. x 8"H. Wgt. 52 lbs.



AL-1200 LINEAR AMPLIFIER
3CX1200 TUBE

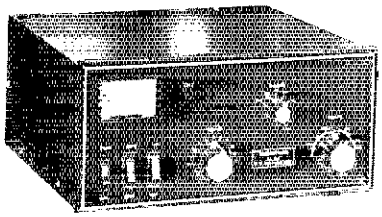
Full legal output with 100 watts drive.

AL-1500 LINEAR AMPLIFIER
8877 TUBE

Full legal output with 65 watts drive.

The cooling system in both amplifiers keeps the tube safely below the manufacturers ratings even when operating at 1500 watts output with a steady carrier. The filament supply has inrush current limiting to insure maximum tube life.

Size: 18½"D. x 17"W. x 10"H. Wgt. 77 lbs.

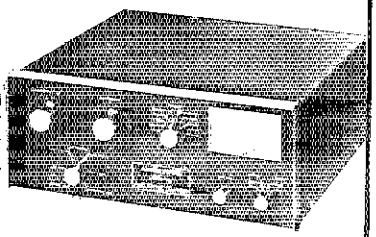


AL-84 LINEAR AMPLIFIER

The **Ameritron AL-84** is an economical amplifier using four 6MJ6 tubes to develop 400 watts output on CW and 600 watts PEP on SSB from 160 through 15 meters. Drive required is 70 w typical, 100 w max. The passive input network presents a low SWR input to the exciter. Power input is 900 watts. The AL-84 is an excellent back-up, portable or beginner's amplifier.

Size: 11½"W. x 6"H. x 12½"D. Wgt. 24 lbs.

ATR-15 TUNER



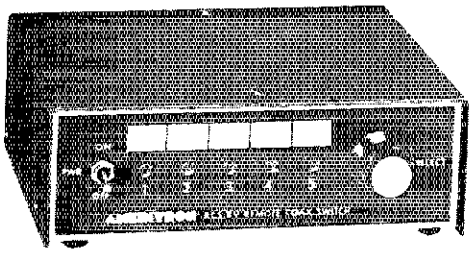
The **Ameritron ATR-15** is a 1500 watt "T" network tuner that covers 1.8 through 30 MHz in 10 dedicated bands. Handles full legal power on all amateur bands above 1.8 MHz.

Five outputs are selected from a heavy duty antenna switch allowing the rapid choice of three coaxial lines, one single terminal feed or a balanced output. An internal balun provides 1:1 or 4:1 ratios (user selectable) on the balanced output terminals.

A peak reading wattmeter and SWR bridge is standard in the ATR-15. It accurately reads envelope powers up to 2KW.

Size: 6"H. x 13¼"W. x 16"D. Wgt. 14 lbs.

Remote COAX Switches



RCS-4 FOR CONVENIENT INSTALLATION

No control cable required.
Selects one of four antennas.
VSWR: under 1.1 to 1 from 1.8 to 30 MHz.
Impedance: 50 ohms
Power capability: 1500 watts average, 2500 watts PEP maximum.

RCS-8V FOR SPECIAL APPLICATIONS

Selects up to five antennas.
Loss at 150 MHz: less than .1 dB.
VSWR: under 1.2 to 1 DC to 250 MHz.
Impedance: 50 ohms.
Power capability: 5 kW below 30 MHz, 1 kW at 150 MHz.

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Bill picks up the slack in the traffic nets for people away on vacation. It's great not to have to double up on skeds while the regular NCS is on vacation. Thanks, Bill. Traffic: KA1IFC 648, KA1MEW 218, KA1EXT 150, KA1RVN 98 W1SJV 77, WB1HIH 63, KA1QFV 59, NX1K 36, KA1GHF 30, W1TM 21, K1JHC 21, NM1U 6, WA1OPN 4, KA1HSP 4, W1GQP 2, W1UD 163.

NORTHWESTERN DIVISION

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. SEC: N7MAL. STM: W7GHT. OOC: WB7CYO. ACC: N7BI. PIO: WG7E. The Eagle Rock ARC is the winner of the first Idaho Field Day trophy with a score of 5605. Congratulations on a good job. Tnxs to the others who submitted a score. Idaho hams are busy helping with the forest fires. A large number of hams are in the field now supporting the Forest Service with our communications. More details next month. Traffic: W7GHT 154, WS7U 69, N7MAL 40.

NET	SESS	QNI	QTC	MGR
FARM	31	2071	66	WA7GSM
CD	21	604	17	K7UBC
NWTN	31	822	41	N7LMA
IMN	31	282	98	KA7EEE

PSHR: W7GHT 92, WS7U 69, N7MAL 82.

MONTANA: SM, Pete Peters, KF7R—Another very good turn out by many hams in July for help with communications for public events. Many thanks to all those that participated. Congratulations KE7X, Fred Cady, who was selected for the Herb S. Brier Instructor of the Year Award and W7BKM, Harold Schnider who got his Worked All Counties certificate. Proclamation as Amateur Radio Week was given to Butte ARC for public service: Mt. PIO K7BFJ had a PR article published in the Billings paper, good work Eileen. New repeater at Bigfork 146.02/62. Novice: Justin Carlson. Tec: Nikki, Wold, NC; KB7HSA; Gen: N7NGW, KB7HLH. Adv: KA8MNI, KB7GPW. Ex: N7LSM. PSHR: WB7WVD 71, tfc 66, KA7YYR 82.

NET	SESS	QNI	QTC	NET MGR
MTN	31	1262	81	N7AIK
IMN	31	282	82	KA7EEE
MSN	5	92	0	KF7R

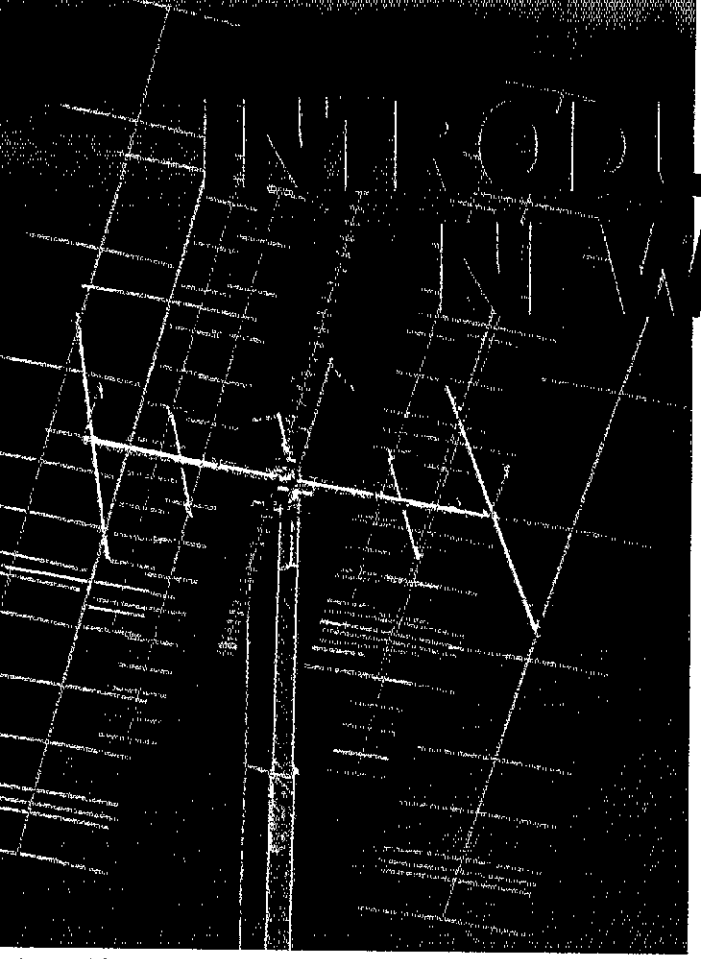
OREGON: SM, Randy Stimson KZ7T—ASM: KM7R. ASM: W7FBP. STM: W7VSE. SEC: KV7F. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. STC: N7ENI. A bit of bad news. Emerson, K7SGU has resigned as Emergency Coordinator for Portland because of family illness. Emerson is a good friend and has done a great job as EC. I hope everything works out for him. Now for a bit of happy news, Ken, K7IFG and Joanne, KB7GYC, had a baby girl. Congratulations, I presume her first word will be Dit-Da. We have a couple of public service events coming up that will promote Amateur Radio and its capabilities. The first is the Hood to Coast relay run. There will be 9000 runners and 2000 support people. It covers 185 miles and lasts for at least 34 hours. There will be 40 hams doing the communications. Last year there were four ambulances called in during the event. These people have learned the difference between Ham Radio and CB. The next event is Cycle Oregon. They tried it last year with the States communication and it didn't work too well. They called and asked if we could help and you know what I said. This is a State run operation so there will be state officials with us at all times including the state police. We will use seven different repeaters. There will be 2000+ cyclists. It starts in Portland and ends in Ashland seven days and 550 miles later. They will be bussed back to Portland. Bob, KV7F, told me that a lot of the Emergency Coordinators will be participating in the national SET in October. Traffic (P) = Packet W7VSE 360, WB7VMS 300P, N7BGW 235, KA7EEE 170, WB7EMO 76, W7ODG 63, WX7A 54, K7IFG 33P, W7LNE 29, KA7AID 27, N7DRP 24, KA7DEF 18, KA7WFW 12, Late June WX7A 102.

EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA7CBX. OOC: W7LKR. ASM: KC7MM. ACC: NQ7M. SGL: KD7AC. TC: W7DBV. ASM: KE7WG. Congrats to David, KE7WG, on appointment as ASM and Net Manager of Washington Emergency Net. Congrats to new ORS N7HXT, Emily. A big thank you for many years of service to Harvey Marsh, K7GXZ, traffic handler extraordinare who recently retired and is doing some traveling. Speaking of traffic, STM W7GB sez, "We need more traffic handlers. Phone or CW. No previous experience necessary. No fancy equipment needed. Just a desire to become part of the great fraternity of traffic handlers and a willingness to learn." Contact W7GB if interested. W7LKR reports regular VEC testing in Pullman, Walla Walla, and Clarkston. Interested in the FCCs ideas on non-ionizing electromagnetic radiation? Contact TC W7DBV. 73, KC7PH @ N7HHU BBS. Traffic: W7GB 167, W7LBK 81, WA7YEN 38, N7HXT 14.

WESTERN WASHINGTON: SM, Ed Holloway, KA7INX (@N7HFV). STM: KD7ME (@K7KNZ). SEC: NM7N (@N7HFZ). OOC: (@W0LVJ). SGL: KD7AC. BM: N7CAK (@W0LVJ. PIO: N7FKV. ASM: K7CLL (@K7IFG). ACC: KR7L (@W0LVJ). Please be advised that KE7OM is no longer the BBS that some of us use. N7HFZ has taken over that BBS. Looks like almost all of the planned summer activities are all over and put away for another year. PUBLIC SERVICE HOURS: Mason County 66, Island County 220, Thurston County 150, King County 275, Cowlitz County 18, Clark County 78. Total ARES membership 518 reported, increased by 2. Traffic: K7AJT 14, K7CLL 6, KA7CRN 24, WB7EJS 11, N6EQZ 43, N7GGJ 56, W7IGC 281, W7LG 118, KA7PMD 33, K7SUX 85, KA7TTY 45, W7TVA 241, K7UQH 62, WB7WOW 281. Additions for April KR7F 92, WB7WOW 361. PSHR: W7TVA 123, WB7WOW 116, KD7ME 108. Next month the announcement of election results will be listed in this column. 73.

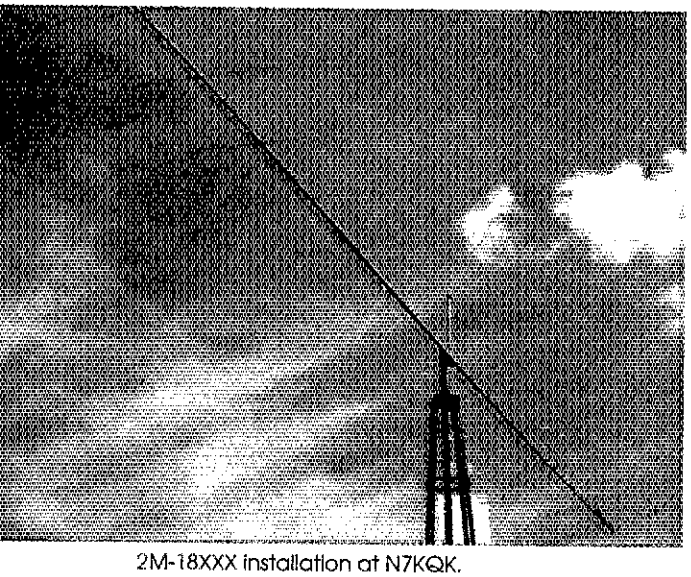
PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: K6TI. TC: N6AMG. Welcome to new OOC, K6TI, and my thanks to previous OOC, NY6Z, for his service as the East Bay Section's first OOC. NBARA Pres, KA9MQF, singled out the following members for their service to the club: K6EHR, NH6CN, K6IZU, W1VDE, N6GHR, WD8JPA, & N6NZO. The CCCC welcomed new members KA2OGQ, W6RMY, KB6VOL, KD6KV & N6VKK. Upgraded are KC6CTW to N6VFZ, KC6YKT to N6VIF & KC6COI to N6VJL. HRC's "The Chewed Rag" featured an "Oakland Tribune" article which included news of SBARA and HRC FD plans as well as general info on



UCING AEA's W ANTENNAS

neter and 2-meter moonbounce installation. Four 6M-2WL, four M-5WL and one 432-13WL antennas in array on self-supporting 89-foot US tower at N7ML.



2M-18XXX installation at N7KQK.

The superior engineering designs, quality and high performance that AEA built its reputation on are now available in its dynamic new line of antennas. Developed and manufactured by Mike Staal K6MYC, president of M² Enterprises and co-founder of KLM antennas, the product line includes an assortment of 2-meter, 6-meter and 440 MHz antennas and accessories for fixed or portable applications. AEA/M² antennas are already recognized for their superior performance by many moonbouncers.

Features. AEA's new antenna line features computer-optimized antennas with the highest gain for boom-length attainable.

Other features include:
• Machined aluminum driven element housing with built-in "N" connector and O-ring seals including access cover • Silicone dielectric gel in the cavities to withstand inclement weather • Parasitic elements insulated through the boom on most units for long-term performance and reliability • Electronically tuned balun combined with unique driven element design to produce symmetrical patterns • Swaged and tapered boom plus solid rod elements to reduce windload • Low windload overhead dacron boom support • Flexible boom-to-mast mounting for mechanical balance • Ideal for multiple antenna arrays.

Accessories. To compliment the antenna line, AEA also offers various "H" frame support packages. The MT-3000 heavy-duty elevation mechanism and controller for tilting up multiple yagi arrays. Also welded aluminum power dividers for coupling multiple antennas.

For further information, see your local AEA authorized dealer, or call AEA at (206)775-7373.

lodel	6M-5	6M-2WL	6M-2.5WL	2M-5WL	2M-18XXX	2M-6WLHD	2M-CP14	2M-CP22	EB-144	430-16	432-13WL	EB-432
ements	5	9	11	17	18	20	14	22	N/A	16	39	N/A
oom	15'9"	39'6"	50'4"	33'	36'	41'4"	9'10"	18'	N/A	10'	30'3"	N/A
eight	11/14	31/40	38/47	13/15	14/16	30/37	6/8	12.5/15	1.5/3	4/5	12/13	1.3/3
indload	2.0	5.0	5.9	2.7	2.9	6.1	1.1	2.5	N/A	0.82	2.5	N/A

n - Length, feet and inches.
ght - Weight in pounds, antenna weight/shipping weight.
dload - Windload area in square feet.
- Six meters. **2M** - Two meters. **WL** - Wavelength.
Heavy-duty. **CP** - Circularly polarized. **EB** - Eggbeater.

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Amateur Radio. Very nice. LARK's new officers are: WX6G/Pres, N6FQC/VP, KB6DLT/Sec, KI6OY/Treas, NF6S/Activities and Board members KF6VU, K6USH, K2BIC, WA6TGF, WA6SDA, WD6J & AD6X. Their prestigious J.K. Murphy Award was won by KC6DTB, and the Klutz-of-the-Month award went to N6BQR. BARC's "Log Book" featured an article on the success and growth of the VVRC. The VVRC Newsletter recognized N6UXG, N6SWR, WD6BUS, K6HIH, N6QGS, N6OFZ, K6USW, N6UPU, & N6UPW for their contributions to that success. Their "youngest ham" is 11-year-old John Lawson, who recently completed the club's Novice course and is awaiting his call. FB! EBARC welcomed new members J. Levi Wilson, Dave Reichard & KC6DRW. Member WB6DOB reports their newest member to join the NTS is N6VMK. MDARC welcomed new members WB6DXZ, WA9UKA, and returning member N6OTY. Member N6VHV has upgraded to Tech. July tfc: WB6DOB/243,W6VOM/126, K6APW/43, WB6UZX/43 & N6VMK/35.

NEVADA: SM, Joe Lambert, W8IXD—Guest columnist, Marty, KK4M—One of our reasons for being is public service. Are we teaching our newer members this responsibility and tradition? Can we show our elected representatives the level of public service we regularly perform? The answer to all of the above is, we don't know. We all do know that we may be called upon to defend our frequencies at any time. You do not have to be a big-time traffic handler. If 50 of you handle 1 or 2 messages a month & tell me about it, it results in some pretty impressive numbers. A number of you may already be qualifying for the Public Service Honor Roll or Brass Pounders League awards now. So far, I've not met one of us who doesn't like to see his or her call sign listed in QST. Please use ARRL form FSD-210 for reporting so that I can up with each category. The forms will soon be available from me and will try to send a supply to each club. I need to have your info not later than the 25th of each month. You can send it in the mail, call on phone, send radiogram or send it via packet. Also, I need to know if you are a Novice or Technician as these two classes qualify for listing and awards at lower point totals. Many of you are already doing the work, let's make sure we can prove it if we ever have to!

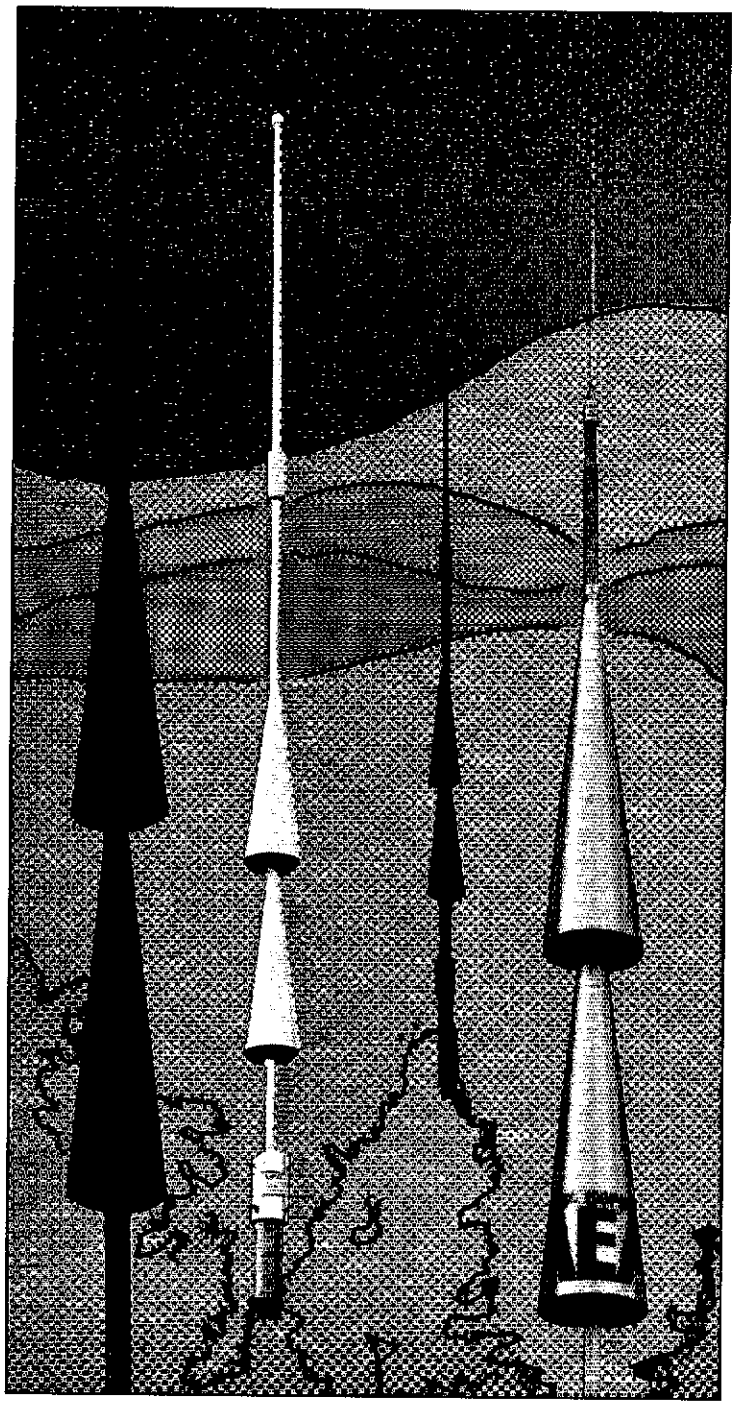
PACIFIC: SM, Wayne Jones, NH6GJ—At 1046 AM, July 13, while camping on Mauna Loa, Paul Leib, KH6HME, established 2-way contact with Jack Henry, XE2GXQ, in Baja, California on 2-meters, establishing a new world record of 2659 miles. Paul was at his 2-meter beacon site, and Jack was located at Rosarita, about 640 miles south of San Diego. Paul was running 80 watts into a pair of 7-element horizontal Yagis stacked vertically and Jack was running 160 watts into an 18-element horizontal boomer. A 5-2 signal report was exchanged, using SSB. They didn't rest on their laurels though, and went back to work, breaking three more records during the next two days. The 70 CM record, 2573 miles was established at 3:47 PM HST July 14, between Mauna Loa and El Rosario, Baja, California, with a 5-5 signal report being exchanged. The 13 CM record of 2573 was established at 5:54 PM, HST, between the same locations with a 5-1 report exchanged. They repeated their record-breaking activities with a 5-2 exchange on 1¼ meters at 7:55 AM on July 15, breaking four records in three days. The best conditions were reported on July 14, when Paul reported hearing Jack using half a milliwatt on 144.170 MHz, over 2500 miles. Congratulations Paul and Jack! Traffic: KH6GMP 42, KH6H n/a, KH6S 33, Nets 54.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—The Section lost its EC for Lassen County when Ken Estes, WB6BRV, moved to Eureka, but Benny Morrow, KJ6MJ, has stepped in to fill the gap. His wife Janis, KC6CHC will help him as an Assistant EC. Thanks to Ken for the many years of service and to the Morrows for volunteering to carry on. Lassen County hams have been busy on two wildland fires lately, and I am looking forward to the details from Benny. Congratulations to the North Hills Radio Club for qualifying as a Special Service Club to become the fifth in the Section. The other SSCs are Amador County ARS, Sierra Foothills ARC, Golden Empire ARS, and the River City ARCS. Speaking of SSCs, if you have QSL cards to be verified by a HF or VHF Awards Manager contact the Sierra Foothills ARC— The one appointed by the Amador County ARC, N6GG, has resigned. With all the talk about the advancing age of the average ham, it gives me great pleasure to welcome mid-teen Jennifer, KC6EAN, to the ranks of active hams. That makes three out of four in the family of N6RWG and KA6OZO, a Public Info. Assistant. Traffic: WA6WJZ 151, WA6ZUD 86, N6DOJ 40, W6RFF 35, K6SRF 23, W6CFQ 16, WB6SRQ 7, KB6WIJ 6.

SAN FRANCISCO: SM, Dick Wilson, K6LRN—W6OSN became a Silent Key. K6TP has had a stroke. We all wish Bob a speedy and complete recovery. Thanks to everyone who helped with the Marin Century Ride communications: WB6TKD, W6FCQ, N6TKD, N6VKK, K6BMW, N6AQY, W6DTV, N6FAX, K6GEV, KB6LAR, WA6UBX, WA6CBQ, WD6HCW, WA6MHO, N6QE & WB6AQW. Hams vs. City of Novato dept: K6QW has been ordered by court to remove 40M beam, keep height at 35', future antenna elements are not to exceed 35' and pay court costs (some compromise!) WA6JYU ordered to remove tower that was in required set-back space. Wilner was postponed for 60 days. (Ironically there is a ham on the Novato's city council.) Looks like Field Day was a success! REDXA, 7738 pts + bonus; SCARC, 1747 pts; SHARC, 10,775. Not too early to start planning for next year! Sarah, N6FAX, is Sonoma Cty ARC's "Member of the Year." Congrats!! WB6ZHD now on Packet and the NCDXSPN. WN6W is moving. (One step ahead, Sam?) N6FWG is on NCN-VHF. Amateur antennas in Marin County are about to become regulated under the Ridgetop Telecommunication Policy Plan while designed to protect Marin Co's scenic skylines and other sensitive areas from a proliferation of commercial and other radio installations, the planners want to include hams in the plan. This would affect those of us in the unincorporated areas of the county, but could affect the cities and planners are encouraging city's adoption of the plan.

SAN JOAQUIN VALLEY: SM, Byron Smith, WA5YLB—Asst. SMs: K6YK and W6TRP. SEC: WC6U. STM: N6AWH. Recent fires in the Auburn area kept hams and amateur repeaters moving—ask Tony, N6DYJ. Congrats to the Southern Sierra Amateur Radio Society's recent article on their repeater install. Upgrades: Al N6SAE, Tom AA6PM, Conrad, AA6PO to Extra, Glen, WA6AVI to General. Introductory code classes via 75 M phone on 3760 kHz ± QRM, Monday through Fridays 0630 to 0700 California local time. Course starts on first Mon-

Improve Your Performance



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VHF versions include a 50 ohm SO-239 connecter recessed within the base sleeve for full weather protection. With the IsoPole™ you won't experience the aggravating deviation in SWR when the weather changes. Also, the impedance matching network is designed for maximum legal power and compensates for the impedance lump introduced by the SO-239 connector used in the VHF models.

AEA's IsoPoles™ are built to withstand the environment. The insulating material offers superb strength and dielectric properties plus excellent long-term ultra-violet resistance. Mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable windload and are attached directly to your TV mast.

Hot Rods.™ Improve your signal with AEA's popular Hot Rod™ antennas for handheld transceivers...2-meters (HR-1), 220 MHz (HR-2) and 440 MHz (HR-4). Hot Rods™ provide more gain than a 5/8 wave handheld antenna!

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day of each month. Sad to report the following Silent Keys: Bill, WB6WXS, Jane, WA6RHW, and WD6BLH. KC6ESL is a new Novice and is active on 10 M SSB. WA6OQV has a TS940. W6DPD has a IC-781. KC6ESL has an IC-O3AT, WA6OQV is on packet- KA6VAF has all mode TNC. Traffic: W6DPD 2. Late report N6MXG, May-5, June-5.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: N6JQJ. TC: WA6PWW. STM: N6JLJ. PIO: N6HMO. ACC: W6MKM. BM:(vacant) OOC: KA6S JULY-A busy month indeed! We had a slight rumbling from the San Andres fault wake us up, and many tuned in to the earthquake nets that came up as soon as the shaking stopped. Thanks to those who took net control duty (KA6TGE and N6JLJ among others). Also thanks to the many of you listened and didn't clutter the net with "yeah I felt it too" when net control asked for "damage reports only"... The Central Coast Radio Council (CCRC) is reorganizing. CCRC is an association of radio clubs in the bay area and has in the past been a major force for the enrichment of our hobby. If your club is interested in participating and wasn't notified of the August 2 meeting, contact CCRC at: CCRC, 1910 Sunshine Drive, Concord, CA 94520. The Foothills ARS had an interesting program, the section slide show with the script read in the correct order and the slides shown in reverse order! It's amazing the effects you get with pictures and text out of sync! FARS meets at 7:30PM on the last Friday of every month at the Electronics Museum at Foothill College... SVECS had its quarterly breakfast. The SVECS newsletter is a sight to behold, 24 pages of excellent articles. Don W6GJF and Kathy N6SPC do an incredible job of putting it together. Well done! Yours truly visited the Gabilan ARC in Gilroy. A very interesting meeting where many of the critical issues in Amateur Radio were discussed. I think we'll be seeing a lot of good things coming out of garlic valley! GARC meets on the second Thursday of every month at 7:30PM at South Valley Jr. High School, 385 IOOF Ave. in Gilroy... Speaking of garlic, many of you participated in the Gilroy Garlic Festival, doing communications and also operating the special events station KG6GF (Kilo Garlic 6 Garlic Festival). They've got an outstanding certificate for those they worked... The Electronic Museum Radio Club (EMARC) held a pizza bash in lieu of their regular meeting. Sounds like tough duty, guys! EMARC usually meets at 7:30 PM on the first Friday of every month at the Electronics Museum at Foothill College... The Ames ARC is losing their shack, a trailer. The good news is that they are getting a new double wide trailer with a roof that dosen't leak and a floor with no holes. Congrats, guys! The San Mateo Radio Club heard from Stuart Fox KM7V on "Transceiver Specifications: What they really mean." The SMRC meets on the third Friday of every month at the Beresford Park Recreation Center, 28th Ave and Alameda de las Pulgas in San Mateo at 7:30 PM. The Los Gatos/Monte Sereno ARES/RACES group is growing at an incredible rate, thanks to EC Jim KJ6CW. They also put out one of the better newsletters in the section, with a month calender of public service events and articles on a number of topics. Jim is also the Assistant DEC for Santa Clara County. There is a telephone number that has information on Amateur Radio License classes, (408) 971-1424. Well...it only has the info that I put on it, and I can only put on it what I know about. PLEASE, let me know about any classes your group or club is sponsoring so that I may include them on the recording. My phone number is on page 8 of this issue of *QST*. Traffic: (no report this month). Phone numbers: Amateur Radio Classes (408) 971-1424. License Exams (408) 984-8353 (ARRL VEC) or (408) 255-9000 (Sunnyvale VEC).

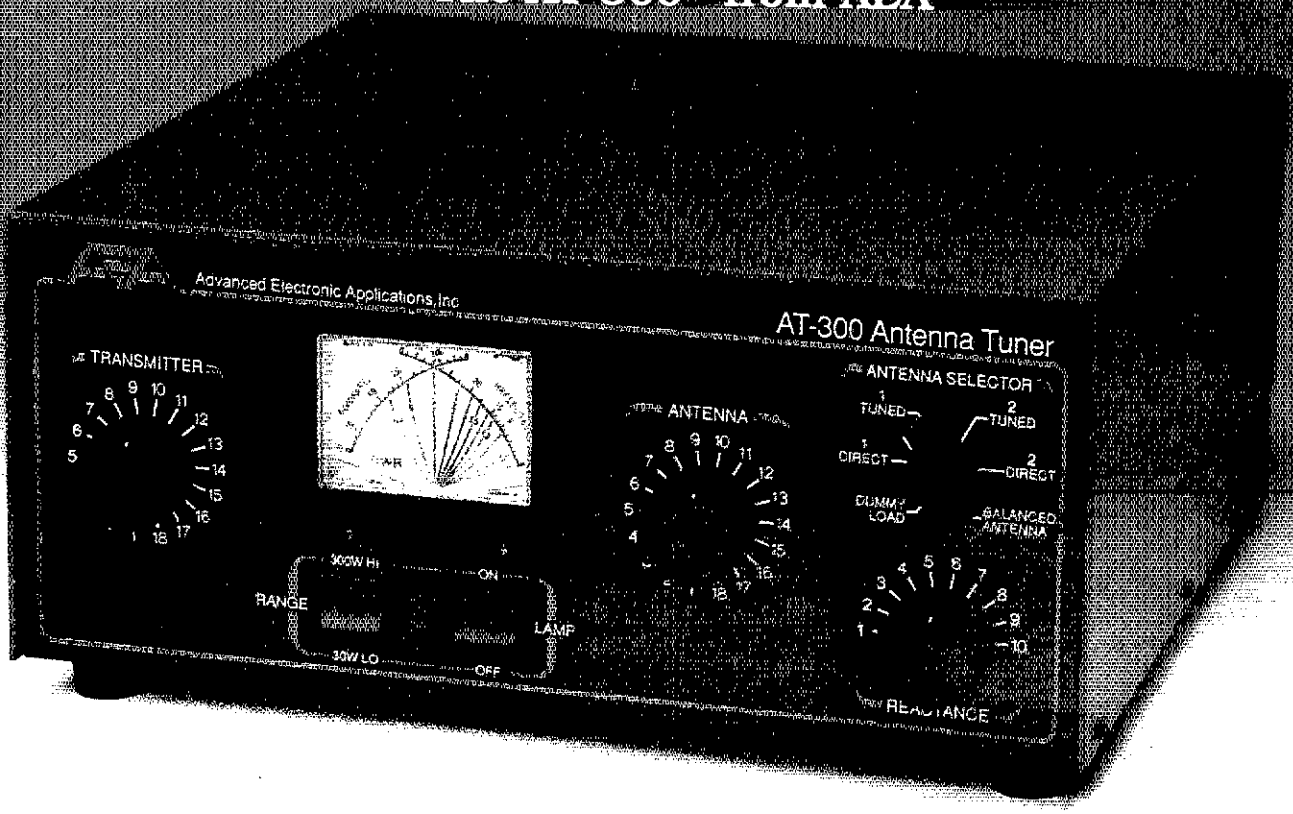
ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASM: AB4S. SEC: N4MYB. STM: K4NLK. BM: K4IWW. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PIO: AB4FW. KE4ML, your section's State Government Liaison (SGL), reports that the State Legislature has just passed Senate Bill 758 which changes the expiration date for all Amateur Radio License Plates to June 30. This bill ONLY changes the date on which you get your renewal sticker. It does NOT change the law enacted three years ago which set the additional fee for an Amateur Radio License Plate at $10.00 for FIVE YEARS ($2.00 per year). Prior to passage of that law, which passed because of a SUPER lobbying effort by amateurs throughout the state (coordinated by KE4ML), we paid the same $10.00 additional fee each year as the holder of a personalized tag. (NOTE: the Legislature has also just passed a bill which doubles the additional fee for a personalized tag. Were it not for passage of that law three years ago, the privilege of having a call sign license plate would now cost us $100.00 extra over five years.) Why is the additional fee for Amateur Radio license plates lower? Because the Amateur Radio operators of North Carolina provide emergency communications for the citizens of our state (for which we, of course, receive no financial compensation). The Legislature recognized this and also wanted to encourage the amateurs in the state to have a license plate which would facilitate identification of our vehicles in an emergency situations. This reduced fee is a privilege we have EARNED-and MUST CONTINUE TO EARN-through our participation with the State Emergency Response Team (SERT) and local emergency organizations in emergency situations, emergency exercises, HAM WATCH and SKYWARN. The most recent exercise which SERT held was the National Security Exercise on July 27, 28 & 29. The scenario was an attack on the United States. There was significant involvement of Amateur Radio throughout the State in this exercise. EM officials recognize that Amateur Radio would become one of the prime methods of communication in this scenario. All county ECs: Please plan and publicize your SET (scheduled for Oct 21, but date is flexible to meet the needs of your local agencies). SEC N4MYB will provide more information. Publicity is an important aspect of this ARRL sponsored emergency communication exercise. Make your media contacts well ahead of time. AI0K, SKYWARN EC for the RDU NWS office, held a net training class earlier this year. A number of new competent net control stations were the result of the class. Their participation has enhanced the RDU SKYWARN net. Three Hamfests in October: JARS, Oct 1 in Benson; Maysville, Oct 8, and Triangle East ARS, Oct 21 in Smithfield. Greater Greensboro Hamfest is scheduled for November 25 & 26. July traffic: K4NLK 306, N9CGD 158, WD4HTE 144, KI4YV 126, K4IWW 113, WB4HRR 109, KA4EYF 94, KB4FWL 79, N4UMI 75, AA4ZV 58, WD4LOO 58, KB7LX 56, WA9NEW 47, W4EHF

AT-300™ Antenna Tuner

An affordable antenna tuner from a name you can trust

The AT-300™ from AEA



Low Pass Design

The low-pass design of the AT-300 is what you would expect from a company where Engineering Makes the Difference. The low-pass design of this AEA tuner means harmonic attenuation for lower TVI potential. This design also allows matching a much wider range of antenna impedances than the common high-pass designs.

