QST

October 1990 $3.00

devoted entirely to Amateur Radio



The 3Y5X Club Bouvet DXpedition

10
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63 years and still serving the amateur's needs..now two more fine new amplifiers

the 3KD Classic

the 2KD Standard



Now you have a choice of four high quality HF desk models providing the performance and reliability you have come to expect from a Henry Amplifier

3KD CLASSIC. . .new to the Henry line

1500 W PEP nominal output SSB and CW. 1000 Watts ICAS, RTTY, and FM, covering the 3.5 to 30.0* MHz frequency range. Nominal gain: 15 to 20 times input drive. Tube complement consists of one remarkable new Eimac 3CX-1200D7 ceramic triode. It uses a Pi-L plate circuit with a silver plated tank coil for maximum efficiency and attenuation of unwanted harmonics.

2KD STANDARD. . .new to the Henry line

Smaller than the 2KD Classic and with a slightly lower power output, but still the same rugged construction, the same superior components, the same dependability. The 2KD Standard is a 1200 W PEP nominal output SSB, CW, 750 W RTTY FM RF linear covering the 3.5 to 30.0* range. It uses a Pi-L plate circuit with a silver plated tank coil for maximum attenuation of unwanted harmonics. Its tube complement consists of one Eimac 3-500Z glass envelope triode in a grounded grid circuit.

3KD PREMIER

The same superb specs as the Classic, BUT with the addition of 160 meter operation and QSK break in keying. Both the Premier and the Classic desk models are no nonsense. . .no compromise amplifiers that will please the most discerning amateur for many years to come.

2KD CLASSIC

A proven desk top workhorse providing full legal power. Uses two Eimac 3-500Z glass envelope triodes plus a full complement of top quality components. And, as with all Henry amplifiers is backed by an enduring history of the most reliable equipment available for the amateur market.

*10 meters available on export models only

For additional information on these and the rest of the fine line of Henry amplifiers please call or write for our new information packet.

The Henry line of amplifiers also offers four very heavy duty HF floor consoles in addition to several UHF and VHF models. In all, we now offer 15 different amplifiers. . .more than any other manufacturer that we know of. One of them has to be just right for you.

In addition to our broad line of amateur and commercial FCC type accepted amplifiers we offer special RF power generators for industrial and scientific users. Call or write Ted Shannon for full information.

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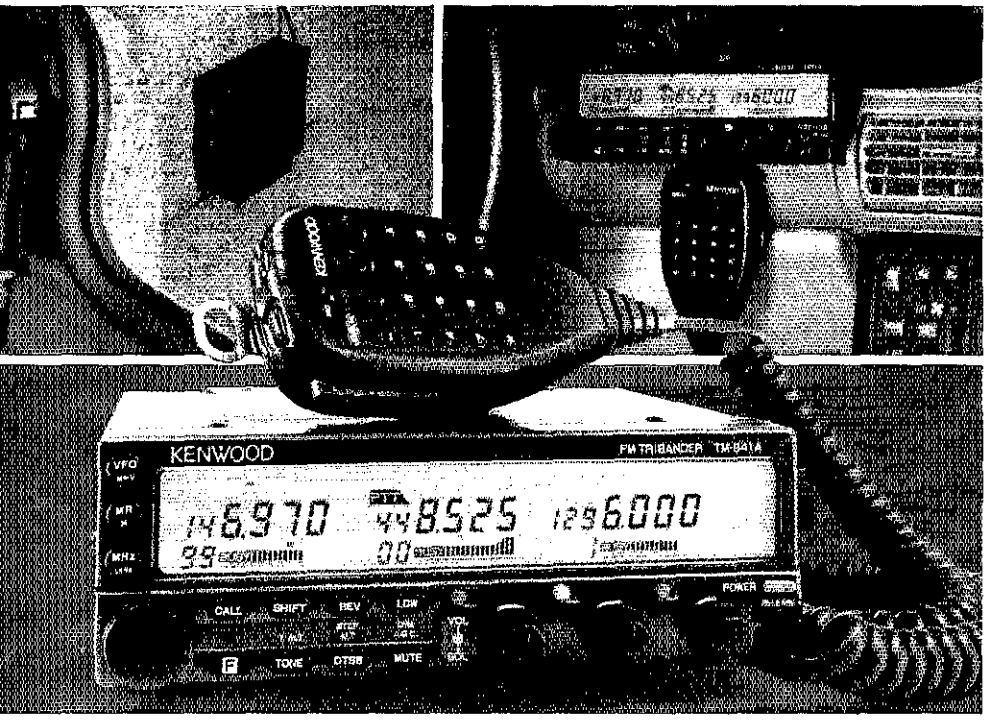
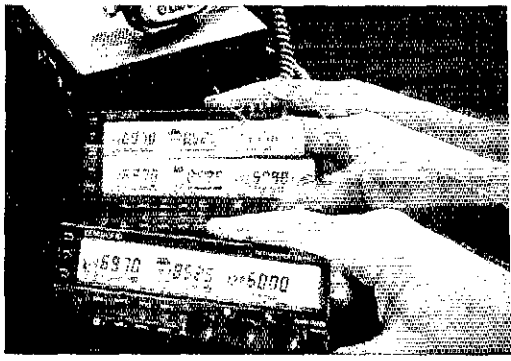
KENWOOD