Larger Size

One look at the AT-300 lets you know this tuner is different, it's bigger. While some manufacturers promote the small size of their tuners, AEA knows that performance is most important. The simple reason for the larger size is that smaller sizes degrade the inductors' Q (Quality factor), which results in less efficiency. Less efficiency means that for a given power output from your transmitter, less power will actually get to your antenna.

Easy Operation

The AT-300 tuner features a precision frequency compensated dual- movement SWR meter for ease of tuning. The high and low power front panel switch selects the proper range for the SWR meter. The AT-300 is rated for 300 watt operation. The internal balun and front panel selector switch allows for balanced and unbalanced outputs.

Get maximum performance from your transceiver and antenna by using the AT-300 antenna tuner from AEA. See your local AEA dealer today or contact:

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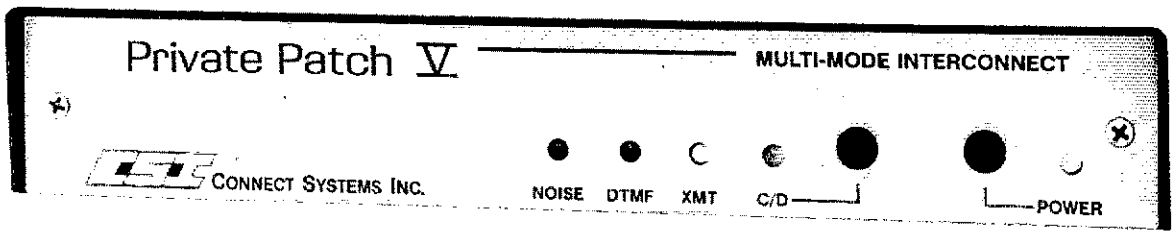
FOUR user selectable operating modes and a 90 number autodialer make Private Patch V the ONLY choice!

Ahora se ofrece manuales de instrucciones en español.



SELECT AN OPERATING MODE USING THE BUILT-IN KEYBOARD . . .

1. SIMPLEX SAMPLING PATCH

Private Patch V achieves a level of sampling patch performance unobtainable in any other product. Crucial to performance is the noise squelch filter. Compare our five pole filter to the competition's two pole filter. Advanced software algorithms perform noise correlation tests which result in greater useable range than the competition. Nine selectable VOX enhancement ratios allow you to vary performance from straight sampling to highly VOX enhanced. (sampling rate decreased while the land party is speaking). The mobile is in full control and can break-in at any time.

2. SIMPLEX VOX PATCH

VOX mode offers superb simplex operation with any radio, including synthesized and relay switched models. VOX mode has other advantages too. **1.** A linear amplifier can be used to extend straight simplex range. **2.** You can operate through any remotely located repeater to greatly extend range. **3.** If desired you can connect Private Patch V to the MIC and speaker jack of your radio. NO INTERNAL CONNECTIONS ARE REQUIRED. Control is maintained automatically with built-in dial tone detection, busy signal detection and fully programmable activity and time out timers. An optional electronic voice delay board eliminates first word clipping with slow switching radios.

3. DUPLEX PATCH

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4. REPEATER CONTROLLER

Private Patch V will convert any receiver and transmitter into an outstanding performing repeater with duplex autopatch. Features such as repeater on/off code, hangtime, activity timer time, CW ID interval etc. are fully user programmable. Private Patch V is the right choice for your club system.

Private Patch V is a totally new concept in automatic phone patches. A built-in keyboard and menu driven display allow you to customize all modes, features, and functions specifically to *your application.*

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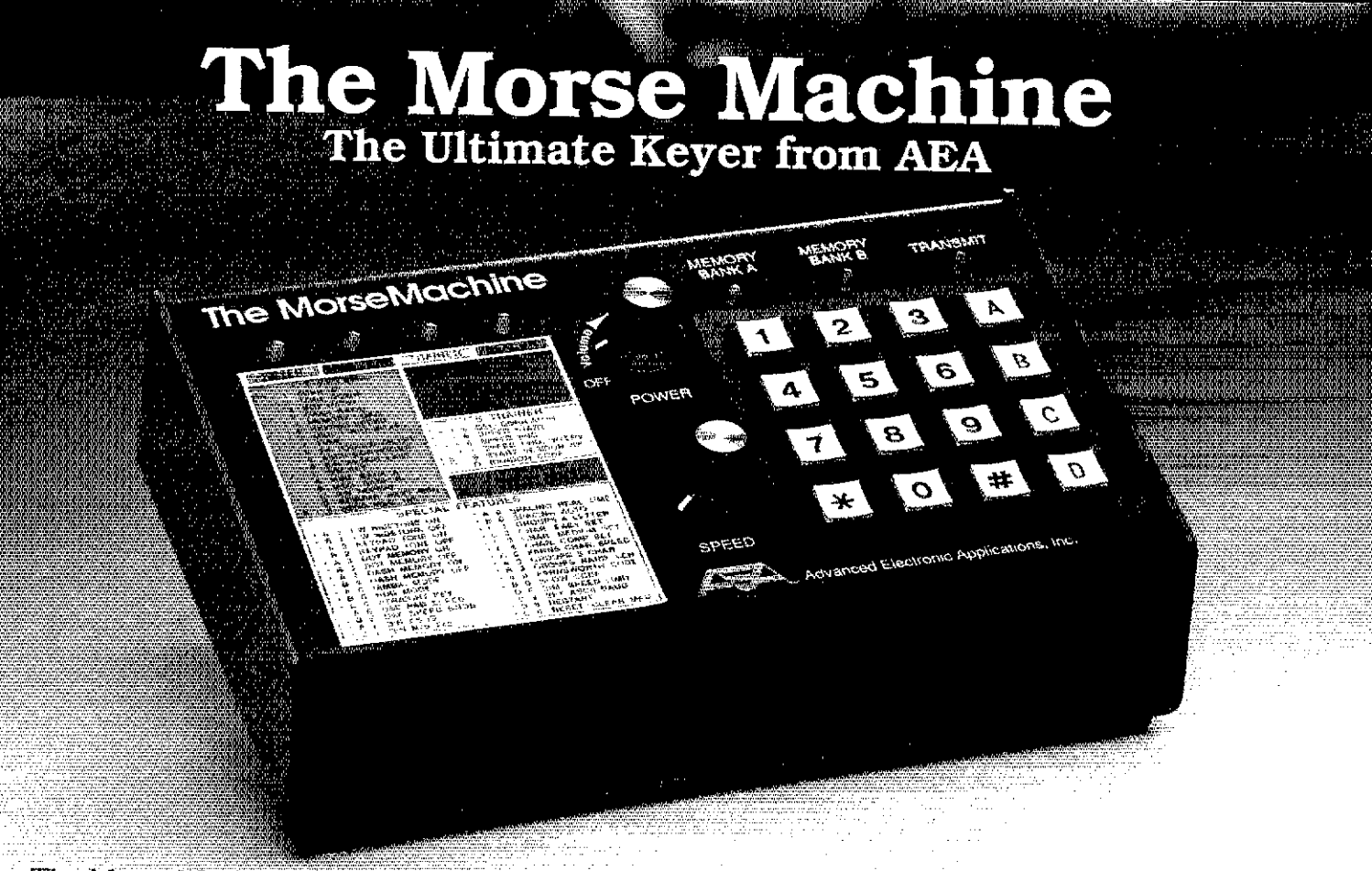

The Morse Machine has all the features you've been asking for in a high performance keyer like 2-99 WPM speed selection and over 8,000 characters of memory that can be stored in 20 memories. The 20 memories are soft partitioned so that your stored messages may be as short or long as you like. Memory can be expanded to hold up to 36,000 characters. Of course, all memory is backed up by an internal lithium battery so that once a message is loaded, it will stay there until you write over it.

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43, N4SVZ 41, WD4MRD 36, WB4WII 35, N4LST 32, N4SMS 31, WA4MNR 27, N4VHU 26, WA2EDN 23, KC4GCK 20, W4LWZ 19, KA4KGZ 19, KF4NJ 15, K4YJB 14, AB4W 14, N4SHE 12, N4UOE 12, KM4BN 11, W8KLF 8, K4OGB 6, W4EAT 4, N4OIC 2 .

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—NTS TFC NETS accomplish more than msg handling! The SCNT Net moved to 7243 kHz. Sched 12 PM daily Mon-Sat & 12:30 PM Sun. NM & Newsletter Editor, KA4UIV. SC SSB Net meets 7 PM daily 3915 kHz. NM, N4RQM. Net Directory Editor/Treas. KA4LRM. CW Nets: Carolinas Slow Net (ATTN: Novices) sched 6 PM daily on 3715/7115 kHz. NM, AA4MP. Carolinas Net sched 7 & 10 PM daily 3573 kHz. NM, K4IWW. 2-Meter Tfc Nets: Anderson NM, WD4BIUH. Blue Ridge NM, N4RQM. G. Pee Dee NM, NN4N. Lancaster NM, KJ4DT. Oconee NM, WA4SUS. York NM, KB4ZA. Digital Mgr, KA4GUT files msg tfc into the PACKET SYS. Tfc is addressed to Pkt Stas & routed to Pkt BBS Mail Boxes. Pkt Stas download msg tfc from the PBBS and perform msg delivery. WE OWE THE PACKET BBS SYSOPs & NET ROM DIGI OWNERS A DEBT OF GRATITUDE! Financial aid is needed to keep their equipment operable & replace lightning-damaged equipment. July tfc: KI4FL 634, W4ANK 111, N4MEJ 104, KA4LRM 54, W4DRF 36.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: N4GHI. SEC: WB4ZTR. ACC: NT4S. BM: AB4U. PIO: AA4VP. TC: WX4C. SGL: W4UMC

Nets	Freq	Sess	
VTN	1 PM	3907/7280	W4JLS
VSBN	6 PM	3947	KI4BR
VSN	6:30 PM	3680	N4KSO
VN (early)	7 PM	3680	N4GHI
VN (late)	10 PM	3680	WB4KSQ
VLN	10:15 PM	3947	KK4FV
SVEN	7:15 PM	146.82	NT4S
STARES	9 PM	146.97	KJ4VT
DEC/EC	9:30 PM (3rd Wed)	3947	KA4NWK

For the first time in many, many years, the call of W4HU is missing from the listing of the section's leadership officials. John, after serving as an OO/OOC for over 20 years has requested to be relieved of these duties and it is with deep regret that I have accepted his resignation. W4HU has performed an outstanding service in the often thankless job of an Official Observer/Auxiliary Station. It was a pleasure meeting and talking with many of you in the section meeting held at the Berryville hamfest. Reports were made by N4MM, Division Director, on the July ARRL Board Meeting, N4GHI, STM, on traffic and WB4ZTR SEC, on ARES activities.WB4ZTR reported WA2FMT as EC for Frederick County and N4SCK replacing WB4WZZ as EC for Fairfax County. It is with deep sorrow I report N4IIC as a Silent Key. Sid was an active member of SPARK and had served as EC for the city of Hampton. In this issue of QST, in the "Happenings" section there should be an announcement seeking nominees for the office of Virginia Section Manager (SM). As I have served you as SM for 2 full term and 15 months of NN4I's term of office it is not my intent or desire to seek re-election as SM. I believe the time has come for the section to have new leadership. Nominations must be submitted to ARRL Headquarters by December 1989. For further info, contact your SM, W3ATQ. Upcoming VE exams; Oct 7 Williamsburg contact WJ4X 253-2811. Nov 4 Portsmouth ARC contact AA4AT, 484-2857-Nov 4 Shenandoa Valley ARC contact NC4B 703/869-5241. While condx during the summer have been very erratic, our nets have managed to function. As the fall season approaches and the traffic increases, we are looking forward to many new stations joining in the fun of traffic handling. At the time of this writing, it appears that the packet operation at the Boy Scout Jamboree is doing an excellent job of clearing the messages from the site. It will be interesting when a postmortem of the operation is held to find out the knowledge gained from this first major traffic handling operation performed by packet. Traffic: N4HOG 946, N4GHI 598, K4DOR 512, W4JLS 247, W4SQO 212, W3ATQ 174, N4EXQ 169, K4MTX 147, KJ4VT 116, WB4PNY 115, WD4MIZ 114, WB4KSG 91, WD4MIS 84, WB4VMX 79. WY7U 77, KK4FV 65, WB4ZTR 56, WB4EDB 50, KK8L 50, KB4OPR 40, W4TZC 35, K4BGZ 33, N8ANQ 30, WS8A 28, WB4ZNB 28, NT4S 26, KJ4M 25, WA4TVS 24, KC4ESG 23, AA4GL 19, KI4W 17, N4FNT 15, K4MLC 12, WB4KIT 11, N4RHV 9, WB4UHC 9, KB4WT 8, W4HU 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Repeater Coord. WB8GDY. Congrats to Matt, WT8L, who has made BPL two months in a row. Regret that several reports were missing from last month's report, due to late receipt on packet. KZ8Q invites everyone to join "slow" WVN-L at 10:00 PM each nite on 3567. New ECs are W8GUL, KA8ZXP, and KQ8E.

NET	FREQ	TIME	QNI	QTC	SESS	Nm
WVFN	3885	6:00	820	80	31	WD8DHC
WVN	3567	7:00	223	99	31	KZ8Q
WVMD	7235	11:45	666	48	31	WD8V
WVRN	3640	6:30	142	15	28	K8LG
WVNN	3730	7:30	81	34	28	KA8ZGY
Hillbilly	14290	Noonsu	183	14	5	W8YP
VN-L	3567	10:00	192	53	31	KZ8Q

Traffic: WT8L 888, WD8V 269, KA8WNO 126, W8YP 118, K8TPF 91, WD8DHC 75, KE8FI 58, K8QEW 53, KA8ZGY 39, N8FXH 30, W8FZP 27, K8KT 27, W8JWX 15, KB8AOB 11, NJ8J 11, NC8G 6.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Edie Sheffield, KAØMQA—SEC: K4UBU. STM: KBØZ. ACC: WBØDUV. PIO: WBØFQB. OOC: KAØCDN/WØIJR. SGL: WDØHNQ/WDØHNP. TC: WØLFJ. BM: KAØVKM. The ARRL Colorado State Convention was very successful for the DRC who hosted it. The Colorado Section Amateur of the Year (1988) was WØHJX. Emergency Commendation certificates were given to Boulder Amateurs & BCARES and Longmont Amateurs for their communication efforts in the Sugar Loaf Mountain fire. ARRL certificates of Merit were given to WA9ABB, NØBQP, KA7TYU, KAØEFM, OOC KAØCDN & WØIJR helped with the recent testing of new DF equipment for the FCC. Congrats to the amateurs in Grand Junction who helped with communications during the 4th of July parade and a river float trip during Dinosaur Days. Congrats also to the many amateurs who helped ECHO with the communication efforts for the Jerry Ford Golf Tournament in Vail. October 7th is the ARRL Computer Networking Conference to be held at the Air Force Academy in Colo Springs. Contact NØCCZ for info. 73, KAØMQA NETS: CWN QNI 41,

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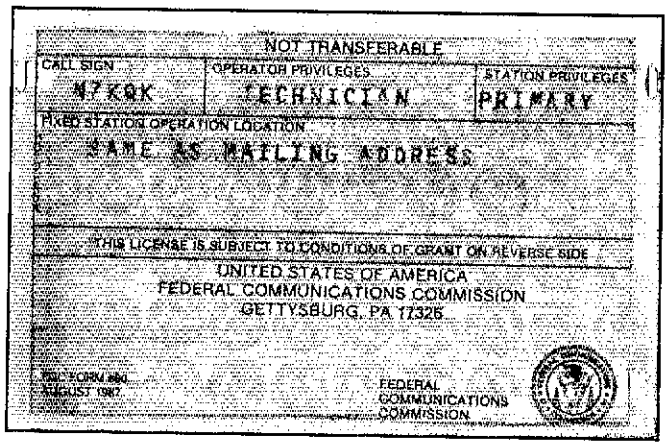
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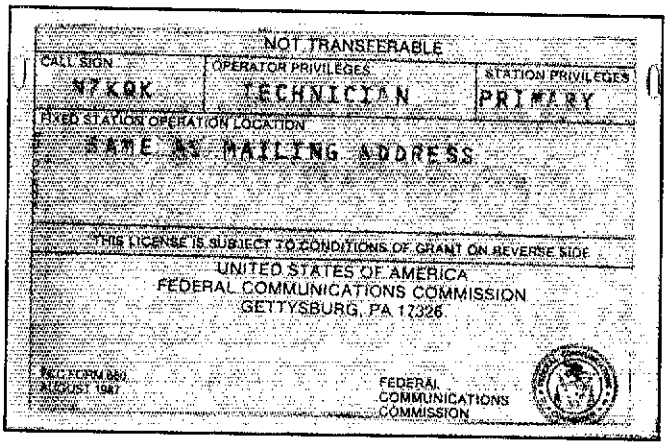
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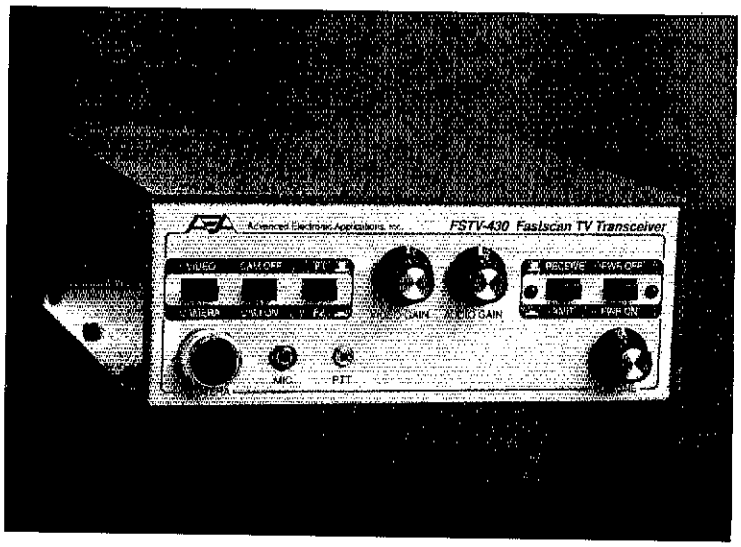

QTC 41, QNF 212, 22 sess. CWXN: No totals. Col: QNI 833, QTC 29-115, QNF 1006, 31 849,31 Sess. QNI 744, QTC 132-747, QNF Sess. NCTN: QNI 237, QTC 74, QNF 347, 29 Sess. SCTN: QNI 317, QTC 30, QNF 302, 31 Sess. Traffic: KØHOA 546, NØHFZ 465, WTØG 202, KAØWIE 198, WØLJF 92, KØSN 85, KBØZ 30, WDØGVH 23, NØKIA 15, KØCNV 10.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO, KA5NNG, W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net meets daily, 3583 @ 0230 UTC, handled 77 msgs with 127 checkins. NM Roadrunner Net meets daily, 3939 @ 0100 UTC, handled 60 msgs with 947 checkins. NM Breakfast Club meets daily, 3939 @ 6:30AM, handled 139 msgs with 874 checkins. Yucca 2-mtr Net, 78/18 handled 11 msgs with 295 checkins. Caravan Club 2-mtr Net, 66/06 with 126 checkins. SCAT Net, 66/06 handled 7 msgs with 404 checkins. Info Net 12/72, with 85 checkins. The Ft. Tuthill (Flagstaff) hamfest was certainly a grand success with the best participation ever. New Mexico was very well represented and all reported a grand time. So very sorry to report the passing of one of our very old timers, W5GWI. Warren will certainly be remembered as one of the original members of the Sandia Base Radio Club and the Caravan Club. Traffic: KB5VF 94.

UTAH: SM, Rich Fisher, NS7K—SEC/STM: Jim Brown. If you have info for the Section report please let me know. I need info on all clubs in Utah. Pres, name, and club mailing address. 73, NS7K. Traffic: WA7MEL 64, N7JLC 59, KO7R 10, NS7K 4.

WYOMING: SM, Jim Raisler, N7GVV—KC7AR Reports Cowboy Net held 21 sessions with 508 QNI and 5 QTC. W7TZK reported 160 traffic count. Balance of reports will be in next month's report. Is your county interested in running a special-event station during this next year to celebrate the Centennial? If so, when? The University ARC is recommending a spring weekend for all WY counties on the air (during good DX conditions). Are u interested in getting involved? WE NEED A FEW GOOD OPERATORS. If we can get enough support, then special QSLs will be printed up etc. Please contact Wayne, NQ7Q, in Laramie or me. Plan on getting involved in the WY QSO party on Oct 7 & 8 sponsored by the University ARC. 73 till next month.

SOUTHEASTERN DIVISION

ALABAMA: SM, James Spann, WO4W—ASM: W4XI. SEC: KB4GDN. STM: W4PIM. PIO: KB4KCH. ACC: AA4BL. OOC: KF4VS. SGL: N4FRQ. BM: KA4ZXL. We welcome the South Baldwin ARC as our newest ARRL affiliated club in the section. The club President is Ray, W4CRY, and their meetings are held on the fourth Thursday of the month at the Riviera Utilities Kilowatt Room on US 98 in Foley. Please think first before you use packet beacons! The digipeat functions on nodes BHM2and BHM3 have been shut off due to "beacon congestion" in the Birmingham area on 145.67. Silent Keys: Jim Muse, N4TUH, of Birmingham, and Len Bonner, WA4YHZ, of Verbena. Interest in fast scan television continues to soar along the Alabama Gulf Coast. Daily transmissions are taking place between Mobile and Pensacola, and plans are being made for construction of an ATV repeater between those two cities. The new President of the Bibb Co. ARC is James, KB4Y1F. The Alabama Repeater Council is working with a pair of repeater owners on an interference problem involving systems in Birmingham and Muscle Shoals on 146.62 MHz. Lets hope things get worked out on this matter. Remember to send you monthly traffic reports to our STM: W4PIM, and your PSHR reports BPL: WA4JDH. PSHR: WA4JDH. PSHR: WA4JDH, W4PIM, and your PSHR: WA4JDH, W4PIM, W4QAT, W4CKS. Traffic: W4QAT 107, W4CKS 58, W4ZJY 5.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM: KC4MJ. SEC: NC4E. STM: WB4WQL. Packet: W4QO. ACC: KM4IH. OOC: W4TG. SGL: WB4UVW. As u probably have noticed my staff is still missing a BULLETIN MANAGER, PUBLIC INFORMATION ASSISTANT & TECHNICAL COORDINATOR. As of this writing, I haven't received an answer from the people I'd like to serve on the staff. In order for the GA section to function as we have in the past, these people are very important. The rest of our FB staff agreed to stay with us as I start a new two-year term as SM on Oct 1. TNX guys! Also as most of u know I retired from the Penney Co. two years ago. Well, I hate to tell u this, but I'm working full time at Sears as an Electronic Tech. Got tired of washing the dishes & doing the laundry. Hi! NC4E, our SEC, reminds all that on Oct 21 & 22, it's SET time agn & he would appreciate even more activity than we had last year. Let's get out & be number ONE in the nation this year. Also, PLEASE get with ur club officers & see the ANNUAL CLUB REPORT has been sent in. In the printout I received only yesterday many haven't sent one in for over two years. PSHR achievers for July are WB4DVZ, KC4BHX, WB4WQL, KJ4NK, WA4LLE, KA4HHE & WA4YYQ. Warner Robbins Hamfest this yr is on Oct 21-22 at a new location. Two more Silent Keys in the section are: W4ZMI & W4ORI. Our sympathy to the families of both of these fine Hams. Pat, W4NLK is moving to Michigan in the near future and all of us in the section hope that she will continue to chekc into the Ga nets. There is no reason for anybody not to take an AMATEUR RADIO EXAM in the Georgia section, because we have an overflow of VE teams. Most repeaters announce their VE teams's EXAM skeds. If you are having a problem, please contact me & I'll see if I can help. God Bless. Traffic: WB4DVZ 139, KA4HHE 114, WB4WQL 83, KC4BHX 64, WA4YYQ 44, KJ4NK 34, K4JNL 34, WA4LLE 32, N4UZ 24, K4ZUY 23, WA4TXT 20, N4MWR 20, K4BAI 15.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—TC: Ed, WØRAO. BM: Dave, N4GMU. PIO: Petey, WA4PUQ. SGL: John, KC4N. ASM: Bill, KB4LB. STM: Cotton, KB9LT. SEC: Rudy, WA4PUP. OOC: John , AB6I. ACC: Dick, WA4BIH. Just noticed that I left WA4BIH off the list of LOs for last month. Sorry, Dick will try to do better! By the time this is printed, the IARU meeting in Orlando will be past,but I want to thank all the clubs and operators who spent time to set up, operate and take down the antennas and gear for running the station W1AW/4. It was a great once-in-a-lifetime opportunity for us to be part of a great event. FMTN now has Carl, W4NFK, as its NM. We wish him success in this endeavor and hope he can recruit a few more active hams for NCS and liaison duty to 4RN and RN5D, so more people can be involved in this key element of the NTS. FMTN is in its 32nd year of operation and we hope it will continue to be active for many more years. If you would like to assist, check in on 7247.5 at 1600Z (noon ET) andlet your call be added to the roster. We'll all

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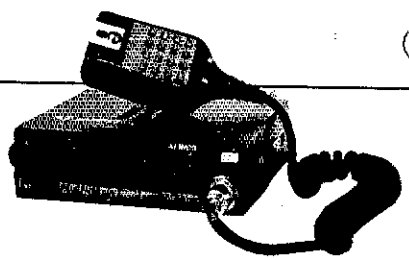

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welcome you!! If you do not have a radio club in your area and would like to organize one, get in touch with Dick, WA4BIH, in Jacksonville and he will send you the info you need to apply to join the 1800 or so affiliated clubs in ARRL. As few as five members can be nucleus for a club , so ask around and see if there is interest and get in touch with Dick, our ACC. 73, Roy, N4ADI. Traffic: N4SS 318, WA4QXT 207, KB9LT 197, WD4IIO 190, WC4D 150, N4JAQ 129, AA4HT 106, WA4EYU 101, AA4FQ 71, KI4CQ 67, N4GMU 66, N4AOX 42, W4UEA 41, N4QYS 41, N4UF 25, W4KIX 23, N4ADI 21, WB4GHU 21, WA4APQ 18, N4OZD 17, W8IM 11, K4UTY 10, W4AT 9. WA4STZ 5.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—STM: K4ZK. SEC: W4SS. TC: KI4T. BM: WD4KBW. PIO: N4PBF. AAC: W4TAH. ACC: K4EUK. SGL: KC4N. Pkt Mgr: K4CY. THE SUPER NEWS THIS MONTH IS THAT MISS PHIL, KA4FZI, HAS BEEN NAMED "ARRL PROFESSIONAL INSTRUCTOR OF THE YEAR." at the July meeting of the Board of Directors. The presentation is scheduled to be made at the Melbourne Hamfest in September. The Fort Myers ARC, K4KKP and KC4EGO will be recognized for their enthusiastic assistance in the outstanding program she developed. The following note was received from maude Hottenstein- Maude is an elderly widow living in Plantation with her daughter and son-in-law. She has lived practically all of her life in Maryland- where most of her friends still are located. This writer has originated many messages for her and she writes; "Please tell all who help, I pray God will bless all who send my little messages. You'll never really know those sick and elderly people...If you could read all of my thank you notes you'd feel as high as a steeple. Thank you from the bottom of my heart." The Fort Myers ARC, Modulator has an interesting article taken from the W5YI Report concerning mobile operation and how to reduce unwanted effects on the vehicle. The Everglades ARC notes that WD4PWC received a plaque on behalf of the demonstration given earlier this year. The Motorola ARC's The Marconi had information from KD4GR that the club operated Field Day for 24 hours without interruption with an estimated 3900 points compared with 2500 for 1988. KD4GR also spoke on traffic handling at the Broward Amateur Radio Digital Society meeting as well as the Broward County Emergency Preparedness Net. The South Brevard ARC Spark gave info that WA4SIR has permission to operate a station in the orbiting shuttle scheduled for March 1990. Other club bulletins included the Englewood ARC and the Southwest Florida Traffic Net in which K4FQU thanked K9ALX and all of the net members for the work done while he was away on vacation. The Florida Phone Traffic Net reported with sadness that Coy, KA4AJR, became a Silent Key. WD4KBW reports 141 bulletins received and sent by WA4EIC 70, WT4F 24, K4IEK 20, WD4KBW 22, and WA9VND 5. The ARRL Information Net is going strng on 3940 at 8 AM Saturday mornings. 73 de WA4PFK. Traffic: W3CUL 2056, W3VR 936, WA4PFK 378, WA9VND 287, K4SCL 273, WA4EIC 255, N4HAP 172, KB4KXV 163, KD4GR 161, WA4RUE 155, W4NFK 139, WB4WYG 128, K4IA 128, AA4CH 125, N4ORZ 108, KA4FZI 100, N4MML 99, AA4BN 99, W4DWN 95, WA4HXU 88, N4KFU 88, N4ET 86, W3TLV 81, K4EUK 74, KA4NXF 64, KC4VK 59, KF4QU 59, WA4NBE 58, KB4WBY 54, KF4RL 53, KM4LPWD4KBW 53, KB4MON 43, W7LUS 34, KB4UHC 34, AB4OV 31, K4ZK 31, N4HAS 30, KA4SIH 29, KC4HDJ 29, WB4ZJS 27, KA7YHS 19, N4TKS 18, WB4CGK 18, KA9AKY 17, KC4GHT 17, K4JI 15, AB4BC 15, KI4ZW 15, K9ALX 14, N4TVV 14, KB6EHC 13, W4VQE 12, NØOIA 11, KAØGYF 8, KA4GDV 7, W3IJR 7, KB4UIA 7, NØABC 7, W4MPV 7, N4RHJ 6, W4MFD 4, WT4F 3, KB4HAY 3, NX5Q 2, W4NSY 1, KA2KNZ 1. (June) N4TVV 12.

VIRGIN ISLANDS: SM, Ron Hall, KP2N—ASM: KV4JC. SEC: NP2B. STM: NP2E. NM: VP2VI. Hurricane Dean caused quite a scare for the islands. It was on track to hit us with winds of 85 MPH. At the last minute, it turned North and later hit VP9 land. Local ARES members under our SEC direction were activated and ready to go. KV4EY furnished us up-to-date weather info from VITEMA HQ via the 6.810 repeater. We are all thankful that the islands were spared. I had the good fortune to meet the new SM for PR, WP4CSG, along with PRARL Pres. KP4PQ and SE Div. Dir. Frank Butler, W4RH. This meeting went to establish communication links between our sections. A trip to the Arceibo radio-telescope highlighted my stay. St. Croix ARES had 4 sessions with QNI 29. St. Thomas ARES had 4 sessions with QNI 22. Traffic: NP2E 8. The SM net is now QRT until Fall. New ham classes have started on both islands. Spent 9 days stateside and attended Hamfesters hamfest. 73s de KP2N.

SOUTHWESTERN DIVISION:

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K7POF, K6LL, KI6ZH. Ft. Tuthill Hamfest is now history and as usual was a great event. ARCA sure runs a good show. Attendance was estimated at 2,500 to 3,000 this year. VE's testing 50 applicants with about 85% pass rate on written elements, 100% on 20 wpm code, 14% on 13 wpm and 80% rate on 5 wpm. Over 20 applicants upgraded to new class. Congrats. ARRL-elected officials attending were W6BF, SM from LA; W5PDY, NM SM; W8IXD, Nevada SM* WA6WZO, SW Divn Director, KJ4KB from ARRL HQ. Many thansk to Sandy Heyn, Fried's wife who came from Los Angeles to help out in the ARRL booth. She is WA6WZN and is Fried's right hand in ARRL affairs. Success story of the year comes from Superstition ARC who obtained a zoning amendment in the City of Mesa to allow antennass and towers up to 75 feet! The previous limit was set at 30 feet. This vote by the city was a conclusion to six months of negotiations between Mesa City Staff and the Superstition ARC headed by Bill, KA7SUF. Legal guidance was provided by Neil, KV7O. Others providing much assistance included Marge, K1YCZ, Barry Goldwater, K7UGA, the LDS Church, American Red Cross, Maricopa Co. Civil Defense and Emergency Services, the US Army MARS, the American Graduate School of International Management, the Consular Corps of AZ and many other individuals who plugged for Amateur Radio in the area of public service. Also Ed, KX7P, our SEC and retired Superior Court judge attended the hearings and spoke on behalf of Amateur Radio. Congrats to all. (thnx, ARA Squelch Tail) While on the subject of public service, a group of the Green's Peak Repeater users in the White Mtns. provided tactical and logitical communications on their two mtr repeater to the US Forest Service in fighting a forest fie. The fire occurred in CC Canyon early in July and burned for several days. Assisting the firefighters with radio comm. were: KD7EL, Ermon; KA7AKK, Beth, KF7AH, Bill; N7JJE, Jackie; KA7YYV, Mike; KB7EWO; Linda and K7RJD, Warner. These hams took portable equip into the field to the various fire camps. Many other Green's Pk. rptr users operated either at home or mobile to assist. Congrats on a job well done. Their repeater site on the mountain is leased from the US Forest Service. Bet they won't have any trouble renewing their lease next time, Hi. Final note on Ft. Tuthill hamfest: Gail Peterson, N7BXX was awareded "Ham of the Year," by ARCA members. KA7SUF, K1YCZ, KV7O, and KF7PO received Certificates of Merit from ARRL for their outstanding efforts on the Mesa antenna ordinance. See you on the same street corner next month. 73, Jim.

NET	ABBREV	QNI	TRAFFIC	SESSIONS	LIAISONS
SOUTHWEST Net	SWN	117	77	31	TWN
ARIZONA CACTUS ACN Net (HF)	415	42	29	TWN	
ARIZONA CACTUS ACN Net (VHF)	163	37	31	ACN(HF)	
ARIZONA TFC & ATEN Emerg Net	819	121	31	TWN	

Traffic: W7AMM 344, WE7G 65, W7EP 64, W7OIF 44, K7POF 31, K7RLL 23, N7ETP 10.

LOS ANGELES: SM, Phineas J. Icenbice, Jr. W6BF—First, the good news: We still have part of the twenty-meter band for OUR use. The bad news is-that not many hasm write to the FCC or their Congressional representatives. You may or may not know that your life is becoming more POLITICAL. Therefore you must express your opinion and desires just to maintain your status quo. Two years of INTRUSION monitoring our Amateur bands has led me to this conclusion. Comments by (US) Service radio operators also lead me to believe that some if not many Military and Commercial stations regularly tune up and operate in our exclusive Amateur bands almost every day. Since many jokes are aimed at our faithful LAWYERS, you should read the Hughes AR Bulletin for something different. The definition of an engineer is: One who passes as an exacting expert on the strength of beingl able to turn out, with prolific fortitude, strings of incomprehensible formulae calculated with micrometric precision from extremely vague assumptions which are based on debatable figures acquired from inconclusive tests and quite incomplete experiments carried out with instruments of rpblematic accuracy by person of doubtful reliability and of rather dubious mentality with the particular anticipation disconcerting and annoying everyone outside of their own fraternity. Oh yes, lawyers, —some are burried 20-feet deep or more. They are the ones that are really good—down deep.—Skip Bolnick, KJ6Y, have his usually outstanding ANTENNA AND TOWER INSTALLATION talk to the Crescenta Valley Radio Club last month, if you need an excellent program give Skip a call at (818) 887-3569. N6VI, Marty, K6YMJ, Hank, KF6UJ, LAPD Capt. Keith Bushey, KA6GSE, Dennis and I visitied our local councilman in July to request his assistance regarding our recently changed ANTENNA ordinance. You must be caretul even when you are 500 miles from home. AK6Y, my good friend Ron, our Section Emergency Coordinator was in the audience at the Flagstaff "Ft Tuthill Hamfest" last week. —N6MAD, Kathleen reported a total of 281 emergencies handled on W6FNO/R for July. 17 operators handled a total of 265 vehicular emergencies, 14 fire emergencies and 2 medical emergencies. W6FNO/R also was employed to coordinate Red Cross activites during the July 3rd Turnbull Canyon/Hacienda Heights fire. ARES members wree activated to handle communications during this emergency. If you want to help the real EMERGENCY GROUP, call AK6Y, Ron Boan, (213) 596-7449. Our new Official Observer Coordinator is WW7K, David B. Morse (818)893-2817. Give Dave a call if you need help or want to help. Dave is a great guy and always ready to help. We also have a new AWARDS MANAGER, NR6O, James T. Hoff. James can certify your WAS and other awards. Call him for an appointment or visit the Long Beach ARC. KI6BU, Henry, is the AWARDS MANAGER in the San Fernando Valley (818) 993-7736. According to N6AHV, Tex is the president of the So. Ca. DX Club. The Visalia DX Convention is scheduled for April 6/7/8, 1990. It is not too early to get your reservations at the Holiday Inn. (209) 651-5000. N6IC, Don Bostrom is in charge of preregistration (818) 784-2590. LA has most everything now the new and the latest in LA is Dodger—SUPER PANTY HOSE—they have fewer runs!

ORANGE: SM, Joe H. Brown—ASM: Riv. Co, Bob, W6LKN (714) 686-3823. ASM: Org County, Ralph, WB6JBI (714) 775-9272. ASM: SB Co. Ken, WA6ZEF (714) 682-6212. STM WF6O reports BPL: WF6O. PSHR: WF6O, KA6HJK, KAdSTND, W6RE and W6SX. Traffic Totals: WF6O 579, W6SX 156, K6ZCE 87, W6CPB 85, ADØA 64, W6RE 56, KA6HJK 49, KA6TND 31, KB6VPI 14. NEED new stations for SCN/CW. Scheds SCNI CW 3598 kHz 6:30 PM. SCN2 Slow Speed 3705 kHz, 10:00 PM. the best to ADØA, Jerry, In addition to SCN 1 manager. He has taken over the Section PIO slot. John, KD7XG, has resigned from the Section TC position, due to school and career commitments. John Wendt, WA6BFH (714) 685-0485 has been appointed to fill the void. Good luck to both of you. ARES/RACES News. Art N6GDM has resigned EC/RACES. Vescom District of Riv. Co. Art should write a book on public relations and amateur radio operator motivation. He did a fantastic job in this area. Bob Gentilin has been appointed ARRL EC for this slot and Riv Co FD has appointed him as RACES Radio officer for the District. Have at it, Bob. City of La Palma forms Amateur Radio Corps ARC has rcvd training on ARES/RACES and exposure to City and County Comm Systems. For info, call LeRoy, WD8GNI or Commander Dave Barr (714) 523-4552. Club Views: St. Jude Hosp and Rehab Central ARA, April WA8OPS sez work on the new console is under way. Hope to have it ready for the Oct anniversary celebration. Look for us each Wed morning. OCCORA, WARA has won the FD Orange County competition with 3691 QSOs and 9072 points. Tri-County ARA (QRM K6AGF) is the oldest radio club west of the Mississippi and goes back to the 1920s. Inland Empire ARC fm Tony WB6OHB. We have classes for upgrading, for getting an amateur license, but nothing for improving our skills. Perhaps it is time to abandon our "monkey see, monkey do" training methods and offer classes for amateurs and offer classes for Amateurs desiring to improve their operating skills communications techniques.

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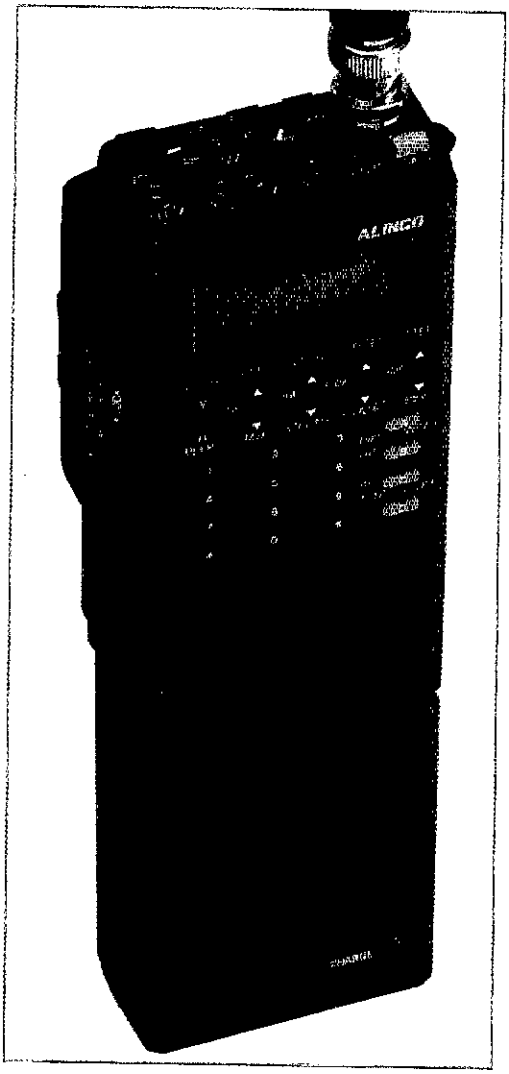

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SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6JZE. SEC: W6INI. STM: N6GW. PIO: N6PKY. ARRL-affiliated clubs are reminded to make their annual reports to ARRL in order to maintain their active status. Forms were mailed to clubs earlier this year. The Southwestern Div Conv for 1990 will be held in San Diego Aug 24-26. Featured will be a dinner-dance cruise on San Diego Bay Fri eve. For info on SANDARC, volunteer exams call 619-465-3926. Upgrades: KB6NZA to Advanced. N6QVW won the Volunteer of the Year Award form the Mra Mesa Town Council. Fifty oprs provided supplementary communications for the US Forest Service at the Vail fire north of Mt Palomar from Jul 31 thru Aug 5. *Rigs were mounted* in forestry vehicles with mag mount antennas and lighter plug power. ARES needs operators to support the Calif Dept of Forestry Red Flag Patrol. Call W6INI, 273-1120, for info. Traffic reports will be in next month's report.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA— ACC: KB5AH. ASMs: N.Vntra N6MA. S. Vntra. WBAKF. Sbar WB6BYU. BM: N6TNG. STM: N6WP. OOC: W8AKF. TC: W6KFV. SEC: WB6IIY. DECs: Vntra-WB6RVA. S.Sbar: KA6KGF. N.Sbar: KI6XG. SLO: WB6IIY. This month we bid welcome to the Santa Maria Amateur Radio Telegraphy and Telephony Club (SMARTT) which became the section's newest ARRL affiliated club after being in existence for only about six months. I'll have the pleasure of presenting their certificate of affiliation at the August 15th meeting. Most of July was pretty uneventful, with many clubs curtailing activity while their members recovered from Field Day and/or took off for vacations, the month ended with a some real excitement in San Luis Obispo county. The following is taken from a narrative report filed by W7AZF: On Thursday, July 27th, at 1730 hours, a major wildland fire broke out in the area between Santa Margarita and Atascadero. In the first 15 minutes the fire consumed 100 acres. The fire spread quickly and soon developed into a major incident. At 1800 EC Steve Woodward, W7AZF, was interrupted at his dinner by California Department of Forestry (CDF) notification that their Emergency Communications and Mobile Command Center was being dispatched to the fire and that assistance from San Luis Obispo County ARES/VIP was requested. (The CDF "command bus" is a self contained unit carrying generators, antennas and radio equipment, including amateur radio voice and packet gear, for emergency field use.) Steve quickly requested EC Dale Auth, N6BUY, to begin call-up procedures and proceeded to the scene with the command bus. Meanwhile, Ross Conner, K6KAX, had been monitoring and immediately activated the ARES station in the CDF Emergency Command Center is San Luis Obispo. Mike Stephens, N6MLJ, and Bob Engdahl, KA6MBB, met with Steve at the fire scene and assisted in setting up antennas, generator and other equipment. Voice and data communications were established with the ECC and the flow of emergency related traffic began. By Friday night the fire had consumed more than 5500 acres and was still burning out of control. The site selected for the Incident Command Post was rapidly becoming too small. At approximately 2300 hours the on site personnel were notified that the ICP would be moved to accommodated expanded operations. Antennas were lowered, equipment stowed and the generator pulled from the soft, sandy soil by N6MLJ's 4 wheel drive-the ICP was relocated to an area about one mile north of Santa Margarita and Communications was once again established from the new ICP. Voice channels used Charlie Klein's WB6FMC/R repeaters on 146.80 MHz and 442.70 MHz while packet went via WB6FMC-1 (NETROM "SNLUIS") on 145.03 MHz. At about that time a vital piece of packet firmware decided to "go south." WB6FMC quickly provided a replacement ROM and operations continued without interruption for the next three days. On Saturday afternoon WD6Z helped set up a second packet station in the newly arrived Planning Section trailer. This was used all day Sunday to transmit demobilization orders to the ECC for all the crews and equipment which had been brought in. This process required the forwarding of large quantities of written data and the use of packet radio was an excellent choice. For two consecutive days during the incident W6RPI accompanied the CDF Public Information Officer and provided an important link to the public. (In any such incident public information contributes very significantly to public safety.) All operations were terminated at 1700 hours on Sunday. At the peak of the operation there were approximately 750 personnel involved in the suppression of the Chispa fire. Before it was contained the bandoned cabins, two vehicles and a mobile home. The fire crews did an excellent job of containing the blaze which, with an unfortunate wind shift, might have threatened the town of Creston or moved into nearly inaccessible mountain terrain. Able support by the San Luis Obispo ARES/VIP operators won praise and Congratulations and WELL DONE to the following operators who assisted in the Chispa incident: At the ICP-W7AZF, AA6DT, AA6CT, WB6KET, N6RAN, N6SRQ, K6SAR, N6MLJ, KA6MBB; at the ECC-WB6IIY, K6KAX, N6NKK, N6MUJ, K6TIB, KG6DG; packet radio assistance-WB6FMC and WD6Z; supporting the Salvation Army canteen-W6ZEK, W6JU, N6LYZ; recruiting and coordinating operators from his home-N6BUY; CDF-ARES liaison-CDF Captain KB6NFY. July testing successes-SBARC/VE (ARRL) 8 July: N6VRJ, General to Extra; to General-N6VMO; to Technician-KC6EKF, KC6EOT, KC6CXQ, KC6EOU, Roger Hoffman (unl), Todd Levin (unl), Patrick Reilly (unl); Examiners-KB5AH, AA6JG, N6PIM, AA6OT, WD6ETK. Satellite ARC/VE (GLAARG) 8 July: N6RAA to Advanced; N6TME to General, KC6ECD to Technician; Examiners; N6IR, N6PKK, KA7MGM, WB6ZZY, AA6FX, WA6VNO, W6PIM. Congratulations to all. 73 for

WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI—ASMs: W5GPO, K5MXQ, KG5SG, W5IWE. ACC: KA1CWM. PIO: K5HOL. OOC: WA5YKO. STM: W5VMP. TC: K5SXK. SEC: N8AJP. This column was due at the time I was scheduled to go to the National Scout Jamboree in VA and help operate K2BSA along with 40 other hams. K5MXQ has agreed to write the column in my place this month and I'll see you next month. So George, as my Cajun wife would say, "How goes it?" With that introduction, it went like this—Anyone interested in learning about traffic is urged to check into the D/FW Traffic Training Net held every Tuesday at 1800 local on the 146.72 repeater. Topics being covered include the "How To's" and also Packet handling of NTS Traffic by WA5MWD. By reading further, you will learn that CW is far from dead. But in the mean time, we need more operators from NTX to participate on TEX which meets at 1900 and 2200 local on 3.697 kHz.

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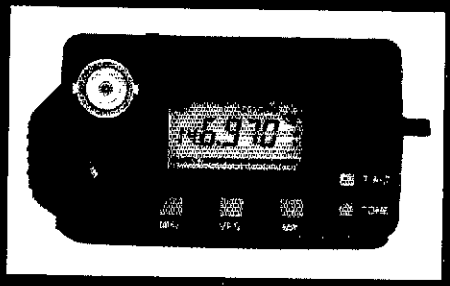

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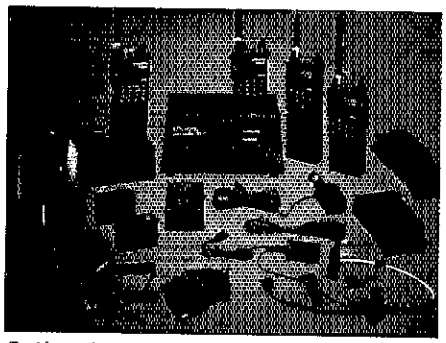

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On the present TEX roster, 69% are STX, 1% WTX and 30% NTX. Of the 30%, 28% are in the D/FW area. We really need some help from areas outside of D/FW and Longview. Traffic arriving from late RN5 has a 12-hour delay till the 7290 Net the next day. In the FYI department, I made a survey of the traffic handled by the NTS Region and Area Nets over the period of Oct 88 to Apr 89 and found that 11294 peices were passed on CW nets and 8691 pieces on the SSB nets. Not bad for an "outmoded" methodology. Non NTS were not included nor were section-level NTS nets. It is with deep regret to note that N5MOR, Dan Moffett of Malakoff, has become a Silent Key. Among his activities were DRN5, 7290 and when conditions were right D/FW Traffic Nets. Now some news about some of our folks on the move. N5CY is now sending traffic from Missoula, MT. WV5Z late of Hollywood, FL, now in the Chicago area, and last, but not least, AC5Z has returned to the NTX Section from STX and is now in Nacodoches. I want to thank all of the NTX folks that have, for about the last three years, been sending in their SARs and PSHRs to me every month. Keep up the good work, but please get them to me by no later than on the 6th of the month. Congrats to KF5BL, Bill, upon making BPL this month. PSHRs for July KF5BL, K5MXQ, K5UPN, N5NZH, W5YQZ, WA5MWD, N5KCL, KB5BNU, and WB5CPY. Traffic for July: K5UPN 470, KF5BL 316, W5TNT 243, W5YQZ 165, K5MXQ 127, W9OYL 117, N5KCL 100, N5NZH 42, KC5NG 32, KB5BNU 24, W5VMP 13. 73, K5MXQ.

OKLAHOMA: SM, Joe Lynch, N6CL—The ARRL West Gulf Division Convention (Ham Holiday) was a fantastic success! Over 1000 paid participants attended several good seminars, bought lots of goodies from the new and used dealers and the flea market. The Wouff Hong ceremony was great. Special tnx to K5EVI, W5SOQ, W5EIU, N5KUE and K5DLE for their assistance in the ceremony. Tnx to W5NZS, Gov. Bellman declared the week including Ham Holiday "Amateur Radio Appreciation Week." A special tnx to AA5GI, President of CORA for all of the many hours he single handedly put in to bring in new dealers and overall organize the convention activities. Speaking of conventions, now is the time to pre-register for Texhoma. There is always a good time to be had by all of the Oklahomans and Baja Oklahomans (that is what we call the state to the south) who get together and swap tall tales. The Bat Net meets every every night after midnight on Tulsa's 28/88 machine. If you are wide awake, check in. Hugo's Boys Orphanage is looking for help in establishing an Amateur Radio Club. Contact your SM if you can help. 73 for this month, Joe, N6CL.

SOUTH TEXAS: SM, Arthur R. Ross, W5KR—SEC: K5DG. ACC: WB5YDD. PIO: WA5UZB. BM: WA5WCY.MTC: NZ5U. OOC: K5SBU. STM: WD5GKH. SGL: K5KJN. ASM, all of above plus N5TC. EC KG5LN reports Huntsville ARS is proud owner of a 15-ft trailer; conversion to emergency communication facility is going nicely. Johnson Space Center ARC is newly ARRL affiliated; welcome aboard; Heath Company donated two HK-21 TNCs for use in SAREX. 7290 Traffic Net Secy NF5T reports 276 messages in 47 July sessions; 3362 QNI; NTS liaison, 2 per session; NM W5YQZ. Clear Lake ARC "CHRONICLES" reports WA5LOO and KA5GLX donated antenna for CLARC repeater; new time for regular swapfest is second Saturday each month 7-10am on Hiway 3 between NASA Road 1 and Bay Area; CLARC PIA KB5AWM reports busy July with South Belt 4th of July Spectacular Parade, Johnson Space Center Homecoming Parade (NASA); following ops worked in one or more of the events: KB5AQV, K5HV, KA5GLX, AA5ML and wife, NY5H, N5GIG, WB5HJV, WD8KUJ, K3WIV, N5OLU, WD5EEU, WD5EEV, K5BY, W5SX, KH6FHS, KB5GNA, N5GFS, N5GIN, KG5U, W5CLW, N5IMC, N5MMC, KB6SMY, WB5HOC, KF6WS, WB5WOW, WA4WRI and wife, KB5AWM. DRN5 NM WB5YDD reports 478 messages in 62 July sessions; STX represented 100% by W5KLV, W5CTZ, WB5HZQ, KE5ZV, N5NAV, WA5TUY, WV5X, KD5KQ, N5ILI, NZ5U, WB5YDD. PIA NZ5J reports WD5DLN performed NCS duties for Seguin's 4th of July Freedom Parade; other net members were WD5IQR, K5KXW, K5TK, W5FFG, N5OEO, KB5AGM, W5MTO, K5KEI, WA5UFL, WA5DYN, KB5FUH; he also reports he finally reached 18 months on the Honor Roll; congratulations, Bill. Pearland ARC President WA4KST reports KB5EBP upgraded to Technician; WA5JVS went from Advanced to Extra; congratulations to both. OBS W5KLV reports 5 propagation forecasts, 10 bulletins given 32 readings on 7 nets in July. PIA KA5EEQ, Brenham ARC, had excellent press coverage for FD89; his picture of Boy Scouts at working positions, plus his accompanying article, made for great effect. The TEXan,"newsletter of the Texas CW Traffic Net (TEX), wants all to know about CTTN; it covers Central Texas like a blanket; meets twice daily on 147.10+ at 1845 and 1930 Central Time. Traffic: N5NAV 256, WB5J 201, WB5YDD 160, W5CTZ 151, WD5GKH 126, N5ILI 78, NZ5J 33, W5BGE 23, K5KLV 11, N5KAO 11, W5KR 6.

WEST TEXAS: SM, A. Milly Wise, W5OVH—According to all bulletins I have received from various clubs in the area of West Texas, Field Day was a big success. There were high scores and good fellowship. San Angelo hams provided communications for the 38 and 76 mile bicyice races in Robert Lee by using a portable and their generator trailer. Also emergency communications were provided when a major storm struck the area with high winds, golfball size hail, and more than 4.5 inches of rain in an hour...The El Paso Amateur Radio Club will start a new Novice class on Saturday August 19 at the Clubhouse. Since the last bulletin, am very happy to report that Childress had only weather watch reported. Jim, N5CAN, reports on June 5 the big hail in Childress will be remembered as he lost his airstream trailer and house roof due to hail damage. The Big Springs ARC will start a Novice class in September. Not many bulletins received this month. I guess it has been too hot for much activity. After Field Day is over, the clubs start getting ready for hamfests etc. Enjoyed Hamcom and am looking forward to seeing friends at the hamfests in Amarillo, Lubbock, Odessa, etc. 73, Milly, W5OVH. PS. Labor Day, September 4, QCWA members and members of El Paso Amateur Radio Club and Sun City Amateru Radio Club along with other amateurs and friends in attendance. Jerry McTernan, W5YV, will be honored for attaining 75 years as an amateur and will be presented with his certificate by Hugh Winter, W5HD, Vice President of QCWA at the W5ES clubhouse 2100 San Diego in El Paso. Congratulations, Jerry. Traffic: AE5I 20, K5KKO 7.

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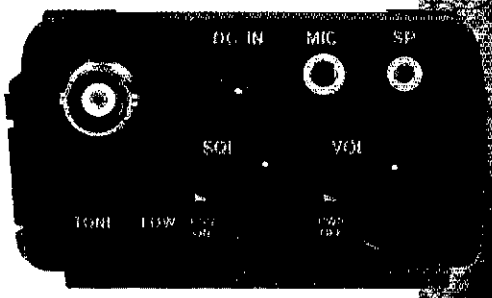
220 MHz TH-315A Here Now!

This HT Has it All!

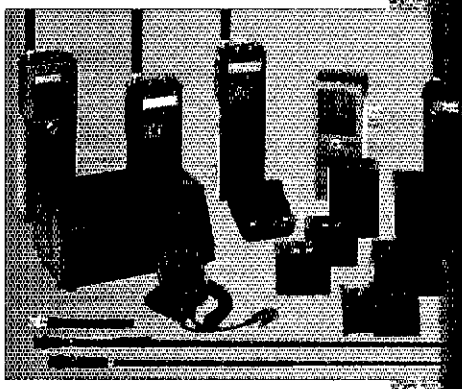
TH-215A/315A/415A

Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A for 2 m, TH-315A for 220 MHz, and TH-415A for 70 cm pack the most features and the best performance in a handy size. And our full line of accessories will let you go from hamshack to portable to mobile with the greatest of ease!

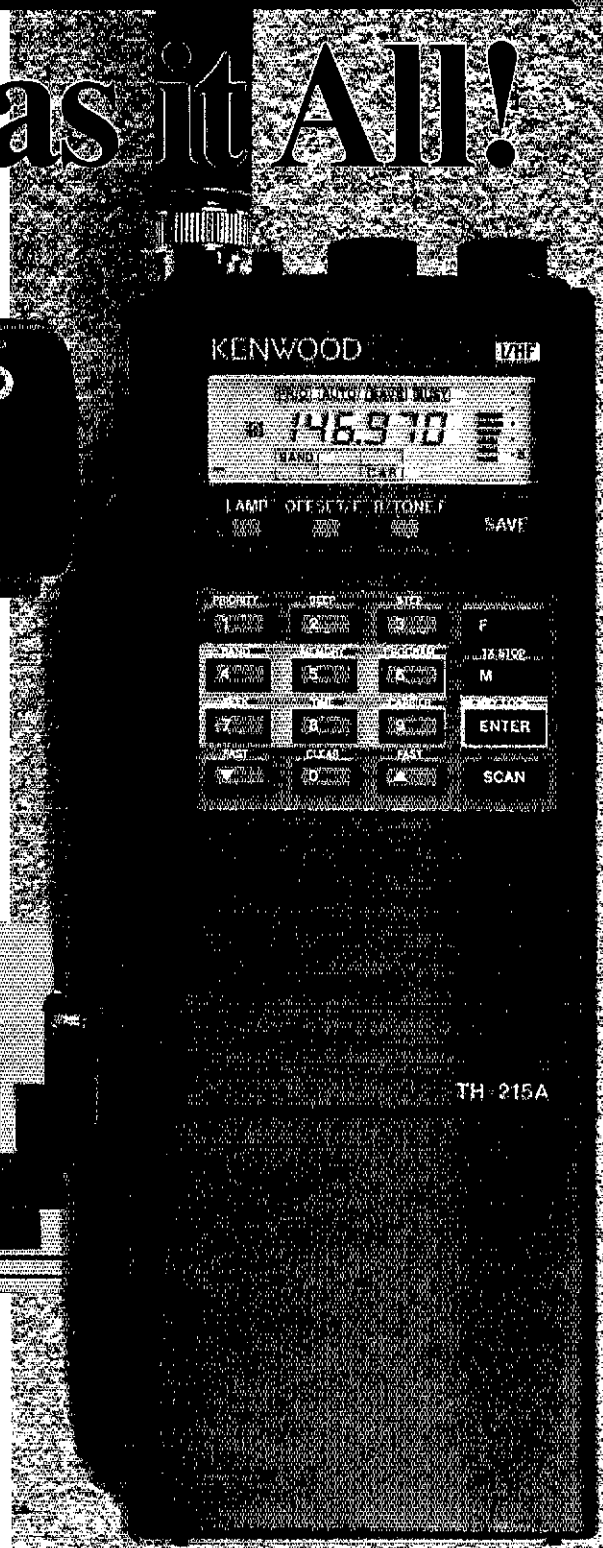


- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-315A covers 220-225 MHz, TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS **decoder** optional.
- **10 memory channels store any offset, in 100-kHz steps.**
- **Odd split, any freqency TX or RX, in memory channel "0."**
- **Nine types of scanning!** Including new **"seek scan" and priority alert.** Also memory channel lock-out.
- **Intelligent 2-way battery saver circuit extends battery life.** Two battery-saver modes to choose, with power saver ratio selection.
- **Easy memory recall.** Simply press the channel number!
- **12 VDC input terminal for direct mobile or base station supply operation.** When 12 volts applied, RF output is 5 W! (Cable supplied!)
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **Priority alert function.**
- **Monitor switch to defeat squelch.** Used to check the frequency when CTCSS encode/decode is used or when squelch is on.
- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** The beeper has a unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, DC cable, dust caps.



Optional Accessories:

• PB-1: 12 V, 800 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, 1600 mAH NiCd pack (1.5 W output) • BT-5 AA cell manganese/alkaline battery case • BC-7 rapid charger for PB-1, 2, 3, or 4 • BC-8 compact battery charger • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-8B StubbyDuk antenna • TSU-4 CTCSS decode unit • VB-2530: 2m, 25 W amplifier (1-4 W input) • LH-4, 5 leather cases • MB-4 mobile bracket • BH-5 swivel mount • PG-2V extra DC cable • PG-3D cigarette lighter cord with filter



Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.

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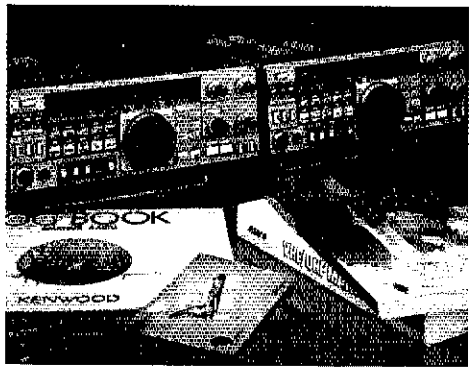
TS-711A/811A VHF/UHF all-mode base stations

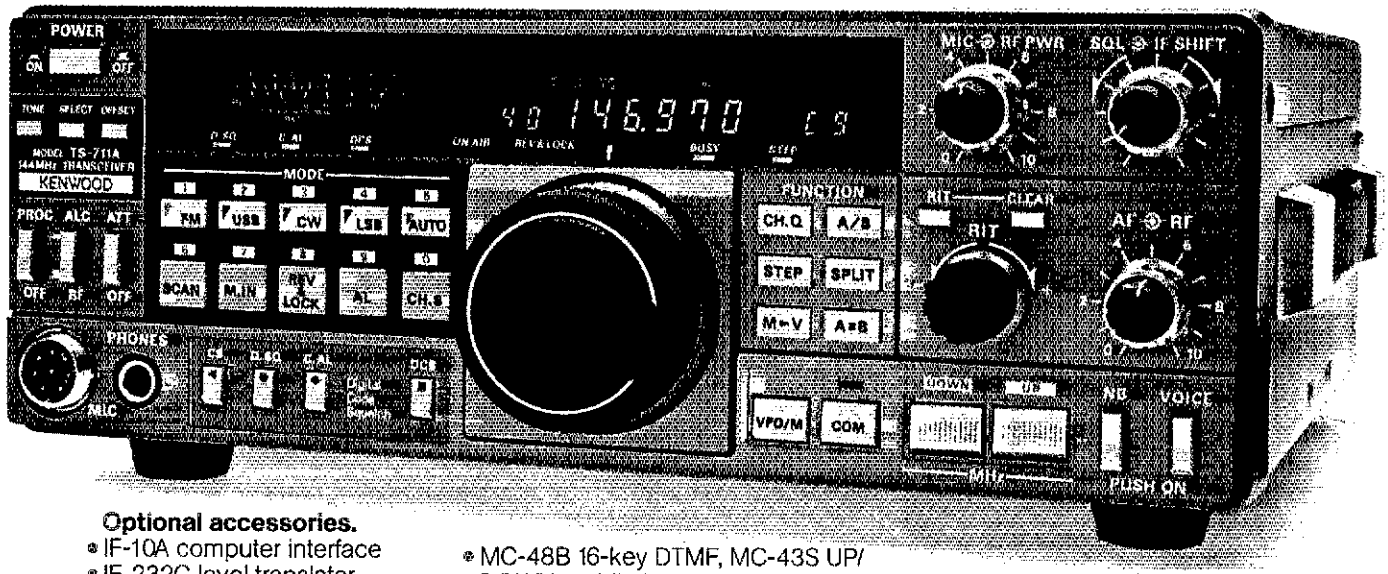
The TS-711A 2 meter and the TS-811A 70 centimeter all mode transceivers are the perfect rigs for your VHF and UHF operations. Both rigs feature Kenwood's new Digital Code Squelch (DCS) signaling system. Together, they form the perfect "matching pair" for satellite operation.

- **Highly stable dual digital VFOs.** The 10 Hz step, dual digital VFOs offer excellent stability through the use of a TCXO (Temperature Compensated Crystal Oscillator).
- **Large fluorescent multi-function display.** Shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, and memory channel.
- **40 multi-function memories.** Stores frequency, mode, repeater offset, and CTCSS tone. Memories are backed up with a built-in lithium battery.