Triple Play!







TM-941A

TRI-BAND FM Transceiver

Kenwood brings you yet another breakthrough – the TM-941A *TRI-BAND* FM TRANSCEIVER. Now you can operate on *three* bands – 144, 450, or 1200 MHz – with one radio! This rig even gives you full duplex, cross-band, triple-band repeat!

- **High power output.** 50 W on 144 MHz, 35 W on 450 MHz, and 10 W on 1200 MHz. (Selectable low power: 5 and 10 W, 1 W on 1200 MHz.)
- **Wide band receiver coverage.** 118-174, 438-450 (400-475 after modification), 1240-1300 (1210-1330 after modification) MHz. TX on Amateur bands only. Modifiable for MARS/CAP. Permits required.
- **CTCSS encode/decode built-in.** 38 sub-tones selectable from the front panel.
- **Cross-band repeat function.** Selectable single or dual input! Offset function on output, allows simplex to repeater repeat!
- **Simultaneous tri-band receive.** Individual volume and squelch controls help you "sort out" the signals.
- **Detachable front panel.** Use the optional PG-4K or PG-4L to mount the front panel remotely.
- **Selective calling option (DTU-2).** Selectively call a single station, or call a group with DTMF tones.
- **303 memory channels.** Store everything you need for efficient operation. All channels allow you to store "odd split" repeaters.
- **Versatile scanning functions.** Band scan, memory scan and programmed scan with carrier or time operated stop.
- **NEW! Auto memory scan.** Automatically memorizes a busy frequency while scanning the band!
- **Automatic repeater offset on 2 m.** Plus or minus 600 kHz for 144 MHz, ±5 MHz on 450 MHz, and ±12 or 20 MHz for 1200 MHz. (Manual offset for 450 and 1200 MHz.)
- **Fixed detect output.** For packet operators!
- **Multi-function DTMF mic supplied.**
- **Auto power off and time-out timer.**
- **4-step dimmer control.** Selectable 4-step dimmer control.
- **Three separate antenna and speaker connectors.** For maximum performance.

Optional Accessories:
- **DTU-2** Digital paging (DTMF) unit
- **PG-4K, PG-4L** Front panel cable kits
- **MC-45** Multi function mic.
- **MB-11** Extra mounting bracket
- **SP-41, SP-50B** External mobile speakers
- **PG-3B** DC line noise filter
- **PS-430** Power supply
- **PG-2N** DC power 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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EXAMINE THE IC-725 PIECE BY PIECE



PA UNIT
provides 100% duty cycle



CPU UNIT
contains band stacking registers

DDS UNIT
provides excellent signal-to-noise ratio

From the CPU to the DDS System to the final output board, the ICOM IC-725 is designed for you... *the amateur who demands* relentless performance.

Whether its fixed, mobile or portable operation you desire, the IC-725 will open your eyes to what amateur radio should be. World renowned for excellence in circuit design, versatility and dependability, the IC-725 is backed by a full one-year factory warranty.

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QST

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OUR COVER

The Club Bouvet DXpedition to the remote volcanic island halfway between Africa and Antarctica (54°S, 5°E) was an exciting way for DXers worldwide to ring in the new year. Shown (l-r) are Jacky, F2CW; Jin, JF1IST; Einar, LA1EE; Willy, HB9AHL and Kare, LA2GV. Read the fascinating firsthand account on p 14.

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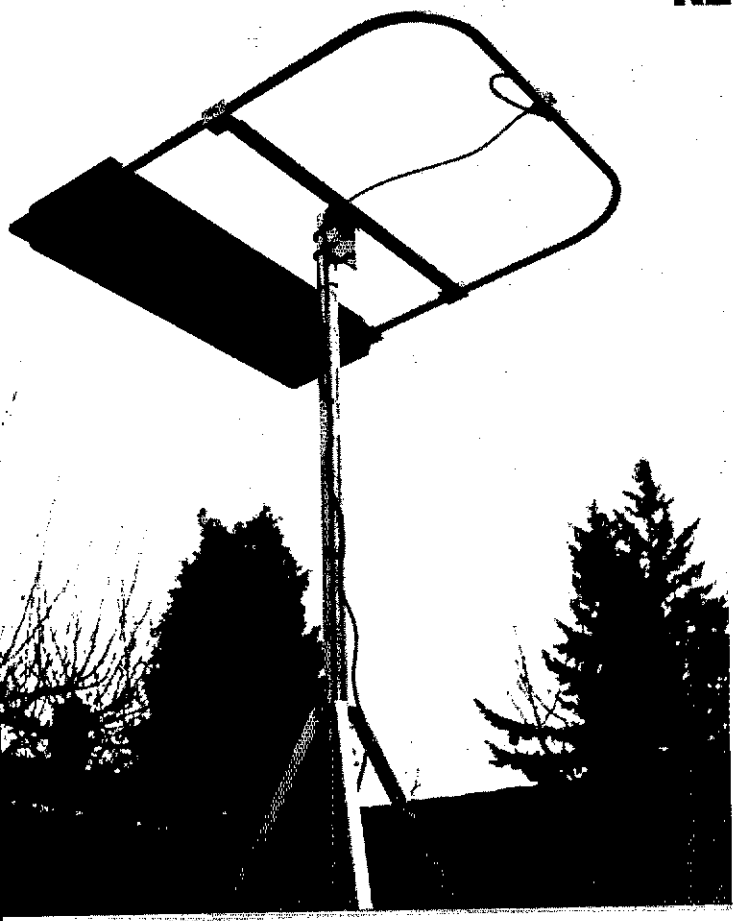
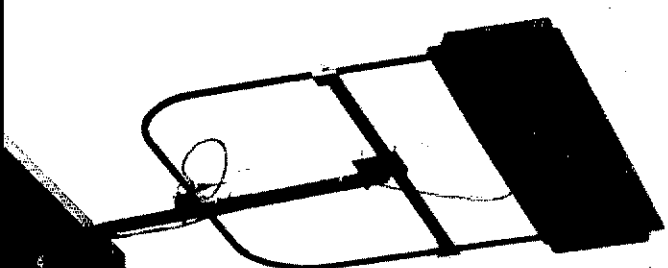
REVOLUTIONARY COMPACT DESIGN





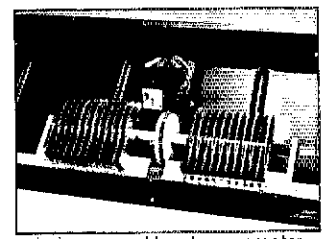
nce again AEA has achieved a significant engineering breakthrough with its high-performance, low profile HF IsoLoop antenna. Performance isn't compromised by its small size. Operate your favorite HF band (14 to 30 MHz frequency coverage) from areas with restrictive zoning ordinances or apartments and condos. Or take it with you on vacation. . . it's the ideal go-anywhere portable antenna. And it's the only antenna you need to cover 14 to 30 MHz. ONE antenna instead of numerous dipoles and without any traps!