- **Versatile scanning functions.** Programmable band and memory scan (with channel lock-out). "Center-stop" tuning on FM. An "alert" function lets you listen for activity on your priority channel while listening on another frequency. **A Kenwood exclusive!**
- **RF power output control.** Continuously adjustable from 2 to 25 watts.
- **Automatic mode selection.** You may select the mode manually using the front panel mode keys. Manual mode selection is verified in International Morse Code.
- **All-mode squelch.**
- **High performance noise blanker.**
- **Speech processor.** For maximum efficiency on SSB and FM.
- **IF shift.**
- **"Quick-Step" tuning.** Vary the tuning characteristics from "conventional VFO feel" to a stepping action.
- **Built-in AC power supply.** Operation on 12 volts DC is also possible.
- **Semi break-in CW, with side tone.**
- **VS-1 voice synthesizer (optional)**

More TS-711A/811A information is available from authorized Kenwood dealers.



Optional accessories.

- IF-10A computer interface
- IF-232C level translator
- CD-10 call sign display
- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48B 16-key DTMF, MC-43S UP/DOWN mobile hand microphones
- SW-200A/B SWR/power meters:
  SW-200A 1.8-150 MHz
  SW-200B 140-450 MHz
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner
- PG-2U DC power cable

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Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

The NEW OMNI V:

The OMNI V is a Paragon with a 12 band crystal mixed local oscillator in place of the general coverage synthesized oscillator. The result is receiver cleanliness like the legendary Corsair and Omni series. The OMNI V local oscillator is a new ultra low noise 5.0 to 5.5 MHz PLL design. Phase noise is simply eliminated as a significant variable. Dynamic range is maintained right up to the edges of the crystal filters, even under the most adverse conditions.

Many of the nifty features made possible by digital technology are included. Dual VFO's with A-B-split select, the frequency stability of a PLL, 25 tuneable memories, VFO to MEM, MEM to VFO and the SCRATCHPAD feature. RS-232 interface is standard and includes remote band switching for the HERCULES II amplifier. The memories are nonvolatile RAM and are retained until you change them. The status registers and clock are backed with a lithium battery (2 year life) so that when the rig is powered up, the status is the same as when you turned it off.

The OMNI V operates USB, LSB, fast or slow QSK CW and real FSK. FM is optional. All bands from 160 through 10 meters are push button selectable. Each band position covers 500 kHz plus 30 kHz over-shoot at the band edges. The four 500 kHz segments of the 10 meter band are switched automatically as you tune through the segment limits. Tuning is in your choice of 10 Hz or 50 Hz increments on SSB, CW and FSK. With the FM option, tuning is in 100 Hz or 500 Hz increments. Up/Down buttons tune in 10 kHz or 50 kHz increments.

An auxiliary frequency tuning system is available and plugs into the rear panel. This allows you to remotely tune the frequency from the most convenient and comfortable position. It takes about 10 ms to fall in love with this option.

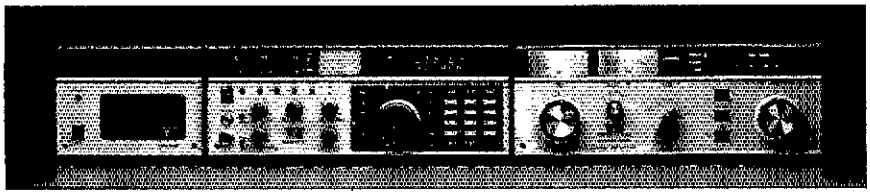
A noise blanker and audio speech processor are standard equipment as is the cw sidetone and speech monitor. The rear panel has a full complement of inputs, outputs and controls for the convenience of the all-mode operator, including an auxiliary RX antenna input. High speed key lines are provided for QSK control of a fast switching amplifier, such as the TITAN or HERCULES II. Changeover in fast QSK is less than 30 ms, great for CW and the digital modes.

The front panel is spacious and friendly. The vacuum fluorescent display uses large, bright, easy to read elements. The frequency display doubles as the 24 hour clock display when the CLOCK button is pressed. Other elements indicate VFO status and warn when the memories are full.

All four of the 6.3 MHz I-F crystal filter positions are push-button selectable, independent of mode. A second filter socket is also provided, in series, behind the standard 2.4 kHz filter in the 9 MHz I-F. This may be used for an optional 2.4 kHz, 1.8 kHz, 500 Hz or 250 Hz filter which is selected with the "NARROW" button. This adds six or eight poles into the crystal filter network and even further reduces the impact of adjacent strong signals. Most impressive!

If you do not need a general coverage receiver in your HF rig, the elegant OMNI V is a great choice. If you are also a serious DX-er and/or contester, the OMNI V is the best choice.

The OMNI V Station with Model 961 Matching Power Supply, and the Mighty Titan Amplifier.

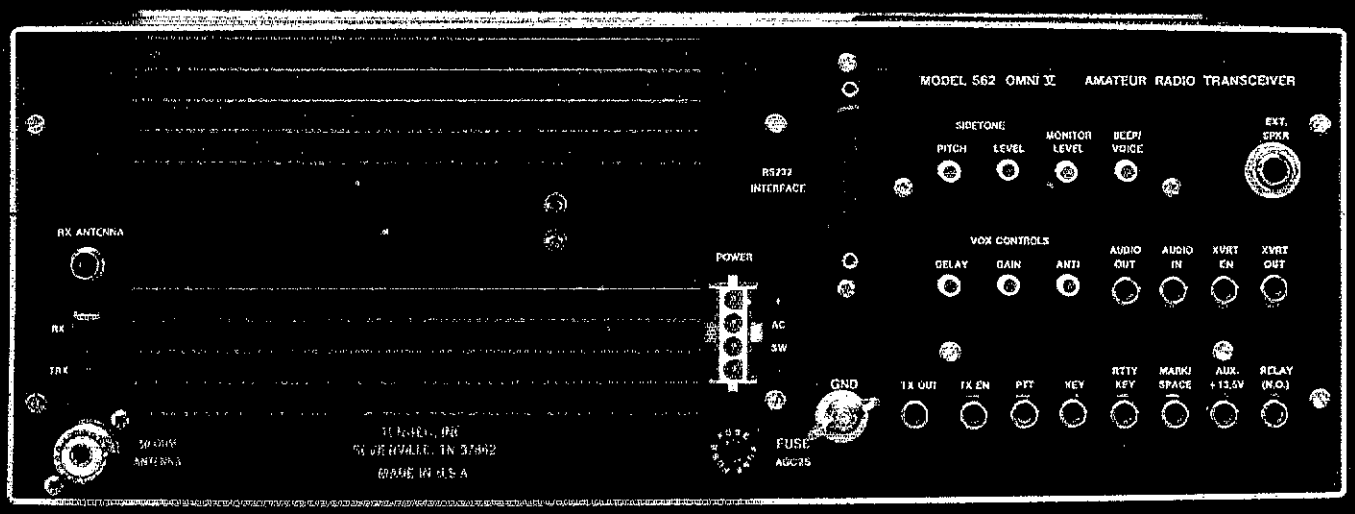


GENERAL SPECIFICATIONS

Frequency Range: Transmit and receive on all ham bands from 160 through 10 meters in their entirety. Twelve 500 kHz segments plus 30 kHz over-shoot at the upper and lower edges of the segments.
Frequency Control: LO generated from a crystal oscillator mixed with a low noise 5.0 - 5.5 MHz phase locked loop.
Frequency Stability: Worst case, 1 PPM per degree C at 29.999 MHz.
Frequency Accuracy: +-100 Hz @ 25 degrees C.
Antenna Impedance: 50 Ohms, unbalanced.
Printed Circuit Boards: G-10 epoxy glass.
Power Required: Receive = 1.5 A. Transmit = 20 A. 12-14 Vdc.
Dimensions: HWD 5¾" x 14¾" x 17", 14.6 x 27.3 x 43.2 cm.
Net Weight: 16 lbs. 7.25 kg.

TRANSMITTER

Modes: USB and LSB (J3E), CW (A1A), FSK (F1A). Optional FM (F3E).
DC Power Input: 200 watts maximum.
RF Power Output: ALC stabilized, adjustable from 20 watts to 100 watts (50 Ohm load) with front panel RF OUT control.
Microphone Impedance: 200 Ohms to 50k Ohms. Bias voltage for electret mic is provided in front panel connector.
CW Sidetone: Internally generated with rear panel level and tone adjustments, independent of front panel audio level control.
SSB Generation: 9 MHz, 8 pole crystal ladder filter, balanced modulator.
Carrier Suppression: Greater than 60 dB.



Impressive from either end... but it's how we make ends meet that really delivers the difference.

Unwanted Sideband Suppression: Greater than 60 dB at 1.5 kHz AF input.
Harmonic Emissions: Greater than 45 dB below peak power output.
Third Order Intermod Products: –30 dB from two tone at 100 watts PEP.
Metering: Switchable forward power, SWR, collector current or audio processing level on SSB.
CW Offset: 600 Hz.
FSK Shift: 170 Hz.

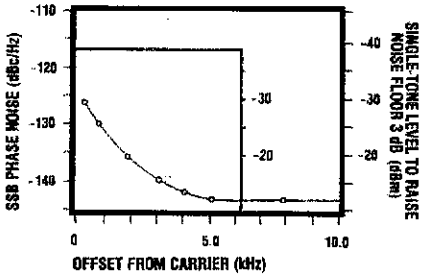
RECEIVER
Modes: LSB, USB, CW and FSK. FM with optional board.
Sensitivity: .15 uV for 10 dB signal to noise ratio at 1.8 kHz bandwidth. With FM option, .3 uV for 12 dB SINAD at 15 kHz bandwidth.
Selectivity:

	-6 dB BW	-60 dB	Shape Factor
Standard 2.4 kHz	2.4 kHz	3.36 kHz	1.87:1
Opt. 1.8 kHz	1.8 kHz	2.90 kHz	1.60:1
Opt. 500 Hz	500 Hz	1.40 kHz	2.80:1
Opt. 250 Hz	250 Hz	.85 kHz	3.40:1
Opt. FM	15 kHz	30.00 kHz	2.00:1

Attenuator: –20 dB.
I-F Frequencies: 1st I-F 9 MHz, passband tuning I-F 6.3 MHz.
Image Rejection: ►100 dB.
I-F Rejection: ►60 dB average.
Noise Blanker: Switchable on/off with width adjustment.
Dynamic Range: 97 dB, measured with standard 2.4 kHz filter at 20 kHz spacing. 100 dB + with cw filters.
Third Order Intercept: + 10 dBm.
Noise Floor: –133 dBm @ 2.4 kHz bandwidth.
Squelch Sensitivity: Less than .6 uV.
Receiver Recovery Time: Less than 30 ms.
Pass Band Tuning I-F Shift: + –2.3 kHz.
Audio Output: Speaker, 1.5 watts @ 8 Ohms. Fixed level 1 mw @ 600 Ohms.
Notch Filter: 250 Hz to 2.2 kHz, greater than 50 dB notch depth.

Audio Bandpass Filter: 4 pole, variable center frequency 220 Hz to 1.7 kHz, 35% band width @ –6 dB.
Tone Control: Variable 15 dB roll-off @ 5 kHz.

PHASE NOISE PERFORMANCE OF THE OMNI V
–127 dBc/Hz @ 250 Hz offset from carrier.
–146 dBc/Hz @ 5 kHz offset from carrier.



Here is a graph of the phase noise performance of the OMNI V receiver. These measurements can only be made under laboratory conditions and, even then, our test equipment is at the limit of its ability to measure the noise at the narrow offsets. The significant measurements are those close-in. Note that this graph does not even go out to 25 kHz offset where many of the published measurements are made. Certainly, we invite comparison.

A WORD ABOUT COST
The OMNI V and the Paragon are the same price. Our 12 band crystal mixed oscillator is the same cost to manufacture as our general coverage synthesized oscillator. The choice between these two transceivers is based on general coverage vs. the best possible receiver performance in the ham bands.

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DX-ing, contests, pile-ups, traffic handling. When you need to command attention, you will with the SB-1000 Linear Amplifier from Heath. And you'll do it for a cost that no one else can match.

From our recent DX-pedition to Taiwan, operators easily controlled pileups with the SB-1000 and nothing more than a dipole antenna. This means that when conditions are tough, you know you can depend on your SB-1000 to lift your signal above the rest. Whether you're using a dipole or stacked monoband beams.

Proven output power

We don't play games by using old rating methods to make you pay for input power you don't get at the antenna. What you do get is 1000 watt output of peak envelope power on SSB and 850 watts on CW. Even 500 watt output on RTTY.

On the chance that someone might doubt our claims, at hamfests we demonstrate that with only 80 to 100 watts of drive, our SB-1000 develops more output than even the world-famous Heath SB-220!

Designed for today, the SB-1000 offers quiet, compact tabletop operation at rated output. That's only 1.7dB (or about ⅓ of an S-unit) below the maximum legal power limit.

"I built it myself!"

Because you build the Heathkit SB-1000 Linear Amplifier yourself, you not only enjoy cost savings, you have the unique opportunity of knowing your equipment inside and out.

A top quality amplifier, cost savings, bragging rights, plus industry-recognized Heathkit manuals and technical assistance from our licensed ham consultants, should you ever need it. An offer that's hard to pass up.

See the SB-1000 and our complete line of amateur radio products in the Spring Heathkit Catalog. Call today for your free copy.

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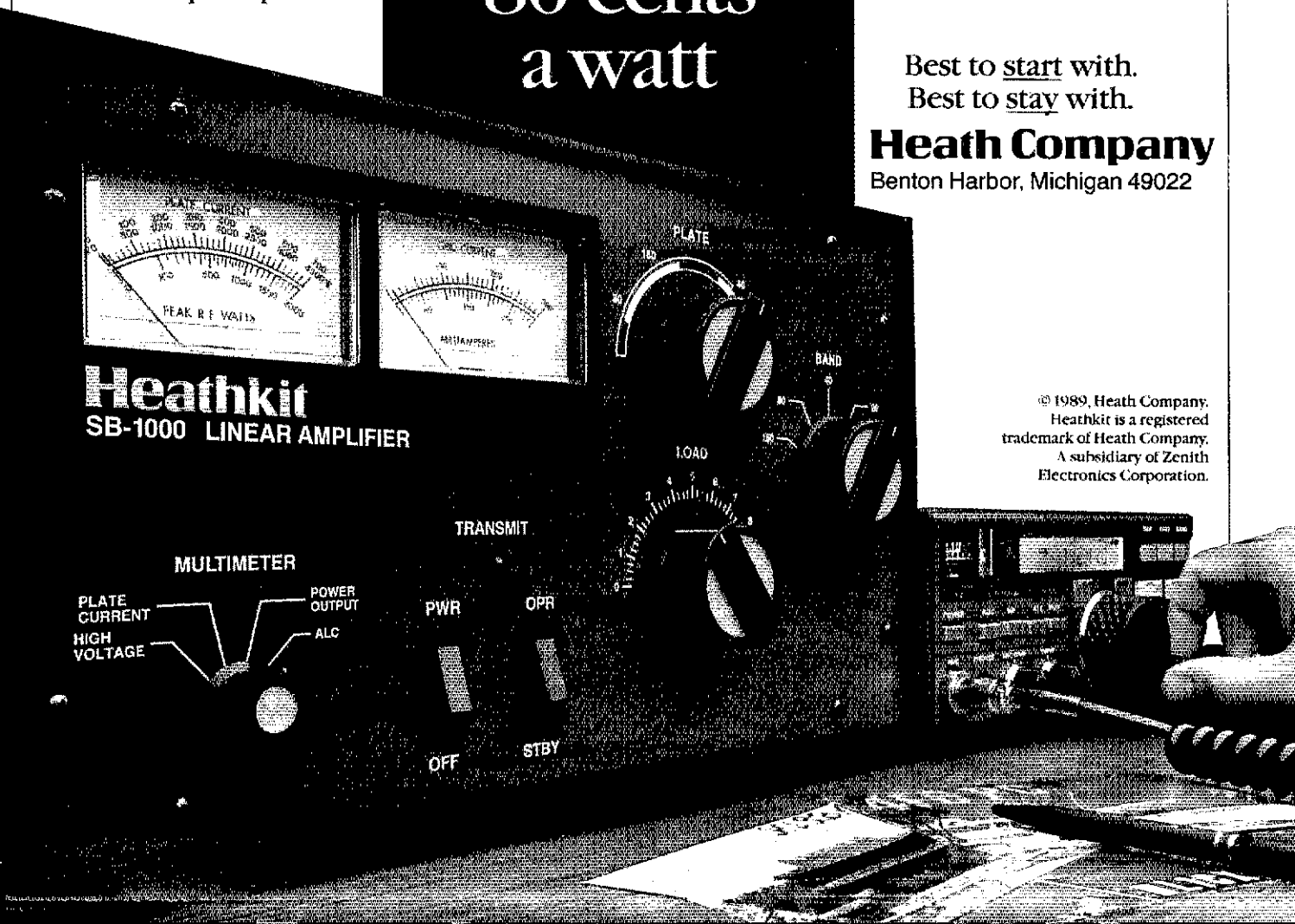

TECH TALK from ICOM

Packeting Via Satellite With ICOM

Packet Radio and OSCAR satellites are two very popular areas of interest among today's amateurs, and their combined operation opens a fascinating new dimension in printed word communications. This unique concept of "computer-to-computer linking" via a flying electronic mailbox or "BBS" was proven highly successful by OSCAR 12, and our upcoming microsatellites will expand those activities significantly. Larger, deluxe-featured OSCAR's like the geostationary Phase IV units (which will also include Packet operations) are still included in amateur radio's space program. Microsats have simply been added because they are more economical to build and easier to launch.

Two of our first micros, PACSAT and LUSAT, will employ a BBS/Packet mailbox with four uplink channels on 2-meters FM and one downlink channel on 70cm SSB. Ground station requirements to operate both these and future satellites are a pair of compact VHF/UHF multi-mode transceivers, two small antennas, a personal computer, and a satellite-compatible modem/TNC (a Manchester-encoded FSK modulator and a BiPhase Shift Keying demodulator). Another microsat, DOVE, will feature SKI TREK'ers monitored on their ICOM handhelds. DOVE's digitalker, however, will be specially orientated for amateur radio use. Tuning in DOVE with ICOM's new IC-2SAT FM handheld will be easy. Program its 24 hour clock to switch the rig on at "orbit time," it reminds you of the action, and it switches itself off after a pass. That's truly today's most intelligent handheld!

Setting up a deluxe and high performance station for both present and future Packet, SSB and FM operation is a cinch with ICOM's top-line equipment. ICOM's IC-275A/H multi-mode 2-meter and IC-475A/H multi-mode 70cm transceivers, for example, incorporate several advanced features for outstanding satellite operations. Dual Direct Digital Synthesized VFO's in each unit assure very low noise reception, ultra-clean transmitted signals, and high speed T/R switching for great Packeting. A rear panel data input socket and front panel DATA switch are also included on both transceivers for convenient single-button shifts between voice and printed modes. Including ICOM's optional AG-25/2-meter and AG-35/70cm mast-mounted GaAsFET preamps adds the perfect finishing touch to this outstanding satellite system.

ICOM manufactures two versions of the IC-275. Units with "A" designations feature an internal AC supply, rear DC socket, and deliver 25 watts output. The IC-275H delivers 100 watts output and the IC-475H is 75 watts output. Each "H" model is powered by ICOM's external PS-55AC supply.

Interfacing the IC-275A/H and IC-475A/H or any other pair of ICOM transceivers with ICOM's optional CT-16 satellite adapter truly makes satellite operations delightful. The downlink transceiver's tuning dial is then used for single knob tuning. When one transceiver is tuned down frequency, the other transceiver automatically shifts up frequency an equal amount to "follow" a satellite's inverting passband (and vice-versa). Additionally, the uplink unit's dial can be readjusted as required for doppler shift compensation. It is fantastic!

Since the CT-16 satellite adapter operates with several ICOM transceivers for mode A, B, J, K and L, a brief switch-setting or "rig specifying" procedure is necessary at its time of installation. Use our accompanying chart or your rig's manuals to determine each transceiver's address, then set the CT-16's switches accordingly. Remember, the CT-16's left switch's address should agree with the transceiver you plug into the CT-16's left socket, and the right switch's address should correspond to that of the rig-connected to the right socket. You are now ready for top-notch satellite action.

If you experience problems, double-check each transceiver's internal addressing switches with this page's figure and reset them as necessary. Remember, too, previous owners of used rigs could have changed internal addresses. If you need further guidance or own a rig not listed in our figure, simply call ICOM's service hotline at (206) 454-7619 for friendly assistance.

Would you like more information on OSCAR's and the new microsatellites? A special edition of ICOM's highly acclaimed newsletter, RADIO NEWS, featuring those topics will soon roll off the press. Send your name and address and a brief description of your activities and interests to: ICOM America, Inc., 2380 - 116th Avenue, N.E., Bellevue, WA 98004 to reserve a free copy. Tell us, also, what topics you would like to see discussed in future ICOM Tech Talks. As always, ICOM stands by your side with a sincere dedication to ensuring that you enjoy all aspects of our super hobby!

ICOM MODEL NO	TRANSCEIVER'S ADDRESS CODE	CT-16'S RELATED SWITCH SETTINGS (ON 1 2 3 4 5 6 7)
IC-275A/H	16	OFF OFF OFF OFF ON OFF OFF
IC-475A/H	20	OFF OFF ON OFF ON OFF OFF
IC-725	40	OFF OFF OFF ON OFF ON OFF
IC-735	4	OFF OFF ON OFF OFF OFF OFF
IC-761	30	OFF ON ON ON ON OFF OFF
IC-765	13	ON OFF ON ON OFF OFF OFF
IC-781	38	OFF ON ON OFF OFF ON OFF
Other ICOM's: Call ICOM Customer Support		

Fig. 1 – Binary addresses of transceivers.

ICOM America, Inc., 2380 - 116th Ave. N.E., Bellevue, WA 98004 **Customer Service Hotline (206) 454-7619**
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ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

ICOM

IC-726 HF Transceiver

NEW TECHNOLOGY AND SOPHISTICATION IN ONE SMALL PACKAGE

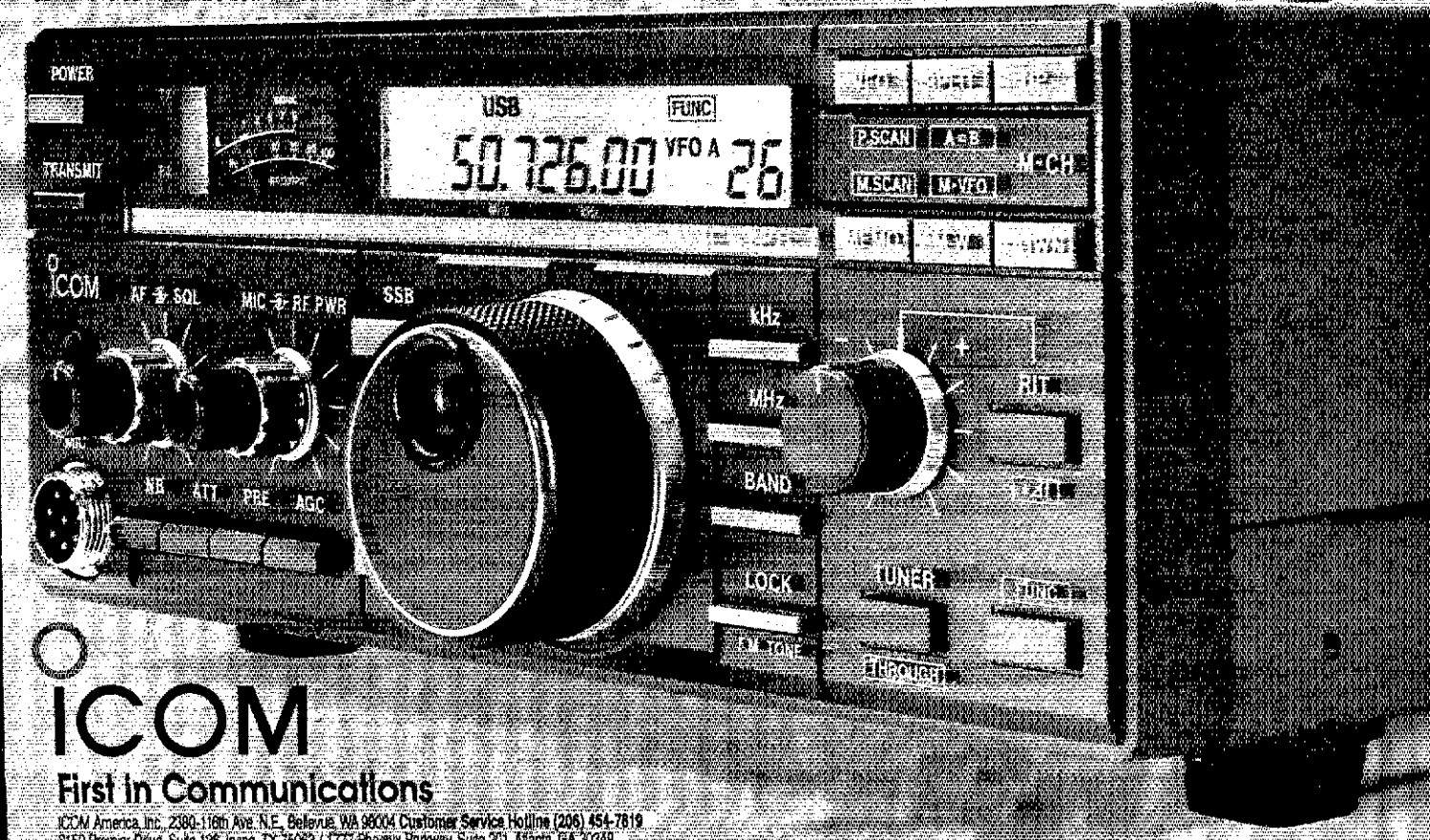
ALL HF PLUS SIX METERS!

ICOM does it again by combining top performance on all HF bands with deluxe six-meter operation in an ultra-compact and easy-to-operate transceiver! Six-meter DXing is terrific and the IC-726 is your key to great all mode action fixed, mobile or portable.

UNCOMPROMISING FEATURES include: ›All mode operation from 160 through six-meters ›Shortwave reception from 500KHz to 33MHz plus 46.2 to 61.1MHz ›100 watts SSB and CW ›10Hz digital frequency display ›26 memories tune full range and reprogram independent of VFO use ›Three scan modes ›Noise blanker.

ADVANCED CIRCUIT DESIGNS feature: ›Direct digital synthesizer (DDS) ›Dual VFOs ›Band stacking registers ›Sensitive 105db dynamic range receiver ›Panel-selectable RF preamp and attenuator ›Built-in controller for optional AH-3 remote antenna tuner for HF operation.

The outstanding IC-726 puts all the exciting DX action of sunspot cycle 22 right at your fingertips, and it is confidently backed with ICOM's no-compromise one year warranty. See this amazing unit at your local ICOM dealer.



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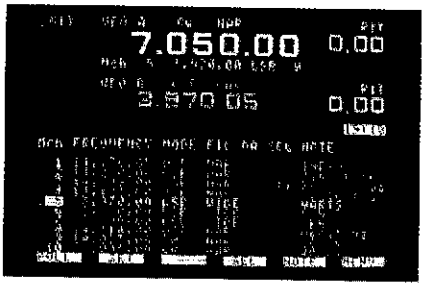
ICOM

IC-781 HF Transceiver

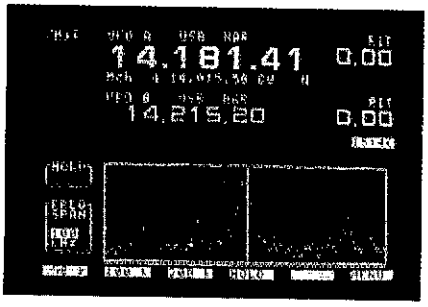
THE FUTURE OF AMATEUR COMMUNICATIONS

Once in a lifetime, a transceiver is introduced that's so extraordinary and innovative that it opens a totally new era in HF communications. ICOM's pacesetting IC-781 proudly exhibits that hallmark achievement with futuristic designs and features of true legendary proportions. Whether DX'ing, contesting, pioneering new interests or enjoying unquestionable top-of-the-line performance, the IC-781 is indeed today's standard of excellence!

Multi-Function Five Inch CRT. Displays frequencies, modes, memory contents, operating notes, RIT, two menu screens, plus a panoramic view of all signals in a selected range. A portion of the screen also serves as a display for data modes like RTTY, AMTOR, and PACKET.



Unique Spectrum Scope. Continuously indicates all signal activities and DX pileups with your operating frequency in the center. Selectable horizontal frequency spans of 50, 100, and 200KHz for each side of the frequency you're listening to. Vertical range indicates relative signal strengths. A contester's dream!



Dual Width Noise Blanker includes MCF filter plus **level and width controls** to eliminate pulse and woodpecker noise with minimum adjacent-signal interference.

Incomparable Filter Flexibility. Independent selection of wide and narrow SSB filters plus CW filters. Second and third CW IF filters are independently selectable!

Dual Watch. Simultaneously **receives two frequencies in the same band!** Balance control adjusts VFO A/B receive strength levels. You can check additional band activity, even tune in your next contact, while in QSO without missing a single word!

DX Rated! 150 watts of exceptionally clean RF output. Easily drives big amplifiers to maximum power.

Twin Passband Tuning with **separate controls for second and third IF stages!** Increases selectivity and narrows bandwidth, independently varies low and high frequency response, or functions as IF shift. **It's DX'ing Dynamite!**

A Total Communications System! Includes built-in 100% duty AC supply, high speed automatic antenna tuner, iambic keyer, semi-automatic or full QSK CW break-in to 60 wpm, Audio Peaking Filter (APF), RF speech processor, multiscanning, 105dB dynamic range, all-band/all-mode receiver with general coverage, and much more!

ICOM Dependability. The phenomenal IC-781 is built for action and backed with the most extensive warranty in the industry.

See the IC-781 at your local ICOM dealer.

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WHAT'S NEW ON THE ARRL BOOKSHELF?

The 1990 Handbook and Tune in the World with Ham Radio

The new editions you've been waiting for. You'll find more information about them elsewhere in this issue.

Conference Proceedings: 8th Computer Networking and Microwave Update, 1989

Here are two conferences that are on the cutting edge of Amateur Radio technology. *The 8th Computer Networking Conference Proceedings* (#2510) has papers submitted for the conference held October 7, 1989 in Colorado Springs, and *Microwave Update, 1989* (#2529) has papers submitted for the conference held on the same weekend in Arlington, Texas. Other recent conference proceedings booklets available are *Proceedings of the ARRL National Education Workshop* (2405) and *Proceedings of the 23rd Central States VHF Conference* (#2413). Price of each conference proceeding booklet is $12 plus postage and handling.

N6RJ Second Op and N6RJ Second Op Software

Here in one place is all of the DX information you need about a particular country: Prefix, Continent, CQ Zone, Beam Heading, Postage Rates, ITU prefix. The software version (requires IBM PC, 640K installed memory, 2 DSDD 5-1/4" floppy disk drives or 1 DSDD 5-1/4" floppy disk drive and hard disk highly recommended) is packed with applications: comprehensive country data, bearings (long and short path) logging system, summary displays of DXCC/WAZ, extensive printing functions (like DXCC need-list by band, band-mode, worked-not confirmed etc), GMT clock with WWV propagation forecast timer, *N6RJ Second Op* (#243X) $9; *N6RJ Second Op Software* vers. 2.0 (#2421) $60 plus postage and handling.

What's going on between our HF ham-bands?

The 1990 edition of *Passport to Worldband Radio* (#2537, $15 plus postage and handling) is hot off the press. In it you will find listings of shortwave broadcasts from over 150 countries. *Ferrell's Confidential Frequency List* (#2206, $20 plus postage and handling) has over 370 pages listing, HF, CW, Coast, Fixed, Embassy, Military, FAX, Aircraft and Aircraft Weather, plus Time transmissions.

The FCC Rule Book

Here are the new rules with important interpretations in the style that has made the "Washington Mailbox" column in *QST* so popular. Find out what you can and cannot do under the new regulations. These are the most sweeping changes in the Amateur Radio rules in decades, so you'll need to have a copy close at hand. 8th Edition (#0453) $9 plus postage and handling.

The Technician Class License Manual

On November 1, 1989 the new element 3A—Technician Class exam becomes effective. We've written this book around the new question pool to provide an understanding of key concepts and to make passing the exam a snap! At the beginning of each chapter, you will find a list of key words that appear there, along with a simple definition for each word or phrase, and as you read the text you'll find these words printed in **bold type** the first time they appear. At the end of the book you'll find the complete question pool with distractor questions, answer key (with page references showing where you can check the text for a quick review) and there's also a glossary of all the key words used in the book. (#2375) $6 plus postage and handling.

The General Class License Manual

There won't be a change in the General Class exam until November 1, 1990, but we've taken this opportunity to break out the element 3B material from the *Technician/General Class License Manual* and put it in a separate book. The description above of the *Technician Class License Manual* also fits the new *General Class License Manual.* (#2383) $6 plus postage and handling.

Amount of order/shipping and handling: less than $20/$2.50, $20.01-30.00/$3.50, $30.01-40.00/$4.50, $40.01-50.00/$5.50, $50.01-75.00/$6.50, Over $75/$7.50. Add an additional $1 for UPS.

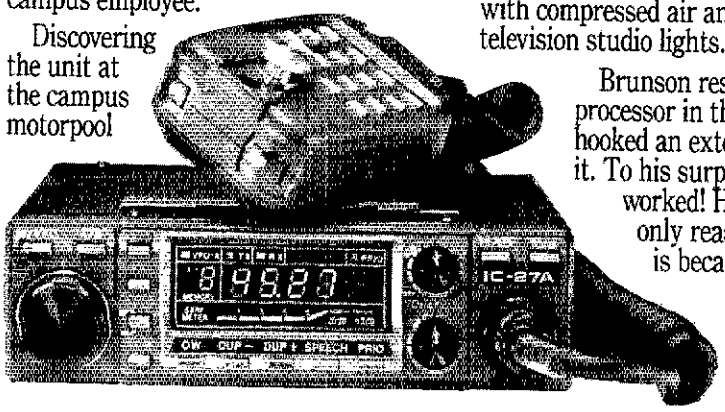
ARRL **225 MAIN STREET** **NEWINGTON, CT 06111 USA**

FIVE YEARS IN A STORM DRAIN

AND STILL WORKING!

The continuing saga of ICOM dependability continues. Hiding in a storm drain for five years, the long forgotten ICOM IC-27A was finally found. For John Brunson, KA4DLU, of Ramer, Alabama, it was quite a surprise.

Some five years ago his ICOM IC-27A VHF mobile transceiver was stolen from his car. Recently it turned up in a storm drain on the Troy State University campus. The mud-filled unit was in working condition when found by a campus employee.



Discovering the unit at the campus motorpool where it was turned in, Brunson, chief engineer at WTSU radio at Troy State University, made a quick check of the serial numbers and the original police report to confirm the radio was indeed the one stolen five years ago.

"The radio was full of mud and rust," Brunson said. "It was so corroded, I didn't know if I could ever get it to work again." He continued, "I took a photo chemical tray, filled it with alcohol, and soaked the radio. Then I blew it out with compressed air and dried it with television studio lights."

Brunson reset the microprocessor in the radio and hooked an external speaker to it. To his surprise, the unit worked! He added, "The only reason it was found is because a new building is being constructed on that site. It has probably been there since it was stolen. I'm utterly amazed that the IC-27A worked after five years in a storm drain!"

Another incredible performance from a dependable ICOM radio.

DO YOU HAVE A TOUGH ICOM RADIO STORY? If so, we'd like to hear from you. Send your best ICOM "Tough Radio" story to: ICOM America, Inc., Attn: "Tough Radio", 2380-116th Avenue N.E., Bellevue, WA 98004.

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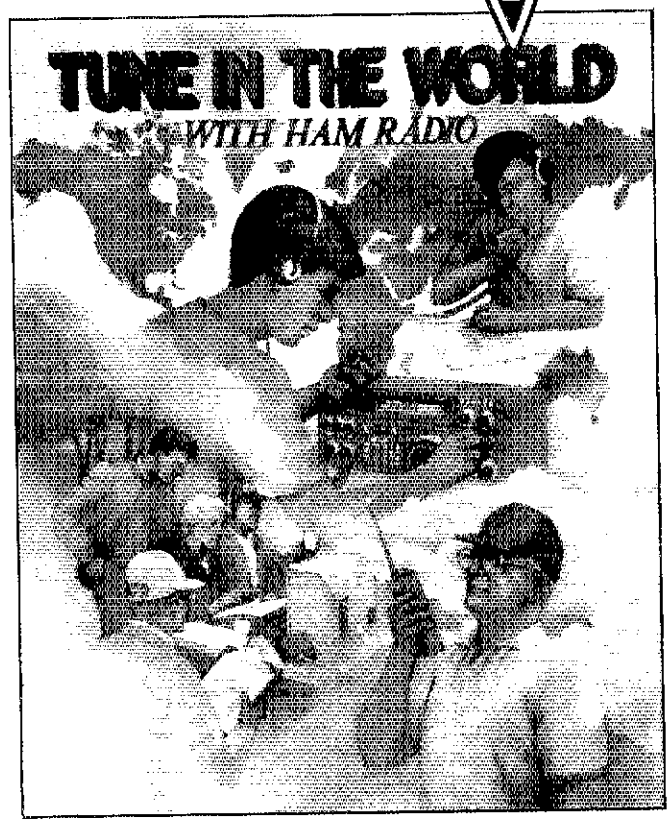
For Fall Classes!



New exams mean a new edition of **Tune in the World with Ham Radio**! Using ARRL's beginner's package, students will quickly pass their exam in no time and be on the air to enjoy the great band conditions we are experiencing today. Novices can now communicate not only using Morse code, but voice communications on 10-meters and VHF/UHF repeaters as well. They can also use digital communications to link home computers through packet radio networks. Imagine being able to personally communicate with an astronaut as the Space Shuttle circles the Earth or with someone on a remote island in the South Pacific!

Besides the bright new cover, we're also excited by the new text which we've made even more understandable and fun for the newcomer. There are hundreds of illustrations that describe important concepts. As with the last edition, two 90-minute cassettes are included. One teaches the code and the other provides practice to make passing the code portion of the exam a snap! Since the tapes are recorded in stereo, the voice portion can be switched off for self-testing and even more practice.

The 30-question part of the exam on regulations and basic radio theory is chosen from categories of topics that are contained in the total pool of 372 possible questions. The text presents all of these questions and distractors along with the answer key and a sample Novice test.

The **Tune in the World with Ham Radio** package including the text and both tapes is available for $19. The book alone is $14. Add $3.50 for shipping and handling.

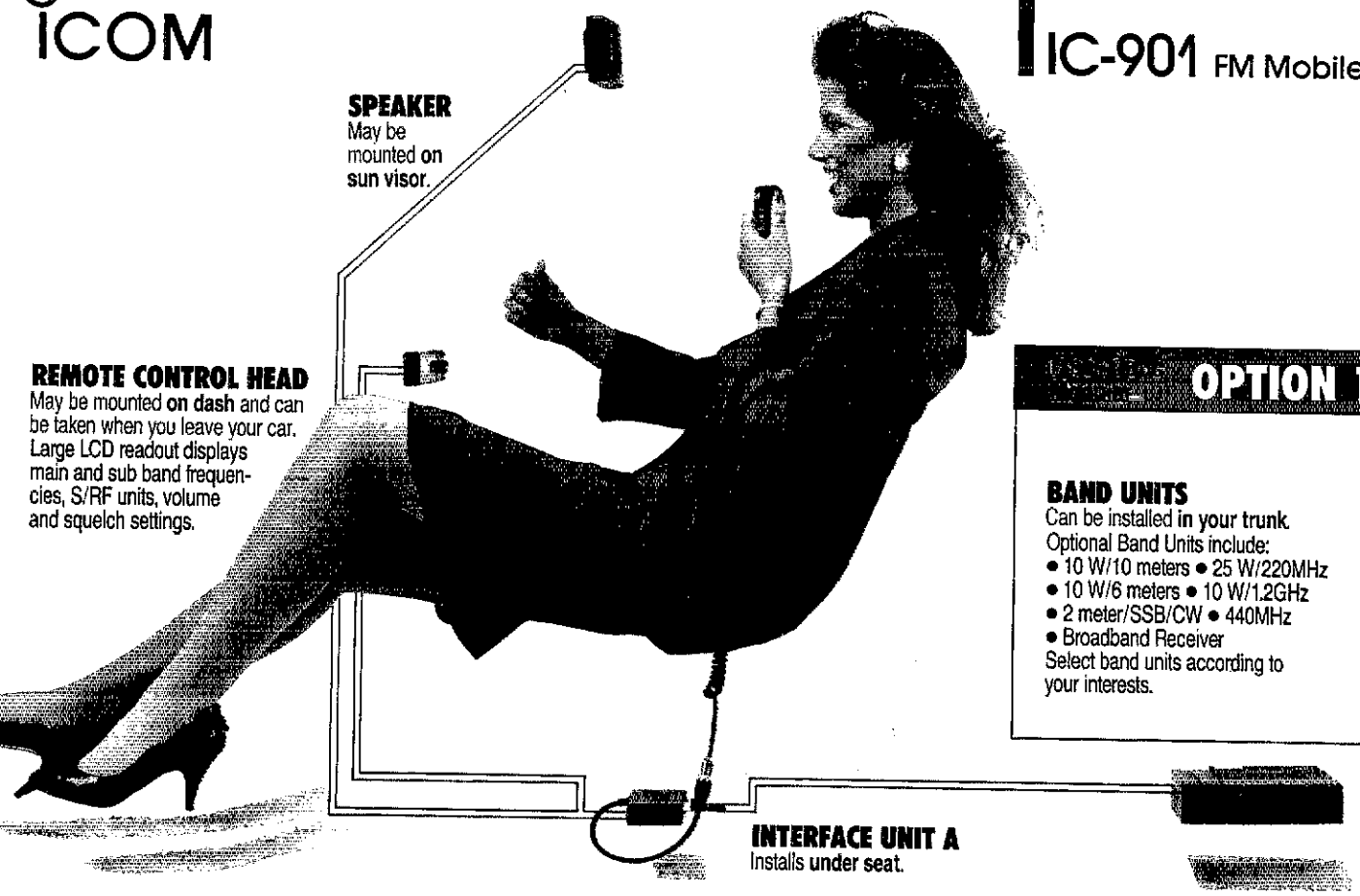
New 8th Edition

The new edition covers questions that will be used on exams effective November 1, 1989.

The American Radio Relay League, Inc., 225 Main St., Newington, CT 06111 USA

ICOM

IC-901 FM Mobile



OPTION 1

BAND UNITS
Can be installed **in your trunk.**
Optional Band Units include:
- 10 W/10 meters • 25 W/220MHz
- 10 W/6 meters • 10 W/1.2GHz
- 2 meter/SSB/CW • 440MHz
- Broadband Receiver

Select band units according to your interests.

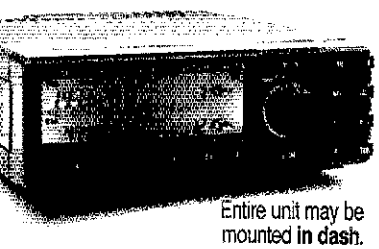
THE WORLD'S MOST VERSATILE MOBILE

OM'S NEW IC-901 OFFERS THREE ASY-TO-OPERATE TRANSCEIVER ONFIGURATIONS

The IC-901 can be (1) field-combined as a ly separated and fiber optic-linked system th multiple trunk-located band units, (2) a gle-cabinet transceiver for dashmounting (3) a remote-controlled unit for underseat tallation.

OPTION 2

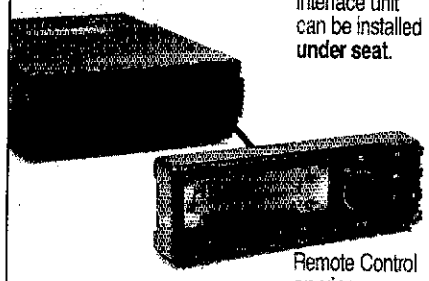
Control head is installed directly to the interface unit, making one compact unit.



Entire unit may be mounted **in dash.**

OPTION 3

Dual band and interface unit can be installed **under seat.**



Remote Control **on visor.**

The IC-901 is supplied with 50 watts 2-meter and 35 watts 440MHz FM band units covering 138-174MHz Rx and 140-150MHz Tx plus 440-450MHz Rx/Tx. Adding more band units is a snap. They install easily out-of-sight in your trunk for security!

Outstanding Features Include: Full duplex operation, simultaneous dual band reception, ten memories per band, programmable band and memory scanning with skip function, any Tx offset, and much more.

The IC-901 also features a clever new **DTMF Calling System** which silently monitors a busy frequency or repeater for stations calling you. Squelch automatically opens when a signal with the same DTMF code you present is received.

Optional Pager Function. When activated, your IC-901 transmits a six-digit DTMF code to call others. Its last three digits identify you as the calling station.

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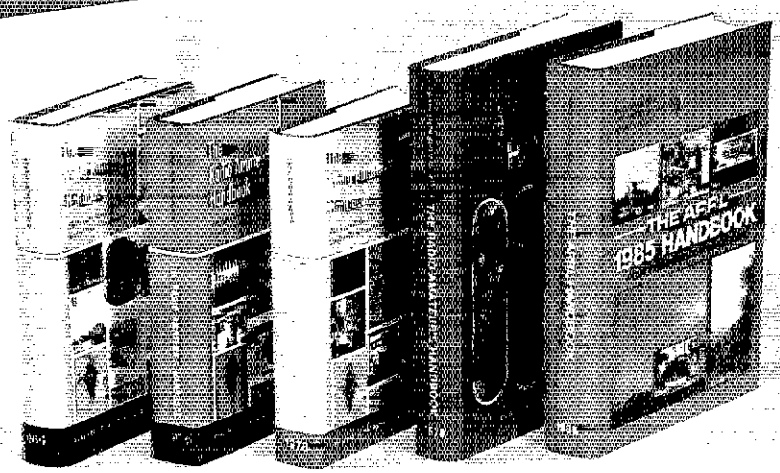
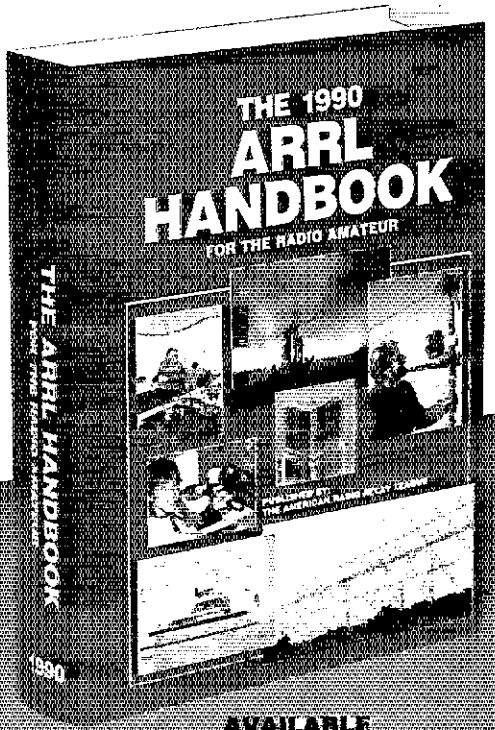
When was the last time you bought a new Handbook?





AVAILABLE IN NOVEMBER

If you bought one of the **Handbooks** pictured above, you're not alone. These represent over 485,000 of the 5.8 million copies of the **Handbook** purchased since 1926! ARRL's premier publication is successful because it is updated every year. The new sixty-seventh edition is no exception. With over 1200 pages and over 2100 tables, figures and charts, **the 1990 ARRL Handbook for the Radio Amateur is better than ever!**

Every ham is interested in antennas, and we've added a host of new antenna projects including three high-performance Yagis for 144, 220 and 432 MHz designed by Steve Powlishen, K1FO. Dick Jansson, WD4FAB, has completely revised the space communications chapter, which includes his innovative helical array for AO-13 Mode L.

But that's not all. You'll find many other popular construction projects that can be built in a weekend, such as power supplies, keyers, measuring devices, QRP transmitters and VHF/UHF preamps. For the more ambitious builder, there are projects like a high-performance communications receiver, high-power HF and VHF amplifiers, a 1296-MHz transverter or digital audio memory keyer.

The **Handbook** has always been famous as a reference for component data. You will find an entire chapter devoted to everything from tube and transistor specifications to aluminum tubing sizes. Also featured is the most up-to-date information on digital techniques and operating practices.

At $23, the **Handbook** remains an exceptional value for a hardcover technical publication. For shipping and handling in the US, please add $3.50 ($4.50 for UPS), elsewhere add $5 for shipping by surface mail. Save on shipping charges by visiting your favorite ARRL dealer!

Here is a description of what is covered in the **Handbook**:

The first five introductory chapters cover basics of Amateur Radio, electrical fundamentals, radio design technique and language, solid state fundamentals and vacuum tube principles. Next are 12 chapters devoted primarily to these topics: power supplies, audio and video, digital basics, modulation and demodulation, RF transmitters, receivers, transceivers, repeaters, power amplifiers, transmission lines and antenna fundamentals. Another four chapters cover voice, digital, image and special modulation techniques. The RF spectrum, propagation and space communications are covered in two chapters. The construction and maintenance section offers 12 chapters of useful projects ranging from power supplies and antennas through digital equipment. You'll also find up-to-date component data that the **Handbook** is famous for. The final five chapters cover obtaining your license, station design and operation, interference, monitoring and direction finding. An abbreviations list and huge index make up balance of the book.

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Presented by:

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SATURDAY
November 11, 1989
9am til 2pm

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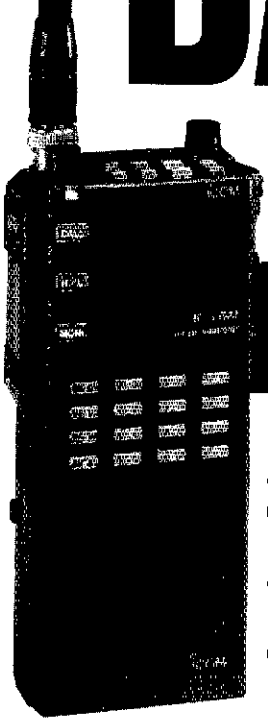

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MN 2.00 analyzes free-space antennas 2-3 times faster than before, with twice as many analysis segments available. New plotting features enhance pattern shape and detail. Better plot printouts. Analyze almost any antenna made of wire or tubing, in free space or over realistically-modeled earth. Compute forward gain, F/B, beamwidth, sidelobes, current, impedance, SWR, take-off angle, and patterns. Compute the interaction among several nearby antennas. MN includes libraries of antenna and plot files, a file editor, and extensive documentation. $75.

YO 2.00 features a powerful new gain-F/B-SWR tradeoff mechanism, optimization across a frequency band, control of all sidelobes, and full EGA color. Better designs, nicer plots. YO optimizes Yagi designs by automatically adjusting element lengths & spacings for maximum forward gain, maximum F/B, and minimum SWR. YO is extremely fast, and can compute several trial designs per second. YO includes models for gamma, T, hairpin, and beta matches, element tapering, mounting plates, and frequency scaling. A Yagi library, file editor, and extensive documentation are included. $80.

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• SUPERSCAF •
(A Switched-Capacitor Audio Filter)

SuperSCAF is a versatile switched-capacitor filter for eliminating interference and noise on CW, SSB, RTTY, AMTOR, PACKET and other narrow band modes. Extremely steep filter skirts remove adjacent clutter and noise to enhance weak signal reception and greatly increase intelligibility and listening comfort.

SuperSCAF incorporates a switched-capacitor bandpass filter, an economical implementation of digital filter technology. Extreme sharpness, stability, accuracy and complete freedom from ringing characterize this design approach. Bandwidth is adjustable from a minimum of 30 Hz to a maximum of 3700 Hz, allowing optimum passband tailoring under widely varying conditions. Skirt slope is 150 dB per octave (about twice as steep as a good crystal filter), and stopband attenuation is at least 51 dB. SuperSCAF is connected via the receiver's speaker or headphone output and provides 1.5 Watts to drive a 3.2 to 8 Ohm speaker. SuperSCAF operates from 105 to 130 VAC.

SuperSCAF is available in kit form for $139.95 or assembled for $179.95. Please include $7.00 for shipping and handling. Order from AFtronics, Inc., PO Box 785, Longwood, FL 32752-0785. Florida resident should include state sales tax.

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ACCESSORIES

HG-COA Coax Arms
HG-TBT Thrust Bearing
HG-GP Gin pole
HG-5, HG-10, & HG-15 Masts.

Hy-gain crank-up towers let you raise the antenna for optimum performance and retract it for service and for security in severe weather.

Order your hy-gain antenna/tower package from *rf enterprises* and save!

Let's talk towers:

So what's the best deal?

Without question you get the most for your money with a Rohn self-supporting tower. We recommend the HDBX series for amateur use -- you won't regret the extra strength. Top it with a large tribander -- like the TH7DXS or a KLM for top performance. If you wish a smaller system, consider a Cushcraft A3S or A4S or an Explorer-14 on an HBX tower. These towers are also great for VHF antennas.

Want the convenience of a fold-over? Again it's Rohn with the fold-over series.

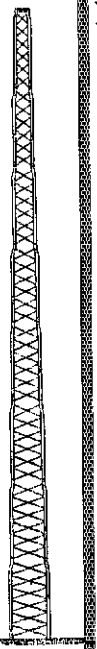
For the ultimate in service and security, it's the hy-gain crank-ups.

Finally, count on us all your tower and antenna needs.

We're ready to deliver!

Hy-gain crank-up series

Rohn self-supporting towers



ROHN TOWERS:

SELF-SUPPORTING

(6 sq. ft. models)

BX40	40 ft.	$CALL
BX48	48 ft.	$CALL
BX56	56 ft.	$CALL
BX64	64 ft.	$CALL

(10 sq. ft. models)

HBX40	40 ft.	$CALL
HBX48	48 ft.	$CALL
HBX56	56 ft.	$CALL

(18 sq. ft. models)

HDBX40	40 ft.	$CALL
HDBX48	48 ft.	$CALL

GUYED TOWER SECTIONS

25G, 45G, 55G & accessories
Call for current prices.

FOLD-OVER TOWERS

FK 2548	CALL	FK4544
FK2558	FOR	FK4554
FK2568	PRICES	FK4564

Rohn fold-over towers are shipped freight prepaid from the factory. Freight additional on other towers.

ANTENNAS & ACCESSORIES

TELEX/hy-gain

TH7DXS: 7-el. tribander
TH5 Mk2: 5-el tribander
Explorer-14: tribander
Disc. 7-1: 40 M. dipole
Disc. 7-2: 2-el 40 M. beam
Disc. 7-3: 40 M. director kit
205BAS: 5-el, 20 M. beam
204BAS: 4-el, 20 M. beam
155BAS: 5-el, 15 M. beam
105BAS: 5-el, 10 M. beam
18HTS: 80-10 M. vertical
18ATV/WBS: 80-10 M. vertical
V2S; V3S; & V4S
64BS & 66BS: 6 Meter beams
OSCAR Link Antennas

HUSTLER

6BTV	80-10 mtr vertical	$139.95
5BTV	80-10 mtr vertical	124.95
G6-144B	2 mtr base antenna	89.95
G7-144	2 mtr base antenna	124.95

Complete mobile systems. CALL!

MOSLEY: *Close-out prices*

CL33, TA33Jr, TA34, TA40KR

ROTATORS

TELEX/hy-gain	YAESU
HDR-300	G600RC G1000SDX
T2X	G800SDX G500A
HAM IV	G5400B
CD 45 II	

ALLIANCE

KLM

KT34A	$409.00
KT34XA	599.00
2M-16LBX	169.95
432-30LBX	124.95
2M-22C	189.95
435-40CX	219.00

HF Monobanders in stock.

BUTTERNUT

HF6V Vertical, 80-10M.
HF2V Vertical, 80 & 40M.
RMK II roof mount kit
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WARC resonators

CUSHCRAFT

A3S (RFE exclusive) Tribander
A4S Tribander
R5 (10,12,15,17,20)
AP8 (80 - 10 Vertical)
AV5 (80 - 10 Vertical)
40-2CD 2-el 40M. beam
A50-5 5-el 6M. beam
617-6B 6 Mtr. boomer
A147-11 11-el 146-148MHz
215WB 15-el wide band 2M
32-19 19-el. 2M beam
4218XL 18-el 2M Boomer
424B 24-el 432MHz
AOP-1 OSCAR pack

Call for prices on the entire Cushcraft line.

TOWER HARDWARE

3/16 EHS Guywire	$0.15/ft.
1/4 EHS Guywire	0.18/ft.
CCM clamps 3/16"	0.39
1/4"	0.49
Thimbles; 1/4TH	0.39
Turnbuckles:	
3/8 E&E; E&J	6.95 / 7.95
1/2E&E; E&J	12.95 / 13.95
Rohn TB-3 Thrust bearing	64.95
Preformed "Big Grips"	
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1/4"	3.49
Guy Insulators	
500D	1.69
502	2.99
Earth Anchor; 4 ft. screw-in	19.00

Phillystran Guy Systems: We have a complete inventory of cable and accessories.

ALPHA-DELTA

DX-A Sloper	$46.95
DX-DD	65.95
DX-CC	79.95
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Protect your station with Alpha-Delta coax and rotor line protectors. Call us!

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82-202-1006 (N for 9913)	$3.49

We stock a full line of connectors.
Connectors installed!

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BELDEN COAX: (When you want the best)

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COPPERWELD ANTENNA WIRE:

Solid: 12 ga...$0.12/ft.; Solid: 14 ga...$0.09/ft.; Stranded 14 ga...$0.10/ft.

ROTOR CABLE:

Standard(6-22, 2-18).....$0.21 Heavy Duty(6-18,2-16).....$0.38/ft.

We stock Andrew Heliax & Connectors.

For direct burial we recommend Andrew LDF4-50A Heliax. (Long life, low loss. $1.99/ft.)

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FT-212RH	45W 2M fm xcvr
FT-712RH	35W 440 fm xcvr
FT-709R	4W, 440 fm HT
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FGR-8800	150KHZ - 30MHZ Receiver
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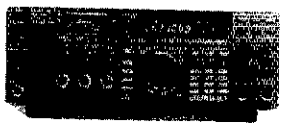
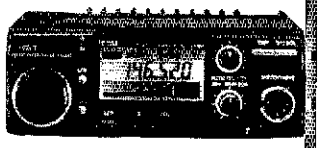
And more! Call for prices.

ICOM

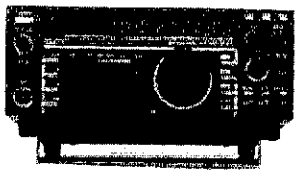
IC-2GAT
IC-02AT
IC-μ2AT
IC-2AT



IC-765



IC-228A/H



IC-735

Team ICOM set a new world record from P4$\emptyset$V in the CQWW Contest.

Let us put ICOM championship equipment in your station!

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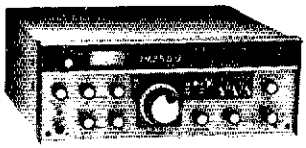

MODEL 561 CORSAIR II

OTHER TEN-TEC PRODUCTS:

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Model 585 Paragon
Model 425 Titan Linear Amplifier
Model 420 Hercules Solid State HF Amplifier
Model 238 Antenna Tuner
Mobile Antennas! Metal Project Boxes.

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KANTRONICS

KAM All mode terminal unit

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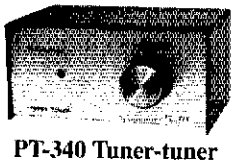

PT-340 Tuner-tuner

Need Palomar baluns to handle big power? Noise bridges, loop amplifiers, or SWR/Power meters? Call us. We can help.

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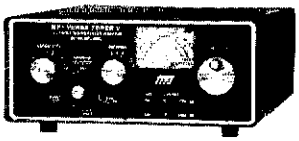
METERS KEYERS TUNERS
ACCESSORIES SWITCHES



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BY-1	Iambic Paddle, black	$54.95
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BY-3	Iambic Paddle, gold	$149.00
YA-1	Low pass filter	$39.95

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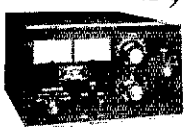

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Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is $1.00 per word. This includes firms or individuals offering products or services for sale. A special rate of 30 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

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 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received October 14 through November 13 will appear in January *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your 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.

The League reserves the right to decline or discontinue advertising for any reason.

CLUBS/HAMFEST/NET

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers—W7GAQ/6, 146 Coleen Street, Livermore, CA 94550.

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Rev. Thomas Sable, S.J., University of Scranton, Scranton, PA 18510.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 48 Murdock Street, Fords, NJ 08863.

FCC EXAMS. Novice-Extra Class, Walk-in's only. Sunnyvale VEC ARC, POB 60142, Sunnyvale, CA 94088-0142, 408-255-9000, 24/hr. Gordon, W6NLG, President. Flea Market, March-Sept, Foothill College, Los Altos Hills, CA.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610.

JOIN The Old Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C., 1409 Cooper Drive, Irving, TX 75061.

LITTLE Big Horn Nets Sundays: 14.057-2200Z, 21.150-2230Z. Native American Indians and Others Welcome. Info WA2DAC.

AYN RAND admirers net 2nd Sunday every month 0045Z, 14270-14280 from RI discuss ideas in her novels Atlas Shrugged and The Fountainhead. K1UKQ.

INTERESTED In Public Service. Join your local radio emergency associated communications team. In Pennsylvania call 717-938-6943.

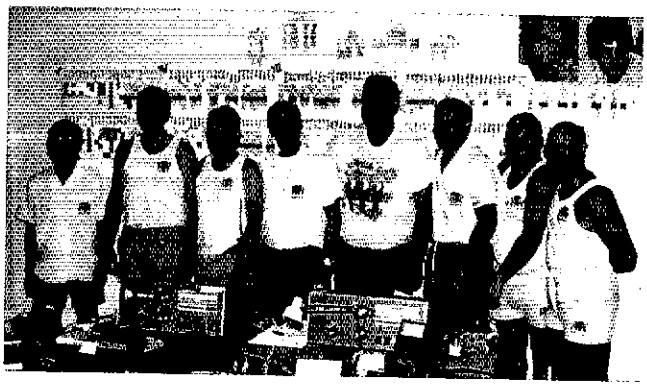
GOOD SAM RV Radio Network—Largest int'l group of hams that are Good Sam's. M-F 2100 Central 7.292. Sunday 1400 Central 14.240. Info send 9x4 SASE to Net Manager Jack Russell, KG5IO, P.O.B. 207, Golden, TX 75444. Do join with us.

TRUCKERS On 10 Mtrs. Would you like to try a net on 10 mtrs. Contact K2SST.

SCARA Indoor Ham Radio and Computer Flea Market. Sunday, November 12, 1989 at the North Haven Park and Recreation Center, 7 Linsley Street, North Haven, CT. Sellers admitted at 7 AM. Buyers from 9 AM to 3 PM. Tables are $12 in advance, $15 at the door. General admission $3 per person. Talk-in on 146.01/61. Reservations for tables must be received with check by November 2, 1989, and no reservations by

1988 CQ WORLDWIDE DX CONTEST

WINNERS



The operators at right (by 80/40M operating positions) and below (by high band positions) pushed P40V to an all-time SSB record of nearly 20,000 QSOs and 50 million points.

After winning the world and smashing the old SSB record by 7 million points, this group decided to return to Aruba for the CW contest. They anchored the CW crew (below) to nearly 39 million points–eclipsing the old CW record by over 50%!

phone. For information or reservations, SASE to: SCARA Fleamarket, P.O. Box 81, North Haven, CT 06473 or call between 7 PM and 10 PM Brad at 203-265-6478.

RECOMMENDED 50 MHz DX Window. A detailed paper recommending 4 calling frequencies 50.010-CW DX, 50.090-CW DX, 50.110-SSB DX & 50.125-SSB USA for peak solar cycles 22 & 23-25. Send SASE for a free 4 page paper. Sam Goda, WA6JRA, 1615 N. Woodside Street, Orange, CA 92665 USA, 714-637-3989.

QSL CARDS/RUBBER STAMPS/ENGRAVING

CANADIAN QSL Cards, send $1 for samples refundable with your order. M. Smith, VE7FI, 18610-62nd Avenue, Surrey, BC CANADA V3S 4N9.

BE SURPRISED—get a variety of cards—100 for $8 or 200 for $13. Samples $1 refundable. Add $2 S&H. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

ENGRAVING: Callsign/Name Badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

CADILLAC of QSLs—Completely different! Samples $1. (refundable). Mac's Shack, P.O. Box 43175, Seven Points, TX 75143.

EMBROIDERED Emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

QSL Samples—25 cents. Samcards, 48 Monte Carlo Drive, Pittsburgh, PA 15239.

QSL's—Quality for less is back! See our display ad in this issue of *QST*. Harry A. Hamlen, P.O. Box 1, Stewartsville, NJ 08886.

QSLs & RUBBER Stamps. Top quality QSL samples and stamp information $1 (refundable with order). Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

QUALITY QSLs. Samples $.50. Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

QSL CARDS—Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSL's, Dept. B, 310 Commercial, Emporia, KS 66801.

QSL SAMPLES send $1 (refundable with order) Box 1262, Point Roberts, WA 98281.

COLORFUL QSLs by WA7LNW—High quality craftsmanship using unique printing process that combines brilliant rainbow colors and sparkling metallic inks. Samples $1 (refundable). Colorful QSLs, P.O. Box 5358, Glendale, AZ 85312-5358.

DON'T Buy QSL Cards until you see my free samples. Also I specialize in custom cards and QSL business cards. Write or call for Free Samples and custom card ordering information. Little Print Shop, Box 1160, Pflugerville, TX 78660, 512-990-1192.

FREE Logbook with first order. QSL samples cost 3 stamps. Gazebo Press, 4148 Mimosa Lane, La Plata, MD 20646.

RAISED Printed QSLs. Very unique. You can feel the type! Our new laser technology produces exotic callsign type effects. Super high quality. Standard designs or use your own artwork/computer graphics to create a really personal QSL. We now offer state outlines in 3-D. $1 for samples & information. Dennis, WA5QMM, Network QSLs, P.O.B. 13200, Alexandria, LA 71315-3200, 318-443-7261, FAX: 318-445-9940.

QSL SALE! 100 QSL cards, plus bonus, $8. $3 thereafter. Shipped postpaid. Guaranteed correct! Free samples. Shell Printing, KD9KW, Box 50, Rockton, IL 61072.

QUALITY QSL Cards, rubber stamps, envelopes and printed letterheads. Send 45 cents postage or SASE for samples. Large selection at attractive prices. Sandollar Press, P.O. Box 30726, Santa Barbara, CA 93130.

QSLS QUALITY And Fast Service For 30 Years. Include call for free decal. Samples 50 cents. Ray, K7HLR, Box 331, Clearfield, UT 84015.

RUSPRINT QSLs. Working to help you look good and log that hard earned contact. Several card themes. (Cartoon, Patriotic, Mike & Key, Contest, Others.) Prices? Some low as 2.5 cents each! Quantities? Start at 100. Plastic card holders. Display 20 cards. 3-$3.95, 4 & up $1.20 each. More information? Business SASE with 45 cents postage. Rusprint, Rt. 1, Box 363*QST*, Spring Hill, KS 66083.

GAILS QSLs, overnight, $6/100. Stamp for samples. 1150 Muenz, Wright City, MO 63390.

FULL COLOR QSL Cards made on Kodak paper from your negative, slide or print. $32.95 per 100. Request samples (enclose $1). Bizcard Co., Box 191-T, Stevensville, MI 49127.

PHOTOS, Postcards—Become QSLs. Clear stick on labels. New! "Kall Kards". Stamp brings details. K-K-L, Box 412, Troy, NY 12181-0412.