Rated up to 150 watts, the IsoLoop transmits and receives on any frequency between 14 to 30 MHz. When mounted with the loop in the horizontal plane, the radiation pattern is omni-directional and horizontally polarized. Maximum radiation is at low angles which is ideal for DX operation. The IsoLoop may also be mounted with the loop in the vertical plane to provide a null in a desired direction. Tuning is provided by a precision stepper-motor and a small remote control box, the LC-1.

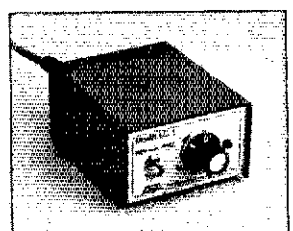
The IsoLoop does not need ground radials and its balanced, shielded feed-loop isolates the feedline from the antenna. The IsoLoop is well-isolated from the feedline. Like AEA's Isopole antennas, your signal is radiated by the antenna and not the feedline. With end-fed antennas, the outside of the coax becomes part of the antenna, resulting in noise and computer hash pickup and increased TVI problems.

One of the unique features of the IsoLoop is its inherent High-Q. The IsoLoop can be considered a very sharp tunable filter that radiates. The narrow bandwidth suppresses harmonics from your transmitter reducing TVI problems. It also attenuates out-of-band signals from nearby transmitters that could overload your receiver.

The IsoLoop is square, with rounded corners, and measures 32 inches on a side and weighs only 12 pounds. Because of the IsoLoop's small size, it makes a perfect attic or balcony antenna. It's also excellent for portable operation, recreational vehicles or camp-site use. A rotator is not necessary when used in the omni-directional, horizontally polarized mode.



IsoLoop precision stepper motor provides accurate tuning.



IsoLoop LC-1 control box with variable speed tuning.

The AEA IsoLoop antenna represents years of research and development. Others may try to imitate the IsoLoop, but none can match the patent-pending design.

AEA also provides technical support from the factory or through your personal computer and modem on CompuServe's HamNet. If you are already a CompuServe member, just type GO HAMNET at any CompuServe prompt. For a free introductory CompuServe membership, call 1-800-848-8199 and ask for representative #48.

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Stand optional.