CUSTOM CALL SIGN. . . for your car. . . van. . . or truck. Adheres to metal or glass! Transfer instantly vehicle to vehicle! Display Amateur Radio & your call in white lettering on 2¼ inch × 8 inch flexible plastic. Order magnetic or suction mounted version on black. . . blue. . . or red background! $8.50 each . . . 2/$15 ppd. Sign On, 1923T Edward Lane, Merrick, NY 11566.

QSLs $28.50 500. SASE samples. Don Ellis, K3LQQ, 84 Chapel Drive, Zephyrhills, FL 33544, 813-973-1238.

FULL COLOR—3,000 $325; 6,500 $425; 12,500 $600; 25,000 $750. WA8CZS, 1-614-452-6375.

NEW DIMENSION QSL's, 6600 Lucia Lane, Minneapolis, MN 55432, 612-571-5881. A thousand dimensional QSL's for only $39.95 shipping included! Send stamp for samples or see our display ad in this issue of *QST* and order now!

THE *New* PCS-6000

AZDEN

BOLDLY GOES WHERE NO OTHER TRANSCEIVER HAS GONE BEFORE!!

RECEIVE 118 TO 173.995 MHZ.

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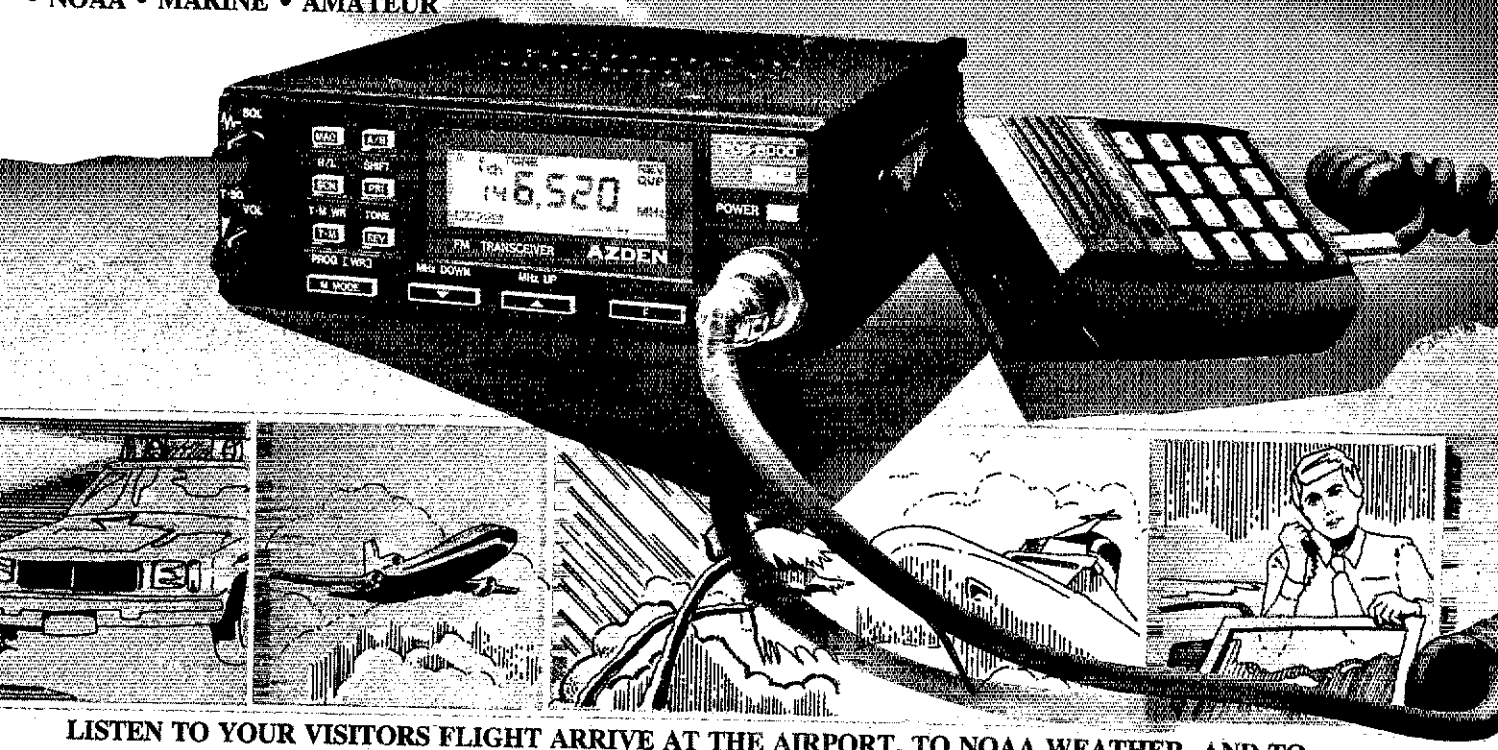
• NOAA • MARINE • AMATEUR



LISTEN TO YOUR VISITORS FLIGHT ARRIVE AT THE AIRPORT, TO NOAA WEATHER, AND TO PUBLIC SERVICE, POLICE, FIRE, FORESTRY AND MARINE FREQUENCIES

MODELS: PCS-6000H 50 WATTS!! *Also coming soon PCS-6200 220MHZ, PCS-6300 70CM and PC-10 10 Meter FM Handheld.* **CMOS AND ADVANCED SURFACE MOUNT TECHNOLOGY PROVIDE UNPRECEDENTED COMMERCIAL QUALITY AND RELIABILITY.**

UNPRECEDENTED WIDE REQUENCY COVERAGE: The PCS-6000 receives 118.00 to 135.995 MHZ AM Aircraft/136-173.995 MHZ FM and transmits 140.100 to 150.000 MHZ. Modifiable to ALL MARS and CAP frequencies (proof of authorization/license required)

TINY SIZE: Only 2 inches high, 5½ inches wide and 7¼ inches deep!! Easily fits anywhere, even in the smallest car!

20 CHANNEL MEMORY IN TWO BANKS PLUS 1 TEMPORARY CHANNEL (TM): Two memory banks, A and B have 10 memory channels each. The memories store frequency, shift width, offset information, and PL tone frequency as programmed. *An extra memory channel (that we call TM-temporary memory) is provided to allow you to store any operating condition instantly again and again!!*

UP TO 21 NONSTANDARD SPLITS: Program any split in any channel.

VERSATILE SCANNING FUNCTIONS: Dual memory scan, programmable band scanning, hold scan and delay scan functions are provided, with selectable delay time. ALL memory channels are tunable independently.

PRIORITY CHANNEL MONITORING: Memory Channel B0(the first channel in memory bank B) is monitored every four seconds regardless of any operating condition. When a signal is received, a beep is heard.

DISCRIMINATOR CENTERING (AZDEN EXCLUSIVE PATENT): Always stops on frequency desired when scanning.

PROGRAMMABLE FREQUENCY STEPS: In memory, frequency steps can be set at 5KHZ to 20KHZ in any increment.

BUILT-IN PROGRAMMABLE TONE ENCODER: 57 different tones are built in for instant programming of PL tones into memory channels and microcomputer. Tone frequency can be entered independently in RX and TX. A tone decoder is available as an option.

LITHIUM BATTERY BACKUP: Memory information can be stored for up to 5 years even if power is removed.

FREQUENCY REVERSE: Allows you to listen to repeater input frequency.

FEATHER-TOUCH TUNING CONTROL KEYBOARD: The LED backlighted light touch keyboard performs all tuning operations simply by pushing the key(s) and key actuation is audibly verified.

LARGE LCD (LIQUID CRYSTAL DISPLAY): The LCD display shows the operating frequency, S/RF, memory channel in use and various other operating functions. The LCD is back-lighted by green LEDs, making it possible for you to read the display even in total darkness.

FULL 16 KEY TOUCHTONE PAD MICROPHONE: DTMF Microphone functions as auto-patch when transmitting.

DIGITAL S/RF METER: Shows incoming signal strength and relative transmitter power.

MICROPHONE CONTROLS: Up/Down memory and frequency control.

TRUE FM, NOT PHASE MODULATION: Unsurpassed intelligibility and audio fidelity. High/Low Power: 25W/45W or 5W/10W (6000/6000H). Output-Fully adjustable.

SUPERIOR RECEIVER: Sensitivity is better than 0.15 Microvolt for 20-DB quieting. Commercial-Grade design assures optimum dynamic range and noise suppression.

AUDIO OUTPUT: 2 Watts or more.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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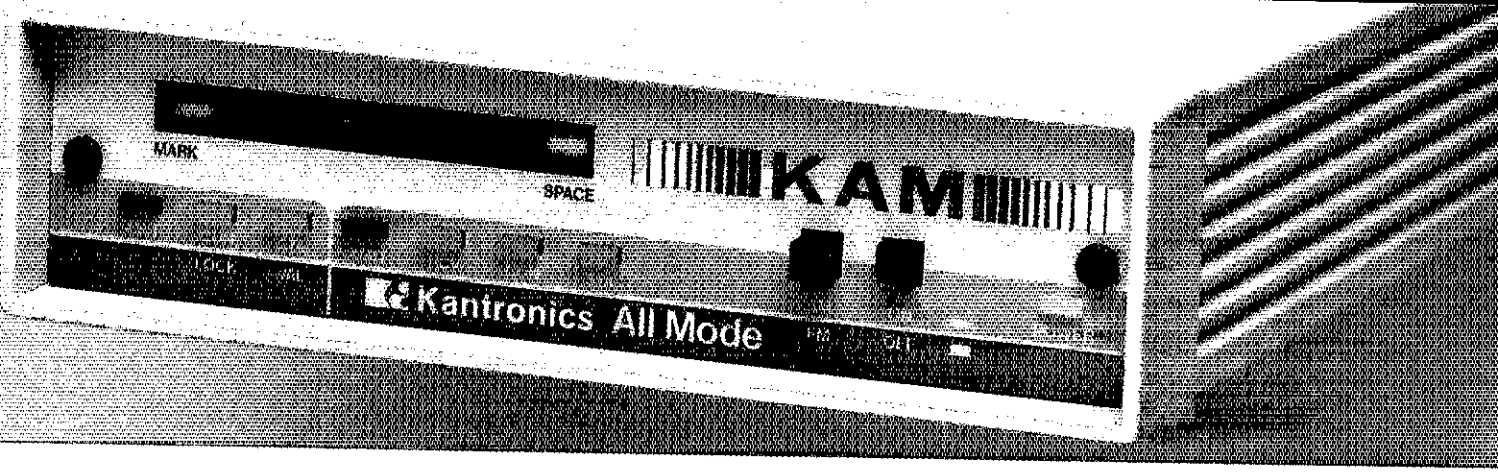

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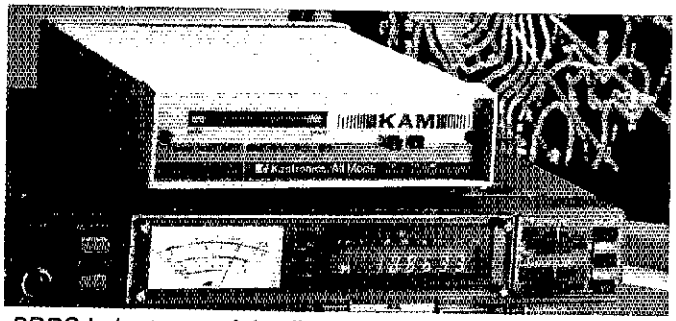

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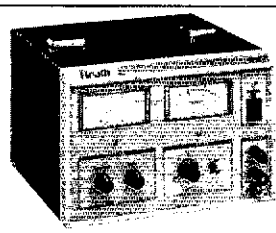

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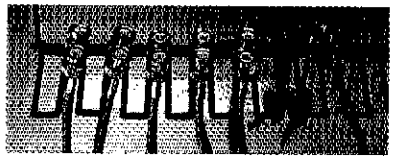

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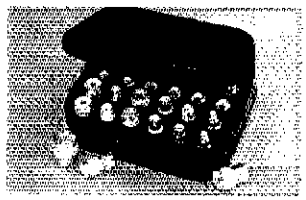

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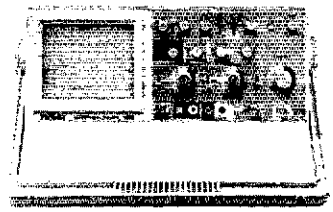

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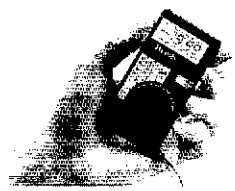

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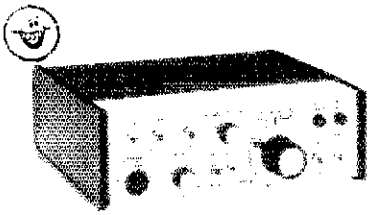

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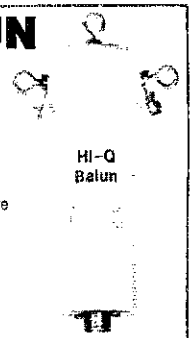

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395S	Explorer 14 Broad Band	606.50
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390S	TH2MKS Thunderbird, 2 elements	360.00
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MODEL	MONOBAND BEAMS	AMATEUR NET
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226S	203BAS 3 element 20 meter	309.00
375S	105BAS Long John 5 element 10 meter	264.00
376S	155BAS Long John 5 element 15 meter	398.50
377S	205BAS Long John 5 element 20 meter	678.50
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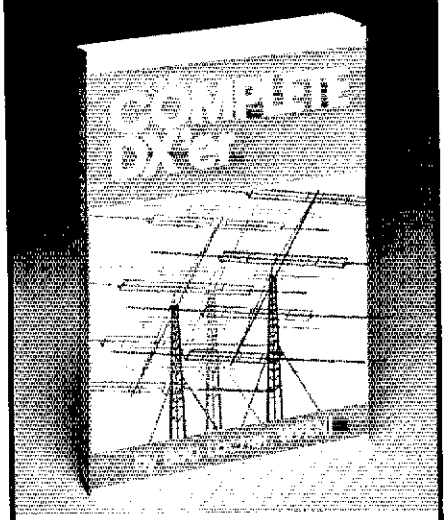

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PHF75	75m resonator	19.95
PHF160	160m resonator	84.95
AB5	5 band kit	89.95
PAQM	mini mag 2m	21.95

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2 Meter	55.95
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KT34A	triband 4 el.	C
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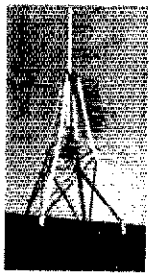
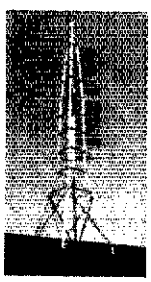
2M-14C	2mt. satellite	L R
2M-22C	2mt. satellite	L I
435-18C	70cm satellite	C
435-40CX	70 cm satellite	F E
432-30LBX	70cm satellite	O S
2M-13LBA	2 meter	R
2M-16LBX	2 meter	

CREATE DESIGN SALE



CR-18

CR-30



CR-45

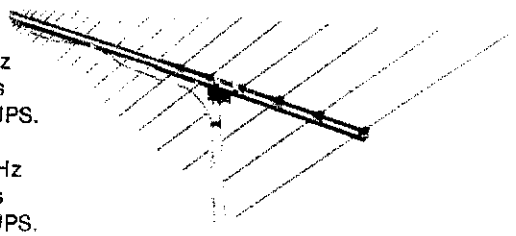
Create Roof Towers Constructed Of High Grade Aluminum With Galvanized Steel Bracing For Added Stability And Strength Will Easily Accommodate Your Antenna Requirements. Three Sizes Of Roof Towers Will Support VHF Antennas, HF Tri-Banders, And Oscar Systems. Rotators Easily Mount Inside The Tower. An Optional Thrust Bearing (CK46) Is Recommended. Specifications Are Subject To Change Without Notice Or Obligation.

*Subject To Availability

Model	Height	Maximum Antenna Wind Load In FT 2	Base Width	Max. Vert. Load Lbs.	Tower Weight Lbs.	SALE
CR-18	5'10"	21@ 90 MPH	31½"	440	28	$139.95*
CR-30	9'10"	27 @ 90 MPH	39"	1,322	39	299.95*
CR-45	14'9"	23 @ 90 MPH	39"	881	55	319.95*
CK-46	Thrust Bearing For CR-18, CR-30, and CR-45 Maximum Acceptable Mast Diameter 2⅜"					47.95*

*U.P.S. Not Included

For Safety's Sake All Towers Should Be Guyed.



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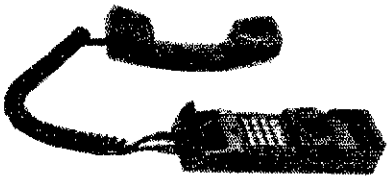

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COMMUNICATIONS Receivers: The Vacuum Tube Era. Book covers history, specs on 700 receivers, 51 companies, 123 photos. $14.95 plus $2 p/s. Details SASE. RSM Communications, Box 218-Q, Norwood, MA 02062.

WANTED: Yaesu FT-680R 6M Xceiver, any condition, QSL w/price or call collect. (Best time 7-11 PM EST.) Bob, KI4MB, 6608 N. 18th Street, Arlington, VA 22205, 703-533-0650.

KWM-380 Keypads. Custom made, very high quality. Matches Collins perfectly, $100. Call for nice color picture. W3ALZ, 301-384-2969.

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TWO METER Hand Held For Sale. Knwd TR2600A. Perfect condition, (2)PB-26 batteries, battery charger, car adapter (DC-26), battery adapter for AA cells (BT-3), bianchi leather case, speaker mic (SMC-30), $225. Call Larry, WO2Q, 212-777-7541.

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VARIOUS electronics parts, IC's transistors, resistors, transformers, small electrical motors, plug in circuit boards, capacitors and connectors etc. Call for particular items. N1CHP, 203-755-1209.

KENWOOD TS-830S $635, TS-820 $425, TS-700SP $395, TS-520S $345, 599D Twins $425, VFO 520 $155, AT-200 (matching 820(S) Tuner) $155, Ham 4 Rotor $195, Ham 3 $180, ICOM IC-735 $750, IC-505 6 Mtr. $395, IC-740 $825, Dentron Clipperton L $425, (two) Yaesu FT-107M's, one loaded (Filters, PS) other needs final work both $750, FT-901 Tuner $165, Drake B1000 Balun $90, MN2000 $225, MN2700 $325, WH 7 $95, SP75 Processor $85, ETO Vomax Processor $75. Money back guarantee. I pay shipping. John Korona, WA2V, 1117 Dewitt Terrace, Linden, NJ 07036, 201-486-0039.

ALPHA 76PA: very good condition $975. Amstrad PPC 640 laptop computer, 640K memory, two disk drives, with monitor, almost new, $700. Call John, 404-896-3586. You ship.

EMERGENCY Power, 4 cyl. gasoline generator, ARRL Handbook page 37-34 fig 80 completely reconditioned, sale or trade. SASE. WB8HWD, 614-594-7611.

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TOWER E-Z Way 40' crank-up tilt-over with CDR $44 Rotor $249. TA-33 Mosley Beam $195. Add shipping charges. KD4LN, 114 Greenhill Road, Landrum, SC 29356.

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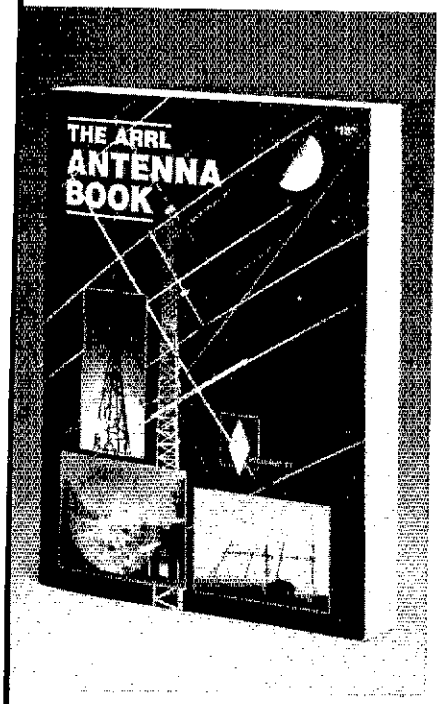

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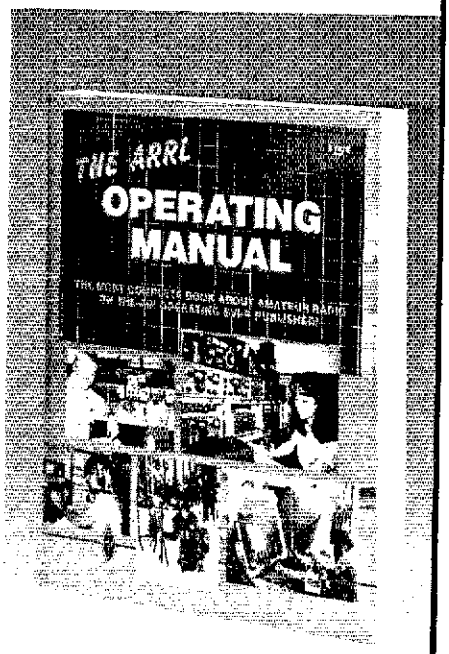
*See the ARRL Bookshelf page elsewhere in this issue for ordering information.



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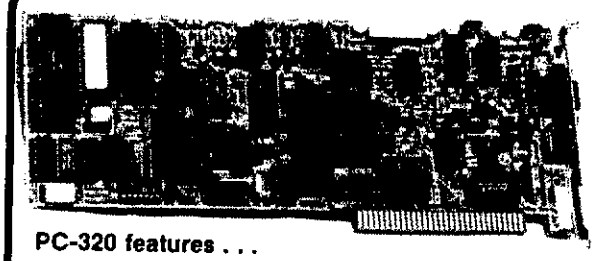

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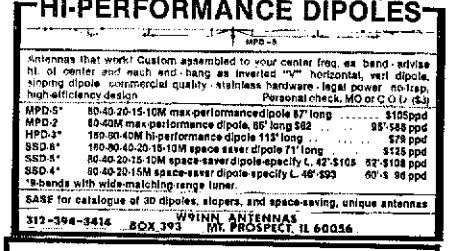

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KENWOOD TS-530S, MC-50 mic, Nye master key being sold by inactive college ham. Fine condition. Original boxes. $575 will ship. Craig, KA7LSZ, 801-359-4514 after 2 PM.

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WANTED: Kenwood 530SP or ICOM 730 Transceiver. Also General Coverage Receiver with Digital Readout. W4MGG, 121 Lamplighter Circle, Winston Salem, NC 27104.

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NEW Collins Manuals: KWM-2/2A 9th ed. $40; 516-F2 $15; 312-B4/B5 7th ed. $15. Complete set $60. Bill, KC5PF, 1740 Tonys Court, Amissville, VA 22002, 703-937-4090 after 6 PM.

75A4 $300, Valiant 1 $200, R4B $200, T4XB $200, 32S1 with 516F2 $250. Ken, K8TFD, 313-652-0963.

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YAESU FT270RH 45W, voice synthesizer, two mobile mounts, orig. box, factory aligned, $275, Cushcraft A449-11, new in box $50, 2M 4-pole, $60. Jerry, N2ERB, evenings 609-771-8011, Trenton, NJ 08648-3110.

WANTED: Power Transformer for Heath SB230, prefer new unused. W4DRF.

WRITTEN Exams Supereasy. Memory aids from psychologist/engineer cut studytime 50%. Novice, Tech, Gen: $7 each. Advanced, Extra: $12 each. Moneyback guarantee. Bahr, 1196-G1 Citrus, Palmbay, FL 32905.

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FOR SALE—Robot 400C Color SSTV Transceiver-$375. W8DD, phone 216-227-9977.

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WANTED Remote VFO: RV7 or 75 for Drake TR7. Call Frank, NR1X.

ALLAN Bart, WA2RZQ is seeking test equipment, looking for impedance bridges, Q-meters, Collins 5181 and sundry items. What do you have? Allan Bart, WA2RZQ, 51 South Oxford Street, Brooklyn, NY 11217.

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TEN-TEC Omni-C, P/S, $525. Hygain 18AVT/WB vertical, $40. Want ICOM 725. Reihl, 1715 Illinois, Northbrook, IL 60062.

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HT-CLONE Batteries: ICOM: BP-3S Double BP3 "Wall Chargeable" $43.95, BP5 $42.95, Yaesu: FNB2 $21.95, Santec 142/442/1200 (3 pin) $22.95. Rebuilding; Send-Ur-Pack. ICOM BP3 $20, BP5 $28, BP7/8 $34, BP70 $30, Yaesu FNB4/4A $37, Kenwood PB21 $18, PB25/H/26 $25, T-T 2991 $28. U-Do-It Repair Inserts. ICOM: BP2 $18.95, BP3 $16.95, BP5 $22.95, BP7/BP8 $28.95, Kenwood: PB21 $12.95, PB24/25/26 $19.95, Azden 300 $19.95, Yaesu: FNB4/4A $32.95, Tempo: S1, 2, 4, 5, 15/450 $22.95, 12V/5Ahr Porta-Pac w/Chgr $49.95, Antennas 2Mtr 5/8-Tel/BNC $14.95. Telephone/Pager & Commercial Packs. Free catalog. $3 shipping/order. PA + 6%. Visa-M/C + $2. Cunard Associates, Dept. A, RD 6, Box 104, Bedford, PA 15522, 814-623-7000.

KENWOOD TL-922A Linear. Less than 10 hours use. $1125 firm. You pay shipping. K8EA, 404-932-2300.

FOR SALE: Magnavox VR8280 color video camera, character generator, 7 pages memory & more. $400 firm. Alan Zachary, KA9CVH, 5400 Imperial Blvd. LH, Crawfordsville, IN 47933, 317-866-1958.

IC720A, CW Filter $575; TS130V $425; Clipperton-L $450; Cushcraft AV5 $75; Collins CP-1 $125, F455FA21 $35. All mint! W9ZR, 1-614-389-4960.

RADIO EXCHANGE. Latest way to buy, sell, or trade radio gear. Published twice monthly, $12 annually. Free ad with subscription! Special event station information published free! Rate: $0.25 per word. Free insertions: 50 words. Radio Exchange, Box 50, Rockton, IL 61072.

FOR SALE: Sky Needle Tower-Model TM358C-includes a 15 ft. 1/4" wall Mast and Hy-Gain HDR 300 Rotor-$3,500 FOB Albuquerque, NM. Harold E. McBroom, WS5O, Rt. 5, Box 52A, Albuquerque, NM 87123. 505-299-0708.

COLLINS 75A-4, 4 filters incl. 500 Hz, manual, excellent $375. Kenwood R-1000 excellent, manuals, car adapter, $325. 4 Sylvania 811A, $35. Erik, WU7O, 602-491-0567.

COUNTY Outline Mapbook: All fifty states. 8-1/2 x 11, 70# opaque paper, three hole punched, logging space. $7.50 plus shipping $2.50/US; $5/DX. Mobile Bureau Press, Box 6436-C, Florence, SC 29502.

WANTED: Yaesu YO-101 Monitor Scope, YC-601B Display/Counter, with all cables and manuals. Must be mint. Joe Locastro, WB2NGX, 183-1/2 Lake Avenue, Auburn, NY 13021, 315-252-6107.

TELEPHONE Line Interface: FCC Registered, $35. N3IC, 301-363-8748.

TOWER E-Z Way 60 ft., 3 section crank up fold over, $99. Also Mosley Tri-Band Yagi TA33, $39. Pat Butler, K2PB, 609-799-0751.

WANTED: Microlog AIR-1 CW/RTTY plug-in terminal board for VIC-20. Jeff, KD3GY, 6315 Harris Heights Avenue, Glen Burnie, MD 21061.

WANTED: Ham Equipment and Other Property. The Radio Club Of Junior High School 22 NYC Inc. is a nonprofit organization, granted 501(c)(3) status by the IRS, incorporated with the goal of using the theme of Ham Radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Meet us in person at the Lima Ohio Hamfest October 15 and learn all about the most exciting and beneficial application of Ham Radio today. Please write us at: P.O. Box 1052, New York, NY 10002. Round the clock hotline: 516-674-4072. Thank you!

NICAD Battery Pacs. Amateur Radio Equipment. K & M Electronics, 1-800-666-4223.

ROSS' $$$$ New October Specials: Kenwood TS-440S/WAT $1219.90, TR-8400 $379.90, TM-231A $389.90, TM-401B $307.99, TM-411A $339.99, TS-711A $839.90, TW-4100A $459.99, SM-220 $409.90, Mirage C-3012R $329.99, B-23S $93.90, B1016 $249.90, B108 $145.90, ICOM IC-12AT $369.90, IC-1200 $544.99, IC-32AT $539.90, IC-725 $809.90,

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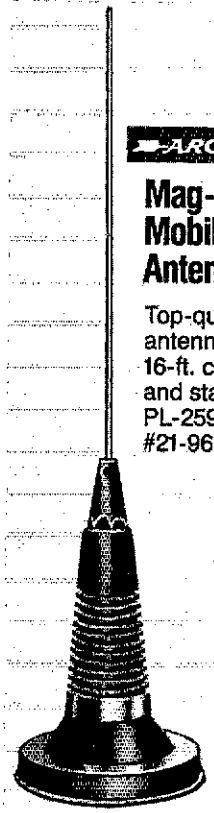
REALISTIC

10-Meter Mobile SSB/CW Transceiver

Winning praise from hams everywhere, novice to extra class! HTX-100 has a 10-frequency memory, mike-mounted up/down tuning, 5 or 25-watt output, digital VFO with selectable steps, and CW sidetone. FB value at only **259.95**

You must have a valid FCC Amateur Radio License to legally transmit with the HTX-100



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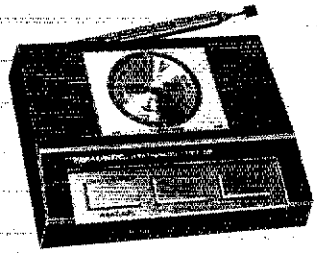
Mag-Mount Mobile Antenna

Top-quality antenna with 16-ft. cable and standard PL-259 plug. #21-960, **37.95**



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Crystal-controlled radio receives WWV on 5, 10 or 15 MHz plus local VHF weather. #12-148, **39.95**

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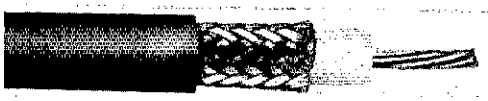
Everything you need to upgrade: Exam manual and speed-building code cassettes. #62-2404, **19.95**



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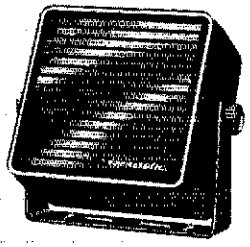
RG-8M	278-1328	25¢
RG-58	278-1326	20¢
RG-59	278-1327	20¢



REALISTIC

Extension Speaker

Better audio for HTs and mobiles! Has 4″ speaker, 10-ft. cord and 1/8″ plug. #21-549, **13.95**

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MFJ's *Deluxe* 300 Watt Tuner

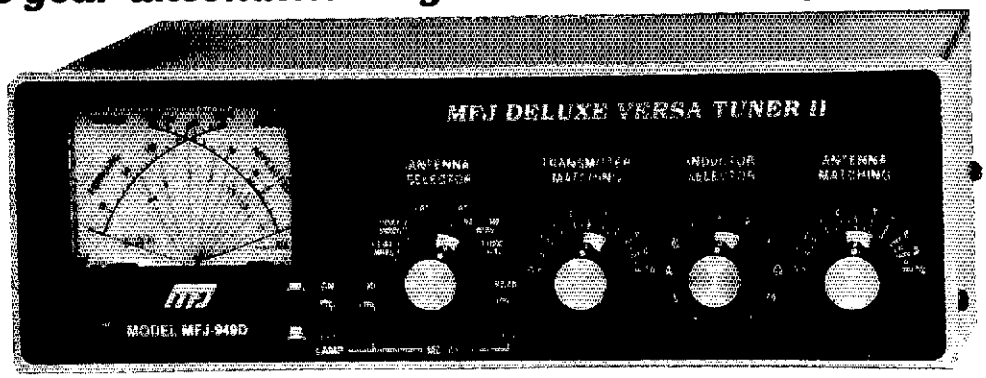
... *gives you* ***full*** 1.8-30 MHz coverage, a ***peak reading*** (and average) Cross-Needle meter, built-in ***dummy load,*** antenna switch and balun ... all covered by a ***full one year unconditional guarantee*** ... for only $149.95

MFJ-949D

$149.95

Made in U.S.A.

- ***Peak reading meter***
- ***Built-in dummy load***
- ***Covers 1.8 to 30 MHz***
- ***1 full year guarantee***



You won't find all these useful features in *any* other 300 watt tuner -- not even at twice the price.

New **peak reading meter**

The new ***peak*** and average reading Cross-Needle meter in the MFJ-949D shows you SWR, forward and reflected power -- all in a single glance.

Without a ***peak reading*** wattmeter you just won't be able to tell if your rig is putting out all the peak SSB power it's designed for. Don't be without one if you want top performance.

Built-in dummy load

A built-in 300 watt 50 ohm dummy load makes tuning up your rig soooo easy. How do you tune up your rig without one?

An external dummy load will cost you about $30 more -- plus it takes up valuable space at your operating position and requires another cable.

Full **1.8 to 30 MHz coverage**

The MFJ-949D gives you **full** 1.8-30 MHz coverage.

Make sure the tuner you're considering covers *all* the HF bands.

Don't get a tuner that keeps you from operating all the frequencies you've worked for -- now or in the future.

Plus more . . .

You get a versatile 6-position antenna switch and a 4:1 balun for balanced lines.

You can run up to 300 watts PEP and tune out SWR on coax, balanced lines or random wires.

Unconditional **Guarantee**

You get a *full one year unconditional guarantee.* That means we will repair or replace your MFJ tuner (at our option) *no matter what* for a full year.

Others give you a 90 day *limited* warranty. What do you do *after* 90 days? Or *before* 90 days when they say, "Sorry, it's your fault"?

What's really important?
precise **control for minimum SWR**

What's really important is your tuner's ability to get your SWR down to a minimum -- and the MFJ-949D gives you more precise control over SWR than *any* tuner that uses two tapped inductors.

Why? Because the two *continuously* variable capacitors in the MFJ-949D give you *infinitely* more positions than the *limited* number on two switched coils.

This gives you the precise control you need to get minimum SWR and maximum power into your antenna.

After all, isn't that why you need a tuner?

High efficiency *and* **a compact size:**
performance **is most important**

The MFJ-949D uses a *single* airwound coil. Using only one inductor takes up a minimum of space and there's no mutual coupling problems.

The excellent form factor of the short fat coil gives you highest Q. Plus you get plenty of inductance that gives you a much wider matching range than other designs.

This results in a highly efficient tuner that puts maximum power into your antenna *and* a compact 10 x 3 x 7 inch size that complements your rig and fits right into your station.

Competing tuners using *two* tapped coils *require* a large cabinet -- not just to house the coils but also to help reduce detrimental coupling between the inductors. The result? *A tuner that's* ***bigger*** *than your radio.*

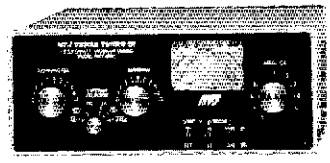
Your very best value

The MFJ-949D gives you your very best value, first-rate performance, proven reliability and the best guarantee in ham radio . . . all from the *most trusted* name in antenna tuners. Don't settle for less. Get yours today!

MFJ's 1500 Watt Tuner

MFJ-962C

$229.95



For a *few* extra dollars the MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP linear amplifier later. It covers 1.8 to 30 MHz.

You get MFJ's *new* ***peak*** and average reading Cross-Needle SWR/Wattmeter.

You also get a 6-position antenna switch and a teflon wound balun with ceramic feed-thru insulators for balanced lines. Measures just 10¾x4½x14 7/8 inches.

How can an American manufacturer like MFJ give you more tuner for your money than clearing houses for foreign competition?

MFJ tuners are made in America.

Here's how MFJ gives you more tuner for your money than *any* clearing house for foreign competition.

MFJ builds every tuner cabinet from scratch using the latest high-speed computer controlled punch presses.

MFJ manufactures, assembles and tests every PC board that goes into MFJ tuners.

Instruction manuals and other materials are printed in MFJ's print shop.

MFJ tuners go directly from our factory to your dealer. We're not just an importer adding profits, tariffs and import charges.

With MFJ's efficient in-house manufacturing and straight to your dealer distribution you get the most tuner for your money.

WHY CHOOSE AN MFJ TUNER?

Hard-earned Reputation: There's just no shortcut. *MFJ is a name you can trust* -- more hams trust MFJ tuners throughout the world than all other tuners combined.

Proven Reliability: *MFJ has made more tuners for more years than anyone else* -- with MFJ tuners you get a highly-developed product with proven reliability.

First-rate Performance: MFJ tuners have earned their reputation for being able to match just about anything -- *anywhere.*

One full year *unconditional* guarantee: That means we will repair or replace your tuner (at our option) *no matter what* for a full year.

Continuing Service: MFJ Customer Service Technicians are available to help you keep your MFJ tuner performing flawlessly -- no matter how long you have it -- just call 601-323-5869.

Your very best *value:* MFJ tuners give you the most for your money. Not only do you get a *proven* tuner at the lowest cost -- you also get a one year *unconditional* guarantee and *continuing* service. That's how MFJ became the world's leading tuner manufacturer -- by giving *you* your very best *value.*

Choose your MFJ tuner with confidence! You're getting proven performance and reliability from the most trusted name in antenna tuners. Don't settle for less.

Call or write for a *free* full-line MFJ catalog with all 10 of our tuners and tons of ham radio accessories!

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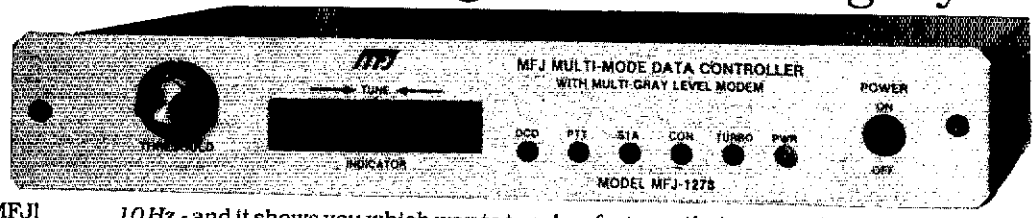
MFJ ... making quality affordable

MFJ gives you *all 9* digital modes

and *keeps on* bringing you state-of-the-art advances

. . . while others offer you *some* digital modes using 3 year old technology

MFJ-1278
$279.95



No three year old technology at MFJ!

Using the latest advances, MFJ brings you 9 exciting digital modes *and* keeps on bringing you state-of-the-art advances.

You get tons of features other multi-modes just don't have.

Only MFJ gives you all 9 modes

Count 'em -- you get 9 fun modes -- Packet, AMTOR, RTTY, ASCII, CW, WeFAX, SSTV, Navtex and full featured Contest Memory Keyer.

You *can't* get all 9 modes in any other multi-mode at *any* price. And nobody gives you modes the MFJ-1278 doesn't have.

The best modem you can get

Extensive tests in *Packet Radio Magazine* prove the MFJ-1278 modems gives better copy with proper DCD operation than all other modems tested.

New Easy Mail™ Personal Mailbox

You get MFJ's new **Easy Mail™** Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

20 LED Precision Tuning Indicator

MFJ's unequaled tuning indicator makes it really easy to work HF packet stations.

And unlike others, you use it *exactly the same* way for *all* modes -- not differently for each mode.

Just tune your radio to center a single LED and *you're precisely tuned in to within 10 Hz* - and it shows you which way to tune!

New MFJ technology prevents collisions: gets packets through faster

MFJ's new *Anti-Collision* technology gets packets through faster, more reliably.

How? Automatic random transmit delays prevent packet collisions.

An MFJ ***exclusive:*** MFJ-1278 is the only multi-mode to have this *new* technology.

Multi-Gray Level FAX/SSTV Modem

You'll enjoy natural looking pictures that only multiple gray levels can give you.

MFJ's new built-in modem gives you the *only* multi-mode with multiple gray levels.

Only MFJ can transmit FAX

Most packet stations can receive FAX.

But *only* the MFJ-1278 lets you transmit FAX without internal modifications that disable other modes.

So now you can send your own high resolution pictures, maps and diagrams by FAX to stations throughout the world.

Full Featured Contest Memory Keyer

Only the MFJ-1278 lets you plug in a key-paddle so you can use it as a memory keyer.

You get programmable CW message memories that you can link and repeat, auto serial numbering, weight control, beaconing, random CW generator and more.

One FREE Upgrade!

When you buy your MFJ-1278 *today*, you don't have to miss new modes and features that come out *tommorow*.

Why? Because your MFJ-1278 comes with a coupon good for one ***free*** eprom upgrade exchange that'll add new features.

Plus more . . .

Plus you get . . . 32K RAM, free AC power supply, KISS, *true* DCD, independent printer port, lithium battery backup, RS-232 *and* TTL serial ports, *standard* 850 Hz RTTY shift, socketed ICs, tune up command, software selectable dual radio ports and more --all in a sleek 9½x9½x1½ inch cabinet.

Get on the air instantly Just plug it all in

All you need is an MFJ-1278, your rig, any computer and a terminal program.

With an MFJ Starter Pack, $24.95, you just plug it all in, wire up your mic connector and you're on the air.

Order MFJ-1282 (disk)/MFJ-1283 (tape) for C-64/128/VIC-20; MFJ-1284 for IBM compatibles; MFJ-1287 for Macintosh.

No Matter What™ Guarantee

You get the best guarantee in ham radio -- a *full one year unconditional guarantee.*

That means we will repair or replace your MFJ multi-mode (at our option) *no matter what* happens to it for a full year.

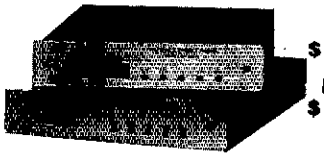
Get 9 new ways of having fun

Don't settle for 3 year old technology.

Choose the only multi-mode that gives you the latest advances and *all 9* modes.

Get 9 new ways of having fun *today!*

MFJ Packet Radio



MFJ-1274
$159.95
MFJ-1270B
$139.95

MFJ-1270B super clone of TAPR's TNC-2 gives you more features than *any* other packet controller -- for $139.95.

You can double your fun by operating VHF *and* HF packet because you get **high performance** switchable VHF/HF modems.

You get the **Easy Mail™** Personal Mailbox with soft-partitioned memory so you and your ham buddies can leave messages for each other 24 hours a day.

In MFJ's new WeFAX mode you can print full fledged weather maps to screen or printer and save to disk using an IBM compatible or Macintosh computer with an MFJ Starter Pack.

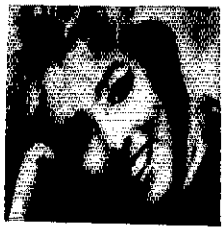
A new **KISS** interface lets you run **TCP/IP.** They also come **NET ROM** compatible -- *no modification needed!*

You also get 32K RAM, one year *unconditional* guarantee and a *free* 110 VAC power supply (or use 12 VDC).

For dependable HF packet tuning, the MFJ-1274 gives you a high resolution tuning indicator that's accurate to within 10 Hz -- and it's only $20.00 more.

MFJ Video Digitizer

Here's Aimee from the MFJ order desk. This unretouched picture was shot directly from a VGA monitor. We digitized Aimee with a camcorder, MFJ "Picture Perfect" Video Digitizer and IBM compatible computer.



Create fascinating digitized snapshots you can transmit with your MFJ-1278 of *anything* you can point your camcorder at!

The MFJ-1292 "Picture Perfect" Video Digitizer connects your video camera to your IBM compatible computer so you can capture digitized video snapshots on disks.

You get a plug-in card for your computer and a versatile software package with instructions for only ... **$199.95.**

As an added bonus you get a handy Contrast and Brightness Control unit that you can conveniently place near your keyboard for fine tuning your pictures.

Packet Pictures

Transmit and receive high resolution EGA and CGA color pictures via packet with MFJ picture passing software.

Beautiful color pictures are automatically received, saved to disk and "painted" to screen.

Pictures are compressed as they are transmitted - so you get true high speed picture passing.

You can save to disk any CGA picture you can see on your screen.

You can set up your own picture bulletin board and exchange pictures with others - even if you're not there.

Let's help spread picture passing throughout the world and create a new world standard. Get this ***powerful*** new software for only ... **$9.95.**

MFJ-1288 works with virtually any packet radio controller and IBM compatible computer. It's included *free* in the MFJ-1284 IBM Starter Pack.

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The 1990 Callbook Supplement will be published June 1, 1990, with thousands of new licenses, address changes, and call sign changes received over the preceding six months. This single Supplement will update both the North American and International Callbooks.

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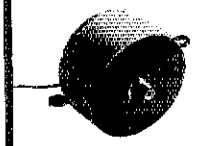

For dipoles. 1.7-30 MHz, 6-Kw PEP 1:1 or 4:1 ratio. Model 2K **$74.95.**

1.7-30 MHz. 1:1 or 4:1 ratio. Model 1K **$45.95.**

1.7-30 MHz. 350-w PEP. Ratios from 1:1 to 16:1. Model PB **$26.95.**

Add $4 shipping/handling in U.S. & Canada. California residents add sales tax.

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- **Tune your tuner without transmitting!**
- **Save that rig!**

Do you use an antenna tuner? Then you need the new Palomar Tuner-Tuner to tune it to your operating frequency without transmitting. Just listen to the Tuner-Tuner's noise with your receiver. Adjust your tuner for a null and presto! You have 1:1 SWR. It's as simple as that.

Easy to install. Works with all rigs. Eliminates tuneup damage. Your rig will love it!

Model PT-340 **$99.95** + $4 shipping/handling in U.S. & Canada. California residents add sales tax.

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Send for FREE catalog that shows our complete line of noise bridges, SWR meters, preamplifiers, loop antennas, VLF converters, baluns, SWL equipment, toroids and more.

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Phone: (619) 747-3343

IC-3200 $464.99, Yaesu FT-747GX $709.90, FT-726R $799.90, FT-470 $465.90, YR-901 $549.99, SC-1 $148.99, FT-411 $326.90, Cushcraft AV4 $85.90, AP-8 $159.90, A-3 $259.90, 220-QK $229.90, AEA PK-64A/WHFM $189.99. All LTO (limited time offer). Looking for something not listed?? Call or write. Over 8780 ham-related items in stock for immediate shipment. Mention ad. Prices Cash, FOB Preston. Hours Tuesday-Friday 9:00 to 6:00 PM, Mondays 9:00 to 2:00 PM. Closed Saturday & Sunday. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

TEKTRONICS 453 oscilloscope, manual, probe, $450. Tektronics 7403 oscilloscope (military version), two 7A15, one 7B53 plug-ins, manual, $400. James Craig, 32 Birchwood Drive, Rye, NH 03870, 603-964-6658.

NEW KENWOOD TH-215A FM Transceiver with Hustler FX-2 mag mount antenna $250. Cushcraft ARX-2B 2M antenna $35. MFJ-841 2M SW Pwr/Swr Meter $30. All for $300. KG5C, 505-835-1088.

SELL: Tektronic, H-P, G/R, etc. Service manual copies. Many available at $15.50 each ppd. SASE for list. J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604-1740.

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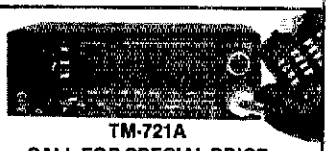

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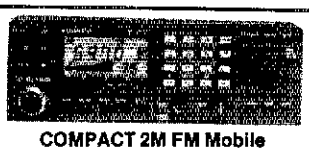

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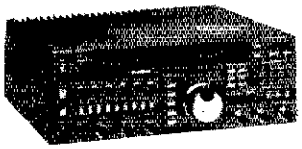

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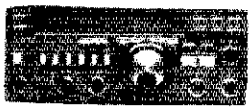

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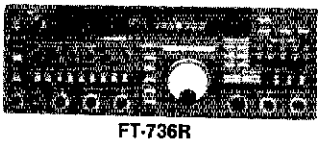

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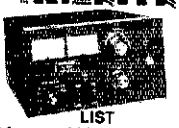

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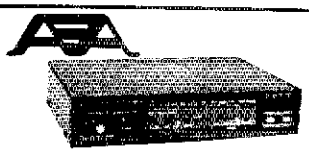

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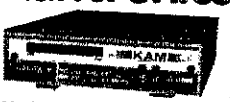

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JOIN TODAY! Take advantage of these membership benefits: **QST** The interesting, lively way to keep on top of everything that is happening in Amateur Radio: Coverage of regulatory developments; Washington news: operating — DX, VHF-UHF, and repeaters, OSCAR, SSTV, RTTY; Novice Notes; lists of hamfests where you can meet local hams, hear interesting talks, and possibly find a bargain at a fleamarket; and you will find technical articles aimed specifically at the beginner's level. **W1AW** is the voice of ARRL. This station transmits daily code practice sessions and regular bulletins. **LOW COST INSURANCE** for your ham gear. **OTHER SERVICES:** Outgoing QSL, Operating Awards, Amateur Radio Emergency Service, Field Organization and much, much more! The League is a **democratic organization,** of, by and for its members. The members determine policies of the League through the Board of Directors which is elected directly by the membership. The League is YOU! Fifty percent of dues is allocated to QST, and the balance for membership.

DUES

	U.S.	Elsewhere
1 Year	$25	$36
2 Years	47	69
3 Years	65	98
Amateurs who are age 65 or over with proof of age:		
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2 Years	37	59
3 Years	50	83

Life Membership: Please write for formal application.

ARE YOU AGE 17 OR YOUNGER?
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If you answered "YES" to both questions then these special rates apply: Age 13-17 $12.50. Age 12 and younger $6.25. Evidence of your date of birth is required. Attach a copy of your birth certificate or have your parent or guardian certify your date of birth. A list of all other amateurs in your household is required. Family memberships, club commissions and rebates and multiple year rates do not apply.

Family Membership An immediate relative of a full dues paying member living at the same address, may become a family member without **QST** for $2 per year.

Cross Needle SWR/Power Meters for All Bands

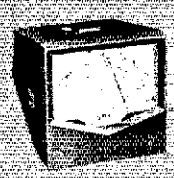
NS-660PA

Model	Freq. Range Int. Sensor	Foward Power	Connectors
CN-720B	1.8-150 MHz	20/200 W/2 kW	SO-239
NS-660A*	1.8-150 MHz	30/300 W/3 kW	SO-239
NS-660PA**	1.8-150 MHz	30/300 W/3 kW	SO-239
NS-663BM*	140-525 MHz	30/300 W	SO-239
NS-663BN*	140-525 MHz	30/300 W	N-Type

*Back lit with remote sensors available.
**NS-660PA-Peak power reading

CN-460M

CN-520



MOBILE/BASE CROSS NEEDLE SWR/POWER METERS

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	3.5-150 MHz	15/150 W	SO-239
CN-460M*	140-460 MHz	15/150 W	SO-239
CN-465M*	140-460 MHz	15/75 W	SO-239
CN-520M**	1.8-60 MHz	200 W/2 Kw	SO-239

*Back lit with mobile bracket
**Optional mobile bracket available

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Electronics Corporation
1842B West 169th St. ■ Gardena, CA 90247
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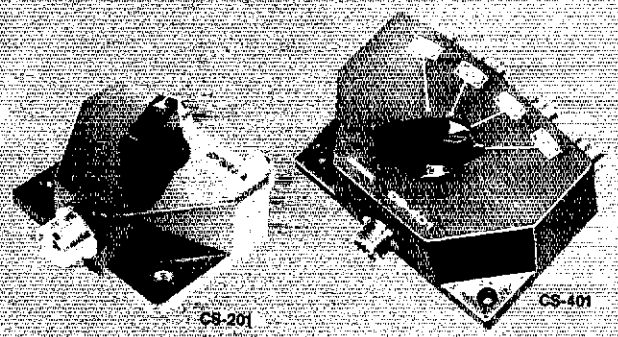
Specifications subject to change without notice. • All models and types not represented.

Coaxial Switches

PAT. No. 59-0003803



CS-201 CS-401

	CS-201 2 Position	CS-201G 2 Position	CS-401 4 Position	CS-401G 4 Position	CS-4 4 Position
Frequency:	500 MHz	1.3 GHz	500 MHz	500 MHz	1.5 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
Isolation:	+60 dB	+60 dB	+50 dB	+50 dB	+60 dB
Power Rating:	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	2.5 kW PEP 1 kW CW	500 W PEP 250 W CW
Insertion Loss:	All models less than 0.2 dB				

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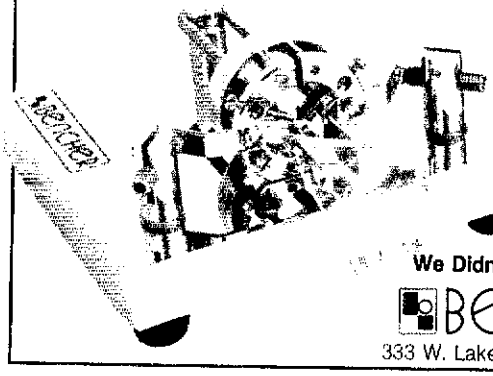
the Ultimate Paddle



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- Large Clear Plastic Handles •

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Collins 516F2 Power Supply for S-Line transmitters; gov't surplus. With tubes 5U4 & 5R4, cabinet, and cables. 34 lbs. sh wt. Used.....**$99.50**
(For choice of cabinet emblem, add $10.00)

516F2 without cabinet and tubes, 23 lbs. sh. #NC-516F2, used **$69.50**

516E2 DC Supply, solid-state unit powers S-Line from 24-28 VDC input; 24 lbs. sh. Used.....**$49.50**

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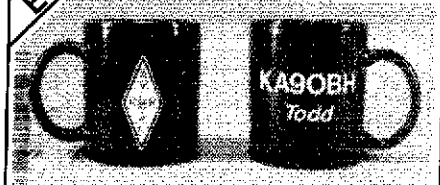

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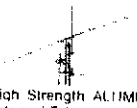

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How many antennas have you seen ruined by the failure of the mast? If you are stacking antennas, or have a beam antenna, our 6061-T6 Aluminum masts will increase the survivability of your antenna system. These masts are 62% lighter and 50% stronger than galvanized steel tubing. An example of the weight difference is 2" OD x .1" Wall x 24' Long. **AL-39#, Steel-112#**

Sizes Available:
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TRADE Yaesu 6 KHz Am Filter for any Kenwood Filter except 2.5 KHz SSB. Also Wanted AV3 Vertical Antenna. Jim, WA1EDN, 1-413-783-3172.

FOR SALE: Yaesu FT-101B Transceiver. Good condition, $400. Call Bob, N2BQA, 203-378-9889.

UPGRADE your Collins S Line. Complete set of solid state tubes by Skytec for 32S3 and 75S3B, $100. W4MSE, 615-982-9371.

WANTED: TS120V, with CW Filter. No PS. No Speaker. KBØWZ, 816-765-3493.

RECENTLY factory overhauled Collins KWM-2 with 516-2 power supply $500 no shipping. W2ADB/4, Charleston, SC, 803-884-8108.

IBM-PC RTTY/CW, New CompRtty II is the complete RTTY/CW program for IBM-PC's and compatibles. Now with larger buffers, better support for packet units, pictures, much more. Virtually any speed ASCII, BAUDOT, CW. Text entry via built-in screen editor! Adjustable split screen display. Instant mode/speed change. Hardcopy, diskcopy, break-in buffer, select calling, text file transfer, customizable full screen logging, 24 programmable 1000 character messages. Ideal for MARS and traffic handling. Requires 256k PC or AT compatible, serial port, RS-232C TU, $65. Send call letters (including MARS) with order. David A. Rice, KC2HO, 144 N. Putt Corners Road, New Paltz, NY 12561.

DRAKE TR4C Transceiver, Speaker, PS, $375. Kenwood TS530 Transceiver, $425. SB220 Amplifier, Spare Tube, $575. Swan WM1500 Wattmeter, $50. All excellent. K1CC, 203-875-0166.

COLLINS KWM-380 ... all mods, all options, service manuals, mint, $2000. Tom Evans, W1JC, 203-658-5579.

CUSHCRAFT 12-4CD 12M beam antenna, excellent condition. Can also adjust for 10M band, $140. KG5C, 505-835-1088.

NEW FCC RULES took effect September 1. Stay current with the new Part 97, plus references to non-97 rules. Specify printed, Commodore or IBM disk. $6 each. Weeden Radio, 6802 Putnam Road, Madison, WI 53711.

SIGNAL-ONE CX7-B, LED frequency read-out; updated by W8CX8 $1250. James Craig, 32 Birchwood Drive, Rye, NH 03870, 603-964-6658.

ROSS' $$$$ Used October Specials: Kenwood TS-930S/WAT, YG-455C1 $1459.90, SP-820 $69.90, R-300 $189.90, TM-231A $339.90, ICOM PS-15 $122.90, IC-720A $599.90, IC-725W/FL-101 $769.90, Yaesu FT-One $1199.90, FRA-7700 $39.90, FRT-7700 $45.90, FT-One $1199.90, FTV-707W/70CM Module $269.90, Collins KWM-2 $499.90, 312B4 $259.90, KWM-380 3 Filter NB SP $1995.90, 75S-1 & 32-S1 $425. Looking for something not listed?? Call or write. We have over 235 used items in stock. Mention ad. Prices Cash, FOB Preston. Hours Tuesday-Friday 9:00 to 6:00 PM, Mondays 9:00 to 2:00 PM. Closed Saturday & Sunday. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

HF LINEAR—Viewstar (Barker and Williamson) Model PT2500. 2 x 3-500Z. Factory 160M-10M including WARC. Less than 2 hours use. New cost $2150, sell $1300. See B and W ad for complete details (p. 184, June *QST*). KC7FN, 208-479-0751.

FOR SALE—JRC 525 Receiver in mint condition-$1000. Contact Curt Sloan at 612-770-3281 eves.

WANTED: National 200 Transceiver and Hallicrafters SX-140 Receiver. Please state condition and price. Philip Schmitt, WJ8L, 800 S. Kendall Avenue, Kalamazoo, MI 49007.

WANTED: electronic home study courses, accessories, filters, manual for TR7. Microlog ATR 6800 RTTY/CW computer $100 or trade. Steven, 1217 9th Street, Manhattan Beach, CA 90266, 213-318-6990.

SELL: TS-820S $500, TS-520 $400, TV-502 2M Transverter $100, TV-506 6M Transverter $100, VFO-520S $100. Pete, KZ5P, 518-798-0397.

HELP Wanted. T-368 Driver VFO Conversion. Write: Yost, P.O.B. 163, Asbury, NJ 08802.

WANTED: CW, SSB, AM crystal filters for Heathkit SB300 series, Drake R4C, also SB series or R4C for parts. N5LB, 13 Traminer Drive, Kenner, LA 70065, 504-466-8318.

ICOM 745 $685, Sony ICF-2001 SSB FM Gen. Coverage Rcvr. $87. W2FZR, 714-951-7155.

TEN-TEC, new boxed latest 1989 production models, USA made, 561 Corsair II, 562 Omni V, 585 Paragon Transceiver. Titan 425 1.5KW and 420 Hercules 1KW Linear Amplifiers, 238 Antenna Tuner 2KW, 2510B Satellite Station, 2410 UHF 100W 430-450 MHz Amplifier, Mobile HF Antennas, Keyers and Accessories. Visa/MC or check. For best deal, write/phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

GROUND Radial Wire For Verticals Or Slopers: Improves performance, new #16 bare solid copper. Lowest cost, 1000 foot spool, $38 includes shipping. Davis RF, P.O. Box 230-Q, Carlisle, MA 01741, 508-369-1738.

SELL: KWS-1, 32V3 K2AK, 716-358-6837.

ETO ALPHA 76PA Amplifier. Three 8874s, full legal limit, 160-10 meters, $1595. Bud, K2KIR, 315-337-9112 evenings.

ANTENNA Parts Catalog, Lowest Prices: Dipole/Quad/Ground Radial Wire, Insulators, Center Feeds, Open Wire Feed Line Coax, Relays, etc. Catalog: $2. Dipole/Quad Wire: New Hybrid Product, 168 strand copper "Flex-Weave", #14, strong, flexible, non-stretch, won't rust/kink like copper weld. $34 first 275' (minimum), $.12/ft. thereafter, includes shipping. Davis RF, P.O. Box 230-Q, Carlisle, MA 01741, 508-369-1738.

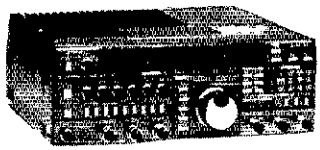
ICOM KENWOOD YAESU

IC-781

HF Equipment	List	Jun's
IC-781 Super Deluxe HF Rig	$5995.00	Call $
IC-765 New, Loaded with Features	3,149.00	Call $
IC-735 Gen. Cvg Xcvr	1099.00	Call $
IC-751A Gen. Cvg. Xcvr	1699.00	Call $
IC-725 New Ultra-Compact Xcvr	949.00	Call $
IC-575A 10m/6m Xcvr	1399.00	Call $
IC-726 HF/50 MHz All Mode	1299.00	Call $
Receivers		
IC-R9000 100 kHz to 1999.8 MHz	5459.00	Call $
IC-R7000 25-1300 + MHz Rcvr	1199.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	999.00	Call $
VHF		
IC-228A/H New 25/45w Mobiles	509./539.	Call $
IC-275A/H 50/100w All Mode Base	1299./1399.	Call $
IC-28A/H 25/45w, FM Mobiles	469./499.	Call $
IC-2GAT, New 7w HT	429.95	Call $
IC-2SAT Micro Sized HT	439.00	Call $
IC-901 Remote Mount Six Band Mobile	TBA	Call$
UHF		
IC-475A/H 25/75w All Modes	1399./1599.	Call $
IC-48A FM Mobile 25w	509.00	Call $
IC-4SAT Micro Sized HT	449.00	Call $
IC-4GAT, New 6w HT	449.95	Call $
IC-04AT FM HT	449.00	Call $
IC-32AT Dual Band Handheld	629.95	Call $
IC-3210 Dual Band Mobile	739.00	Call $
IC-2500A FM, 440/1.2 GHz Mobile	999.00	Call $
IC-2400 144/440 FM	899.00	Call $
220 MHZ		
IC-3SAT Micro Sized HT	449.99	Call $
IC-375A All-Mode, 25w, Base Sta.	1399.00	Call $
IC-38A 25w FM Xcvr	489.00	Call $
1.2 GHz		
IC-12GAT Super HT	529.95	Call $

TS-940S

HF Equipment	List	Jun's
TS-940S/AT Gen. Cvg Xcvr	$2499.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1449.95	Call $
TS-140S Compact, Gen. Cvg Xcvr	949.95	Call $
TS-680S HF Plus 6m Xcvr	1149.95	Call $
TL-922A HF Amp	1749.95	Call $
Receivers		
R-5000 100 kHz-30 MHz	1049.95	Call $
R-2000 150 kHz-30 MHz	799.95	Call $
RZ-1 Compact Scanning Recv.	599.95	Call $
VHF		
TS-711A All Mode Base 25w	1059.95	Call $
TR-751A All Mode Mobile 25w	669.95	Call $
TM-231A Mobile 50w FM	459.95	Call $
TH-215A, 2m HT Has It All	399.95	Call $
TH-25AT 5w Pocket HT NEW	369.95	Call $
TM-731A 2m/70cm, FM, Mobile	749.95	Call $
TM-621 2m/220, FM, Mobile	729.95	Call $
TM-701A 25w, 2m/440 Mobile	599.95	Call $
TH-75A 2m/70cm HT	TBA	Call $
UHF		
TS-811A All Mode Base 25w	1,265.95	Call $
TR-851A 25w SSB/FM	771.95	Call $
TM-431A Compact FM 35w Mobile	469.95	Call $
TH-45AT 5w Pocket HT NEW	389.95	Call $
TH-55 AT 1.2 GHz HT	524.95	Call $
TM-531A Compact 1.2 GHz Mobile	569.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	519.95	Call $
TM-321A Compact 25w Mobile	469.95	Call $
TH-315A Full Featured 2.5w HT	419.95	Call $



FT-767GX

HF Equipment	List	Jun's
FT-747 GX New Economical Performer	$889.00	Call $
FT-757 GX II Gen. Cvg Xcvr	1280.00	Call $
FT-767 4 Band New	2299.00	Call $
FL-7000 15m-160m Solid State Amp	2279.00	Call $
Receivers		
FRG-8800 150 kHz - 30 MHz	784.00	Call $
FRG-9600 60-905 MHz	808.00	Call $
VHF		
FT-411 New 2m "Loaded" HT	406.00	Call $
FT-212RH New 2m, 45w Mobile	499.00	Call $
FT-290R All Mode Portable	610.00	Call $
FT-23 R/TT Mini HT	351.00	Call $
FT-33R/TT 220 MHz HT	373.00	Call$
FT-73R/TT 70cm HT	355.00	Call$
UHF		
FT-712RH, 70cm, 35w Mobile	536.00	Call $
FT-811 70cm built-in DTMF HT	410.00	Call $
FT-790 R/II 70cm/25w Mobile	681.00	Call $
VHF/UHF Full Duplex		
FT-736R, New All Mode, 2m/70cm	2025.00	Call $
FEX-736-50 6m, 10w Module	294.00	Call $
FEX-736-220 220 MHz, 25w Module	322.00	Call $
FEX-736-1.2 1.2 GHz, 10w Module	589.00	Call $
FT-690R MKII, 6m, All Mode, port.	752.00	Call $
Dual Bander		
FT-4700RH, 2m/440 Mobile	996.00	Call $
FT-470 Compact 2m/70cm Mobile	576.00	Call $
FT-690 R/II 6m/10w Mobile	497.00	Call $
Repeaters		
FTR-2410 2m Repeaters	1154.00	Call $
FTR-5410 70cm Repeaters	1154.00	Call $
Rotators		
G-400RC light/med. duty 11 sq. ft.	242.00	Call $
G-800SDX med./hvy. duty 20 sq. ft.	300.00	Call $
G-800S same/G-800SDX w/o presets	322.00	Call $

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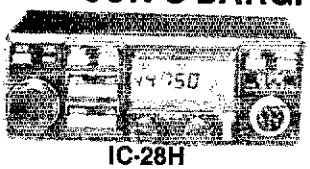

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Once you get bitten by the ATV bug - and you will after seeing your first picture - we have the TX70-1 companion ATV transmitter for only $259 to enable you to send back video from your home camera or camcorder. ATV repeaters are springing up all over - check the ARRL Repeater Directory for one near you. **Call (818) 447-4565** or write for our complete ATV catalog for downconverters, linear amps, antennas, and accessories on the 70, 33, & 23cm bands.

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BX-48	48'self supporting [6 sq.ft.]	$274.50
BX-56	56'self supporting [6 sq.ft.]	$368.50
BX-64	64'self supporting [6 sq.ft.]	$474.50
HBX-40	40'self supporting [10 sq.ft.]	$249.50
HBX-48	48'self supporting [10 sq.ft.]	$338.90
HBX-56	56'self supporting [10 sq.ft.]	$432.00
HDBX-40	40'self supporting [18 sq.ft.]	$313.00
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A3	3 element triband beam	$278.00
A743	7 & 10 MHz add on kit for A3	$87.00
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D3W	10/12/17 mtr dipole	$139.90
4218XL	18 element 2 mtr. 28.8 boomer	$142.00
R4	10,12,15,20 meter vertical	$209.90
R4SK	17 meter add kit for R4	$31.00
R5	10-12-15-17-20 mtrs.	$230.00
A4S	4 element triband beam	$355.00
AV4	40-10 mtr. vertical	$79.00
AV5	80-10 mtr vertical	$122.00
ARX2B	2 mtr "Ringo Ranger"	$40.50
ARX450B	450 MHz. "Ringo Ranger"	$40.50
A144-11	144 MHz. 11 ele. VHF	$51.00
A147-11	11 element 146-148 MHz beam	$51.00
A147-22	22 element "Power Packer"	$146.00
A144-10T	10 element 2 mtr. "Oscar"	$58.00
A144-20T	20 element 2 mtr. "Oscar"	$85.00
215WB	15 element 2 mtr "Boomer"	$88.00
220B	17 element FM "Boomer"	$108.00
230WB	144-148MHz, 30 element	$237.00
32-19	19 element 2 mtr. "Boomer"	$122.00
424B	24 element "Boomer"	$88.00
10-3CD	3 element 10 meter "Skywalker"	$125.00
10-4CD	4 element 10 mtr "Skywalker"	$159.00
15-4CD	4 element 15 mtr. "Skywalker"	$193.00
20-4CD	4 element 14 MHz "Skywalker"	$338.00

HUSTLER ANTENNAS

4BTV	40-10 mtr. vertical	$79.00
5BTV	80-10 mtr. vertical	$105.00
6BTV	6 band trap vertical	$124.00

ROTORS

Alliance	HD73 [10.7 sq.ft.]	$119.00
Alliance	U110	$49.00

CABLE

[2-18 & 6-22]	4080 - per foot	$0.25
[2-16 & 6-20]	4090 - per foot	$0.35
1600	RG8U Mini 8 low loss foam per foot	$0.22
1198	RG8U Columbia superflex 100'	$31.00
1180	RG8U Low loss 100% bonded foil shield 88% tin copper braided sheild -per foot	$0.42
1176	RG213 Columbia - per foot	$0.40

TENNA PHASE III POWER SUPPLIES

PS4 . . . . . **$21.90**
Fully regulated, 13.8 VDC - 4 amps constant with surge protection, overload protection w/instant auto reset

PS7 . . . . . **$27.90**
Fully regulated, 7 amp constant,10 amp surge capacity.

PS12 . . . . . **$37.90**
Fully regulated, 10 amp constant 13 amp surge, electronic overload protection w/instant auto reset

PS20 . . . . . **$72.90**
Fully regulated, 25 amp surge capacity, 13.8 VDC, 17 amp constant, with meter.

PS25 . . . . . **$89.90**
Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage.

PS35 . . . . . **$109.90**
Same as above except, 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts

PS50 . . . . . **$179.90**
Fully regulated 50 amp, adjustable voltage 11-15VDC, dual metering, short circuit protection, multiple binding posts (4), carry handles.

MAXON . . $26.95

Model 49SA - 49 MHz, FM 2-WAY RADIO hands free operation, voice activated transmit up to ½ mile. Batteries optional

model 49S **$34.95**
same features as 49SA except uses "AA" nicad batteries and comes with battery charger

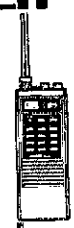
model 49FS **$49.90**
5 Ch FM 2-way, with Earphone mic, offers hands free voice activated or push-to-talk TX. VOX activated by Hi-Med-Lo mic sensitivity switch, 5¼x2¾x1.

uniden

BC55XLT

$114.90

10 Ch 10 band, keyboard lock, 2 digit LC display, review, channel lockout, battery low indicator, memory backup built-in delay, direct channel access, accepts 5 rechargeable nicads.



BC800XLT $219.90

WHILE THEY LAST! The units that receive CELLULAR telephone, 40 Ch 12 band, 800MHz. instant weather, priority, track tuning, auto search, direct Ch access, lockout, memory backup, AC/DC

BC200XLT

$239.90

200 Ch 11 band w/800MHz, 10 priority ch's, ch lockout, scan delay, auto search, battery pack, AC adapater charger, carry case earphone.

BC145XL . . $92.90

16 Ch 10 band programmable, built-in delay, review, priority, memory backup, Ch lockout, direct Ch access, weather search, track tuning, AC/DC

BC70XLT	20 Ch 10 band hand held	$149.90
BC100XLT	100 Ch 10 band hand held	$169.90
BC175XL	16 Ch 11 band aircraft AC/DC	$149.90
BC210XLT	40 Ch 11 band aircraft & weather	$169.90
BC560XLT	16 Ch 10 band mobile	$99.90
BC590XLT	100 Ch 11 band mobile weather	$199.90
BC760XLT	100 Ch 12 band aircraft & 800 MHz	$259.90

Regency

R1077 . . . . . $89.90
10 Ch 6 band digital display, search, lockout, scan delay dual scan speeds, function verification. AC only.

R1099 . . . . . $99.90
45 Ch 6 band, weather, digital display, priority, instant weather search, lockout, scan delay, dual scan speeds. AC only

R4010 . . . . . $114.90
10 Ch 10 band hand held.

R4020 . . . . . $199.90
100 Ch 11 band hand held

R4030 . . . . . $269.90
200 Ch 12 band 800MHz H/H

INF10 . . . $104.90
Preprogrammed for police & fire in all 50 states. Super Turbo Scan, weather channel scan, hold/scan key, mobile mounting bracket

RADAR DETECTORS

BEL **976** **$164.90**
Tri band Vector 3, sequential LED's, volume control.

847 . . . . . **$134.90**
Express remote, X & K band superhet, audible & visual alarm

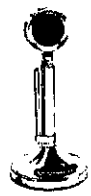
MAXON **RD25** **$74.90**
Delexe mini, X & K band, dual conversion superhet

RD2A **$45.90**
Dual conversion superhet, X & K band, audible & visual alarm.

RD3 . . . . . **$49.90**
Dual conversion Superhet, X & K band sequential LED alarm.

UNIDEN **RD9** **$109.90**
MINI, dual conversion superhet, seqential LED's, audible alarm.

ASTATIC



D104 Silver Eagle **$69.90**
Chrome plated base station amateur microphone, factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation.

ETS D104 SE **$84.90**
Same as above with end of transmission Roger Beep.

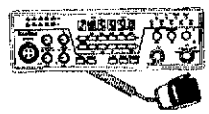
uniden

25 WATT 10 Meter Transceiver, all mode operation, backlit multi function LCD meter, frequency lock, auto squelch, NB, RF gain, PA, external speaker jack, 7¼Wx9¼Dx2½H

HR2510 . . . . $239.90

HR2500 . . . . $289.90

RANGER



10 meter transceiver, 25 watt, can be programmed to solit reansceive, SSB, CW, AM, FM programmable scanning, fully automatic noise blanker, 2½Hx7¼Wx11D.

AR3500 . . . . $349.90

AR3500/100 . . . . . $419.90

FIRESTIK MACH 10, 28.300 to 28.500 tuneable whip antenna.

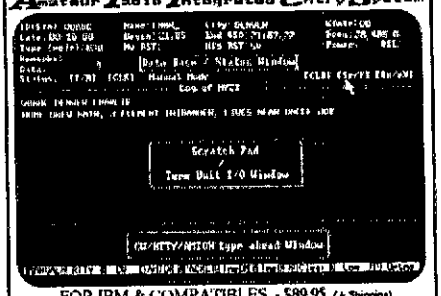
TM3	10 meter 3 ft (white or black)	$13.99
TM4	10 meter 4 ft (white or black)	$14.59

JOBS FOR HAMS

JOB WANTED Chicago Area: Active amateur seeking full-time electronics engineering position in areas of RF/microwave circuitry, antenna design/testing, amateur radio. Will relocate to northern Indiana, Chicago, IL or southwestern Michigan only. Possess BS-EET (Purdue) & advanced amateur license. Will promptly send you a resume for your call at 301-768-1291 after 3:30 PM EST or write to: Steve Arent, N9FBA, 415 J Raindrop Court, Glen Burnie, MD 21061.

Aries-1

Amateur Radio Integrated Entry System



FOR IBM & COMPATIBLES - $89.95 (+ Shipping)

INTEGRATED MULTI-FUNCTION AMATEUR RADIO SOFTWARE that:

- Is a Logging / Terminal / Contest program (simultaneously)
- Interfaces with *Kantronics KAM* and *AEA PK-232* TUs
- Interfaces with computer capable *Icom & Kenwood* Xcvrs
- Automatically inserts Freq. / Mode / Date / Time into Log
- Allows mouse and/or Function key control of Terminal Unit
- Searches Log by any field (including remarks)
- Allows transmission of any ASCII text file through TU
- Can capture all or part of any incoming data to disk
- Prints QSL labels and logbook sheets
- Runs other programs or DOS from within *Aries-1*
- Has User defineable colors for all foreground / background
- Does fast Dupe checking in all modes
- Shifts TU modes, Baud Rates, CW speed etc. and all other necessary internal parameters with a mouse click or key press

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Zip or Postal Code*
Call

Print New Address

Name
Address
City
State/Province*
Zip or Postal Code*
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*Members of CRRL mail address changes to CRRL Headquarters, Box 7009 Station E, London, ON N6Y 4J9

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advertising contributed for the public good

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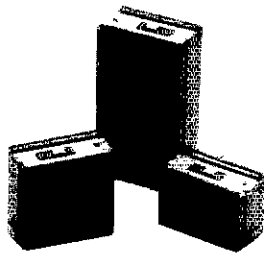
You've bought our replacement batteries before...
NOW YOU CAN BUY DIRECT FROM US, THE MANUFACTURER!



ICOM
CM2, PB2 7.2v @ 500MAH
CM5, PB5 10.8v @ 500MAH
SUPER
7S 13.2v @ 1200MAH **$63.95**
8S 9.6v @ 1200MAH **$59.95**
(base charge only - 1" longer)
ICOM Chargers Available Soon

NEW PRICING

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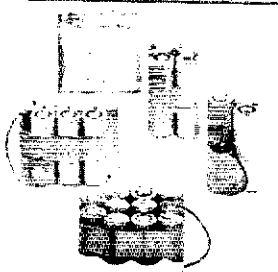
7S (1200 MAH)	$63.95
8S (1200 MAH)	$59.95
ICOM INSERT	
PB-3	$17.45
YAESU	
FNB-2	$20.95
P4W	$20.95

Replacement Batteries For Cordless Telephones

LOOK FOR NEW CATALOG COMING SOON!

YAESU/MAXON
FNB-10 7.2v @ 600MAH
FNB-12 12v @ 500MAH
FNB-10(S)7.2v @ 1000MAH
NEW
FNB-12 12v @ 500MAH
FNB-12(S) 12v @ 600MAH
equivalent to FNB-11
(⅞" shorter)
*same size case as FNB-12
NOW
P4W 11v @ 500MAH - **$20.95**
FNB-2 11v @ 500MAH - **$20.95**



CUSTOM MADE BATTERY PACKS & INSERTS
Made to your specifications.
Introductory Offer!
KENWOOD
PB-21 - $13.75, PB-25 - $20.00,
PB-26 - $20.00
ICOM
BP-5 - $23.00, BP-3 - **$17.45**
BP-7, BP-8

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MasterCard and Visa cards accepted. NYS residents add 8¼% sales tax. Add $3.50 for postage and handling.

SOURCE FOR ALL YOUR COMMUNICATION BATTERY REPLACEMENT NEEDS.

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NO Sales Tax in Delaware! one mile off I-95

Prices are subject to change without notice or obligation. Products are not sold for evaluation.

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Angela M. Beebe, KA1SER, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel.

Index of Advertisers

ANTENNA/TOWER SALE!

hy-gain CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

ROHN Self Supporting Towers On SALE! FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	16 sq ft	228	$449
HBX48	48 ft	16 sq ft	303	$589
HBX56	56 ft	10 sq ft	385	$699
HDBX40	40 ft	16 sq ft	281	$569
HDBX48	48 ft	16 sq ft	363	$689

*Your Total Delivered Price Anywhere In Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN Guyed Tower Packages

- World Famous Rohn Quality and Dependability
- Rugged high wind survival provides safe installation
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, concrete base, rotor plate and top section per manufacturers specs.

Packages shown below are rated for 70 mph wind zone. 90 mph wind zone packages slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

	Model 25G	Model 45G	Model 55G
50'	$849	$1229	$1549
60'	939	1389	1939
70'	999	1719	2159
80'	1199	1869	2369
90'	1289	2039	2579
100'	1369	2199	2989
110'	1449	2459	3209
120'	1669	2619	3429

US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!

Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting-
- No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock-

CALL FOR SALE PRICES!

Model	Min.Ht.	Max.Ht.	Ant.load*	Sale price
MA40 mast	21'	40'	10 sq ft	$629
MA550 mast	22'	50'	10 sq ft	999
TX438	22'	38'	18 sq ft	919
TX455	22'	55'	18 sq ft	1385
TX472	23'	72'	18 sq ft	2279
HDX555	22'	55'	30 sq ft	2079
HDX572	23'	72'	30 sq ft	3559

Note-US Towers Shipped Freight Collect From Visalia, CA Factory

**Note-towers rated at 80 mph to EIA specifications*

RG-213U

$.39/ft $379/1000 ft. Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.22/ft $209/1000 ft.

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

$.45/ft $439/1000 ft.

- Same Specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HANDLINE/HELIAX®

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket.....$.79/ft.
½" LDF4-50 Andrew Heliax®.....$1.99/ft.
⅞" LDF5-50 Andrew Heliax®.....$4.99/ft.
select connectors below
Heliax® is a Registered Trademark of the Andrew Corp.

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.9	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Heliax®	$29	$29	$29	$29
⅞" Heliax®	$55	$55	$55	$55

Amphenol Silver PL259.....$1.50
UG21B N Male.....$3.50
9086/9913 N Male Connector.....$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga.....$.10/ft.
¼ mile 18ga copper-clad steel wire.....$30
Dog bone end insulator.....$.79 ea.

VAN GORDEN

1:1 Balun.....$15 Center Insulator.....$8
Dipole Kits.....D80 $31.95/D40 $28.95
Short Dipole Kits.....SD80 $35.95/SD40 $33.95
All-band Dipole w/ladder line.....$29.95
G5RV all band antenna.....$49.95

ALPHA DELTA

DX-A 160-80-40 Sloper.....$49

CUSHCRAFT

A3 3-el Tribander.....
A4S 4-el Tribander Beam w/S.S. Hdwre.....
A743 & A744, 30/40 mtr KIT for the A3 & A4.
R4 20-10 mtr Vertical.....
AP8 80-10 mtr Vertical.....
AV5 80-10 mtr Vertical.....
D40 40 mtr Dipole.....
40-2CD 2-el 40 mtr Beam.....
A50-5 5-el 6 mtr Beam.....
215 WB NEW 15-el 2 mtr Beam.....
230 WB NEW 30-el 2 mtr Beam.....
4218 XL 18-el 2 mtr Beam.....
3219 19-el 2 mtr Beam.....
424B 24-el 432 MHz Beam.....
ARX2B 2 mtr Vertical.....

CALL FOR SPECIAL PRICES!

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Discoverer 2-el 40-mtr Beam.....
Discoverer 3-el Conversion Kit.....
EXPLORER-14 SUPER-SPECIAL.....
QK710 30/40 mtr. Add-On-Kit.....
V2S 2-mtr Base Vertical.....
V4S 440MHz Base Vertical.....
TH5MK2S Broad Band 5-el Triband Beam.
TH7DXS 7-el Triband Beam.....
TH3JRS 3-el Triband Beam.....
205BAS 5-el 20-mtr Beam.....
155BAS 5-el 15-mtr Beam.....
105BAS 5-el 10-mtr Beam.....
204BAS 4-el 20-mtr Beam.....
64BS 4-el 6-mtr Beam.....
12 AVQ 20-10 mtr vertical.....
14 AVQ 40-10 mtr vertical.....
18AVT/WB 80-10mtr Vertical.....
18HTS 80-10 mtr Hy-Tower Vertical.....
23BS 3-el 2 mtr Beam.....
25BS 5-el 2 mtr Beam.....
28BS 8-el 2 mtr Beam.....
214BS 14-el 2-mtr Beam.....
2BDQ 80/40 mtr Trap Dipole.....
5BDQ 80-10 mtr Trap Dipole.....
BN86 80-10 mtr KW Balun W/Coax Seal...

CALL FOR SPECIAL PRICES!

HUSTLER

6BTV 80-10 mtr Vert $149 5BTV 80-10 mtr Vert $129
4BTV 40-10 mtr Vert $99 G7-144 2-mtr Base $129
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6VX 80-10m Vertical $159.95 Delivered
- Full Legal Power
- Highest Q Tuning Circuits

HF2V 80-40m Vertical $149.95 Delivered
- Full Legal Power
- Automatic Band Switching

Accessories:
RMK II Roof Mtg. Kit.....$59.95
STR II Stub-Tuned Radials.....$39.95
TBR160 160m Coil Kit.....$59.95
30m Add-on Kit.....$39.95
17/12m Add-on Kit.....$39.95

HF6V HF2V

FREE UPS on ACCESSORIES when purchased with antenna

HF5B "Butterfly" 20-10m Compact Beam $259.95

- Unique Design Reduces Size
- No Lossy Traps
- Turns w/TV Rotor
- Boom Length 6 Feet
- Element Length 12.5 Feet

FREE UPS Shipping in Continental USA

MIRAGE/KLM

KT34A 4-el Broad Band Triband Beam.....$419
KT34XA 6-el Broad Band Triband Beam.....$619

ROTORS

Alliance HD73 (10.7 sq. ft. rating).....$129.95
Alliance U110 (3 sq. ft. rating).....$49
Telex CD 4511 (8.5 sq. ft. rating).....$Call
Telex HAM 4 (15 sq. ft. rating).....$Call
Telex Tailtwister (20 sq. ft. rating).....$Call
Telex HDR300 Heavy Duty (25 sq. ft. rating).$Call

ROTOR CABLE

Standard 8 cond cables $.25/ft.
(vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.45/ft
(vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS

20G.....$54.50 45G.....$153.50
25G.....$65.50 55G.....$197.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	CALL FOR PRICES
FK2558	58 ft.	13.3 sq. ft.	
FK2568	68 ft.	11.7 sq. ft.	
FK4544	44 ft.	34.8 sq. ft.	
FK4554	54 ft.	29.1 sq. ft.	
FK4564	64 ft.	28.4 sq. ft.	

25G Double Guy Kit.....$299.
45G Double Guy Kit.....$319.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating).....$.15/ft
1/4 EHS Guywire (6550 lb rating).....$.18/ft
5/16 EHS Guywire (11,200 lb rating).....$.29/ft
5/32 7 x 7 Aircraft Cable (2700 lb rating).....$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32").....$.45
1/4 CCM Cable Clamp (1/4" Cable).....$.55
1/4 TH Thimble (fits all sizes).....$.45
3/8EE (3/8" Eye & Eye Turnbuckle).....$6.95
3/8EJ (3/8" Eye & Jaw Turnbuckle).....$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle).....$9.95
1/2 x 9EJ (1/2" x 9" Eye & Jaw Turnbuckle).....$10.95
1/2 x 12EE (1/2" x 12" Eye & Eye Turnbuckle).....$12.95
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1/4" Preformed Guy Grip.....$2.99
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502 Guy Insulator (1/4" Cable).....$3.49
5/8" Diam - 8 ft Copper Clad Ground Rod.....$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.32/ft
HPTG4000 Guy Cable (4000 lb rating)	$.52/ft
HPTG6700 Guy Cable (6700 lb rating)	$.72/ft
9901LD Cable End (for 2100/4000 cable)	$9.95
9902LD Cable End (for 6700 cable)	$11.95
Socketfast Potting Compound (does 6-8 ends)	$16.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$29	$49	$69	$89
.18 in Wall	$49	$89	$129	$149
.25 in Wall	$69	$129	$189	$249

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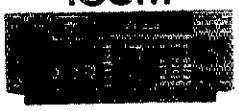
- Dual VFO's
- Full CW Break-in
- Lots More Features

ICOM NEW!

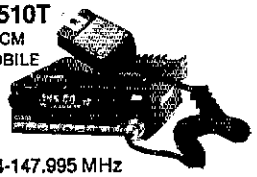


IC-765 NEW HF TRANSCEIVER

- Built-in Automatic Antenna Tuner and Power Supply
- 99 Memories • 100 W Output
- 160-10M/General Coverage Receiver
- Band Stacking Registers

ALINCO

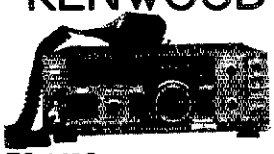
DR-510T
2M/70CM FM MOBILE



- 144-147.995 MHz 440-450 MHz
- Cross Band Repeater Function
- 45W/35W Output
- 14 Memories

SPECIAL SALE-CALL!

KENWOOD



TS-140S AFFORDABLE DX-ing!

- HF Transceiver With General Coverage Receiver
- All HF Amateur Bands
- 100 W Output
- Compact, Lots of Features

YAESU

FT-736R VHF-UHF BASE STATION

- SSB, CW, FM on 2 Meters and 70 cm
- Optional 50 MHz, 220 MHz or 1.2 GHz
- 25 Watts Output on 2 Meters, 220 and 70 cm
- 10 Watts Output on 6 Meters and 1.2 GHz • 100 Memories

ICOM IC-725

NEW ULTRA-COMPACT HF TRANSCEIVER

NEW!

- USB/LSB/CW, AM Receive Optional Module for AM Transmit and FM TX/RX
- 160-10M Operation • 100 W Output
- Receive 30 kHz to 33 MHz
- 26 Memories with Band Stacking Registers

ALINCO

DJ-500T
DUAL BAND HANDHELD

- 144-147.995 MHz 440-450 MHz
- 2.5W VHF, 2W UHF
- Programmable Odd Offsets
- 20 Memory Channels
- Multiple Battery Options

SPECIAL SALE-CALL!

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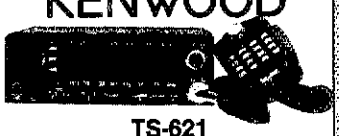

TS-621
2 METER/220 MHz DUALBANDER

- 138-173.995 MHz 215-229.995 MHz
- 45W/25W Output
- 30 Memory Channels
- Dual Antenna Ports

CALL FOR SPECIAL PRICE!

YAESU

FT-212 RH
THE "ANSWERING MACHINE" 2 METER MOBILE

- 45 Watts Output • Multiple Scanning Routines
- 10 Memories • Hi/Lo Power Switch

ICOM NEW!

IC-2 SAT
MINI 2 METERS FM HANDHELD

- Receive 138-174 MHz
- Transmit 140-150 MHz
- Up to 5 Watts Output
- 48 Memories
- Band and Memory Scanning
- Automatic Power Shut-Off

ASTRON

• RS7A $51	• RS35M . . $167
• RS12A . . . $75	• VS35M . . $179
• RS20A . . . $92	• RS50A . . $209
• RS20M . . $112	• RS 50M . $235
• VS20M . . $129	• RM50M . $259
• RS35A . . $149	• VS50M . . $245

KENWOOD

TH-75A
2M/70CM DUAL BAND HT

- Receive 141-163.995 & 438-449.995 MHz
- One Watt Power on Each Band
- Monitor Both Bands at Same Time
- CTCSS Encode/Decode Built-in

YAESU NEW!

FT-470
COMPACT DUAL BAND FM HANDHELD (2M/70CM)

21 Memories for Each Band
Dual VFO's for Each Band
Up to 5 Watts Power
Built-in CTCSS
Built-in 10-Memory DTMF Autodialer

ICOM

IC-32AT
SUPER DUALBAND FM HANDHELD

- 5 Watts on Both Bands
- Receive 138-174 MHz 440-450 MHz
- Stores Standard and Odd Offsets

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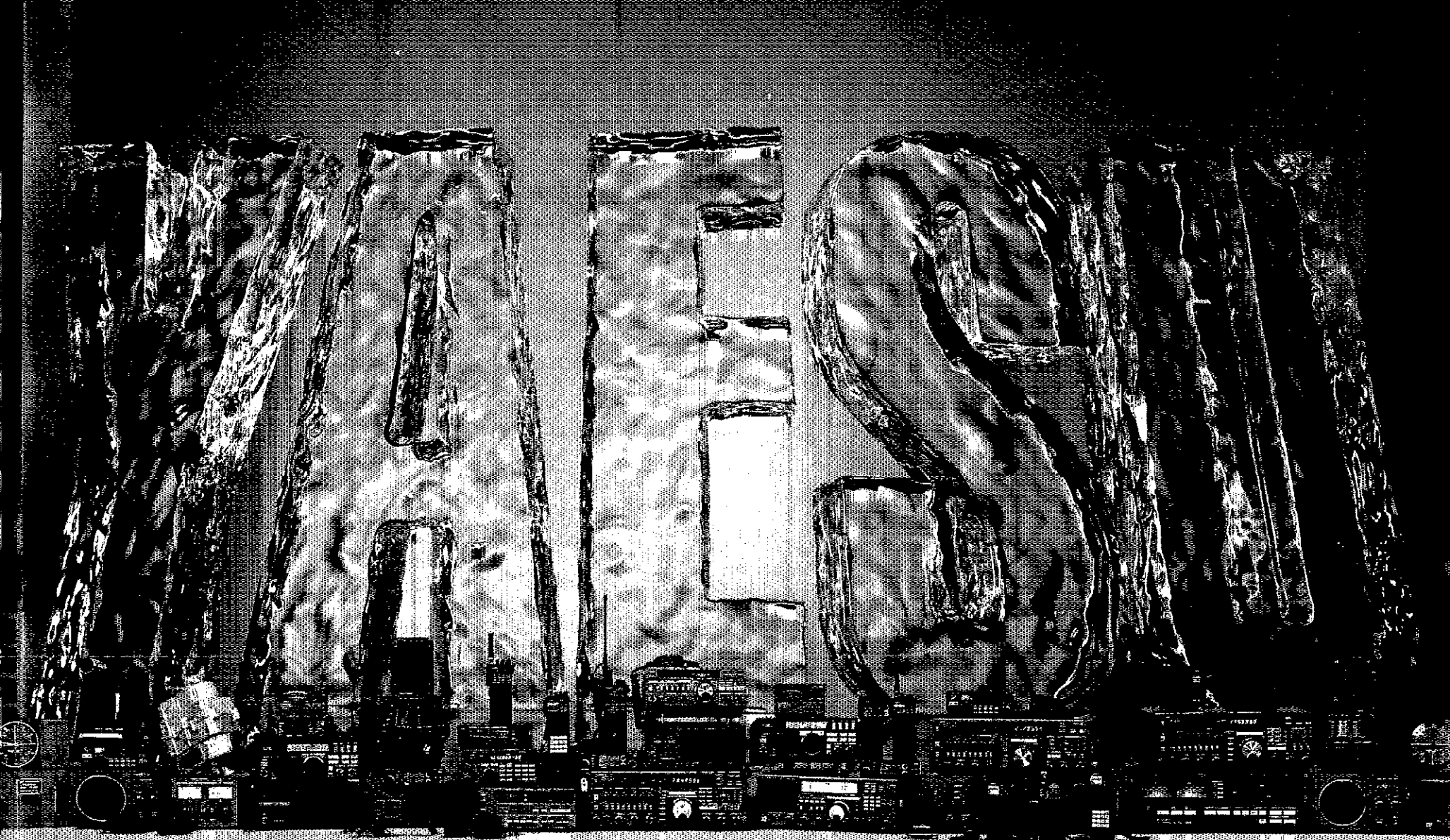

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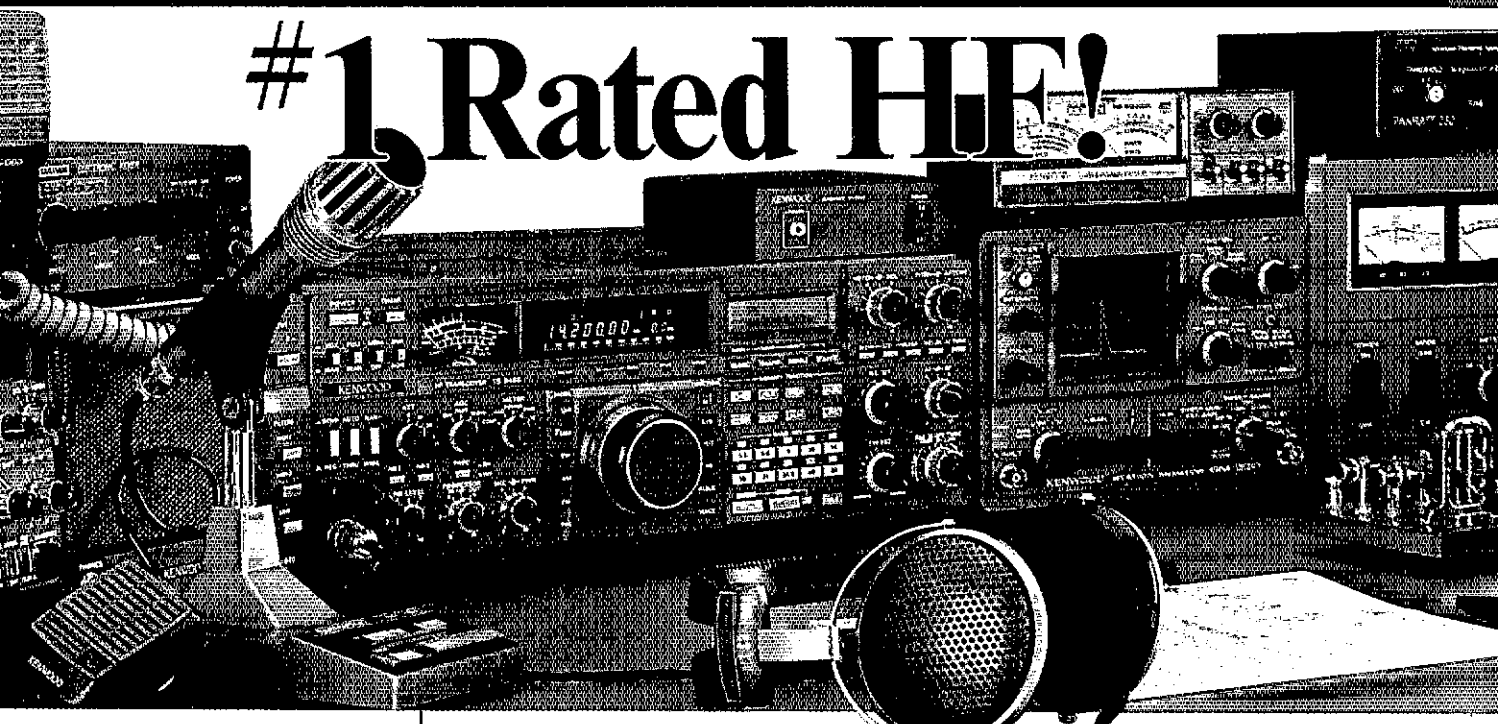
DX-cellence!

#1 Rated HF!

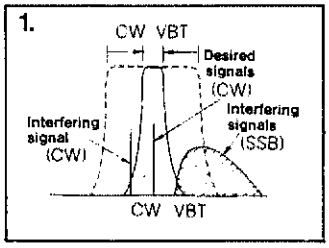


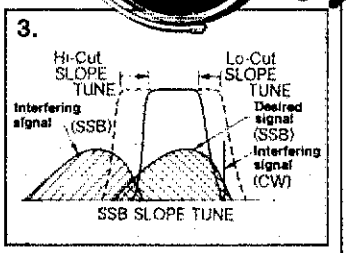
TS-940S

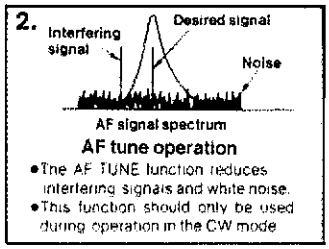
Competition class HF transceiver

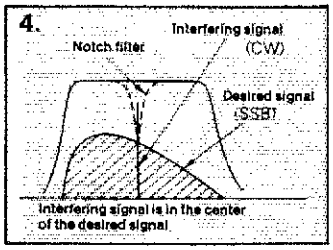
TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

- **100% duty cycle transmitter.** Kenwood specifies transmit duty cycle ***time.*** The TS-940S is guaranteed to operate at full power output for periods ***exceeding one hour.*** (14.250 MHz, CW, 110 watts.) Perfect for RTTY, SSTV, and other long-duration modes.
- **First with a full one-year limited warranty.**
- **Extremely stable phase locked loop (PLL) VFO.** Reference frequency accuracy is measured in ***parts per million!***









1) CW Variable Bandwidth Tuning. Vary the passband width continuously in the CW, FSK, and AM modes, without affecting the center frequency. This effectively minimizes QRM from nearby SSB and CW signals.

2) AF Tune. Enabled with the push of a button, this CW interference fighter inserts a tunable, three pole active filter between the SSB/CW demodulator and the audio amplifier. During CW QSOs, this control can be used to reduce interfering signals and noise, and peaks audio frequency response for optimum CW performance.

3) SSB Slope Tuning. Operating in the LSB and USB modes, this front panel control allows independent, continuously variable adjustment of the high or low frequency slopes of the IF passband. The LCD sub display illustrates the filtering position.

4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
- **Superb, human engineered front panel layout for the DX-minded or contesting ham.** Large fluorescent tube main display with dimmer; direct keyboard input of frequency; flywheel type main tuning knob with optical encoder mechanism all combine to make the TS-940S a joy to operate.
- **One-touch frequency check (T-F SET) during split operations.**
- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
- **Simple one step mode changing with CW announcement.**
- **Other vital operating functions.** Selectable semi or full break-in CW (QSK), RIT/XIT, all mode squelch, RF attenuator, filter select switch, selectable AGC, CW variable pitch control, speech processor, and RF power output control, programmable band scan or 40 channel memory scan.

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • IF-232C/IF-10B computer interface.

Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features and prices are subject to change without notice or obligation.

KENWOOD

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P.O. Box 22745, Long Beach, CA 90801-5745