NEW DUAL BAND RINGO

Cushcraft

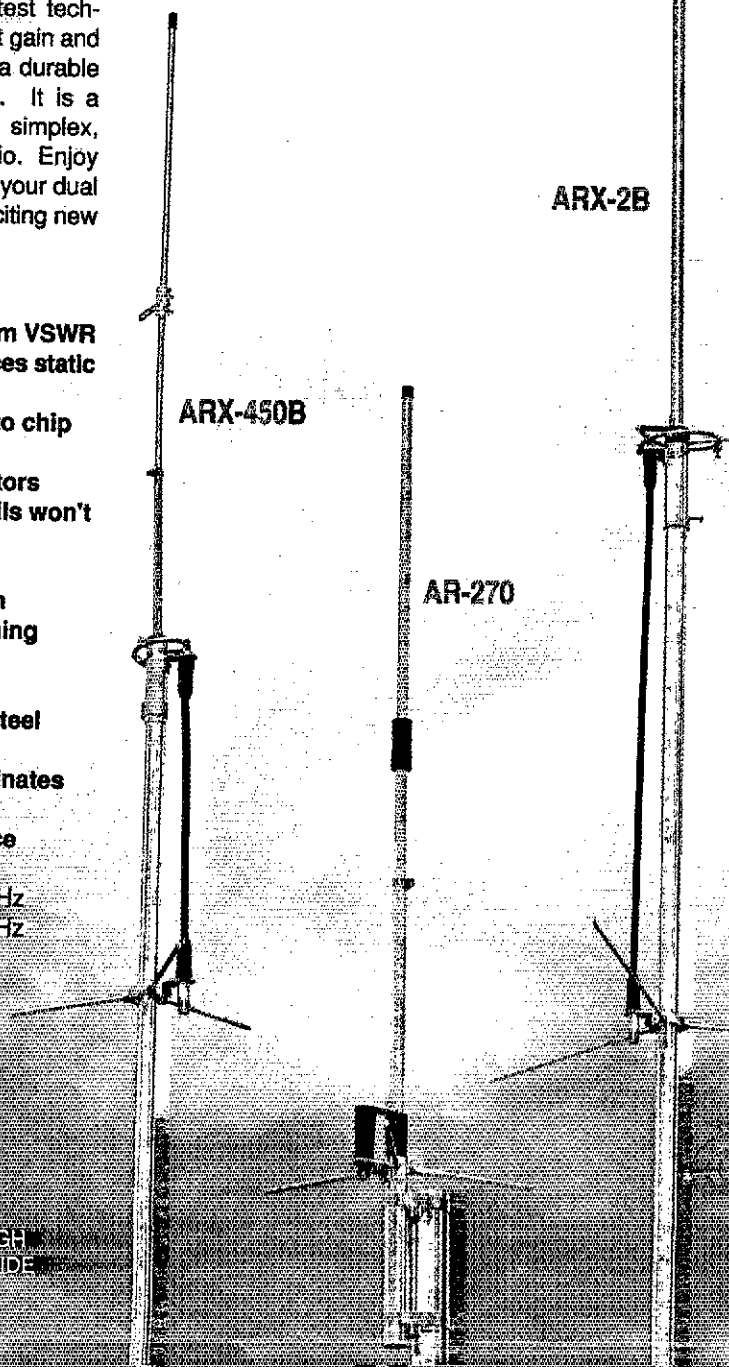
AR-270 (2m/70cm)

The engineering hams at Cushcraft bring to you an all new computer aided design.

AR-270 uses the latest technology to give excellent gain and low angle radiation in a durable all aluminum antenna. It is a perfect choice for FM simplex, repeater or packet radio. Enjoy the full performance of your dual band radio with this exciting new antenna.

- **Excellent gain**
- **Broadband, minimum VSWR**
- **All aluminum - reduces static build-up**
- **No painted surface to chip peel or crack**
- **UV stabilized insulators**
- **Precision wound coils won't detune**
- **SO-239 connector**
- **Less than 4 feet high**
- **DC ground for lightning protection**
- **Mounting flexibility**
- **Rust free stainless steel hardware**
- **RF de-coupling eliminates TVI**
- **Amazing performance**

AR-270	144-148 MHz
	435-450 MHz



RINGO RANGERS

The world's most popular 2 meter, 1 1/4 meter and 70 cm antennas.

They stand tall to give you more performance and wider area coverage. Ringo Rangers are your best single band antenna choice for FM repeaters, simplex or packet radio. There are many imitations, but none equal the value of a Ringo Ranger.

- **Excellent gain and bandwidth**
- **Optimum low angle radiation**
- **Broadband with low VSWR**
- **Highest power rating**
- **Built in lightning arrester**
- **RF de-coupling radials**
- **All weather performance**
- **SO-239 connector**
- **Rust free stainless steel hardware**
- **Slim profile for better appearance**
- **Durable static free aluminum**
- **Traditional Cushcraft value**

ARX-2B	135-160 MHz
ARX-220B	220-225 MHz
ARX-450B	435-450 MHz
ARX-450BN*	435-450 MHz

* N connector

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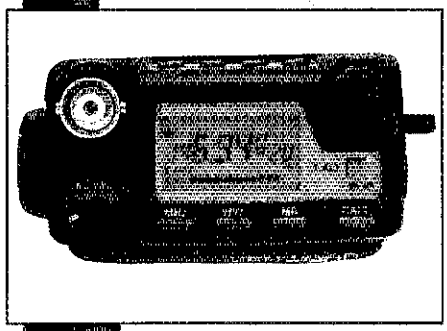
Prefer-ability!

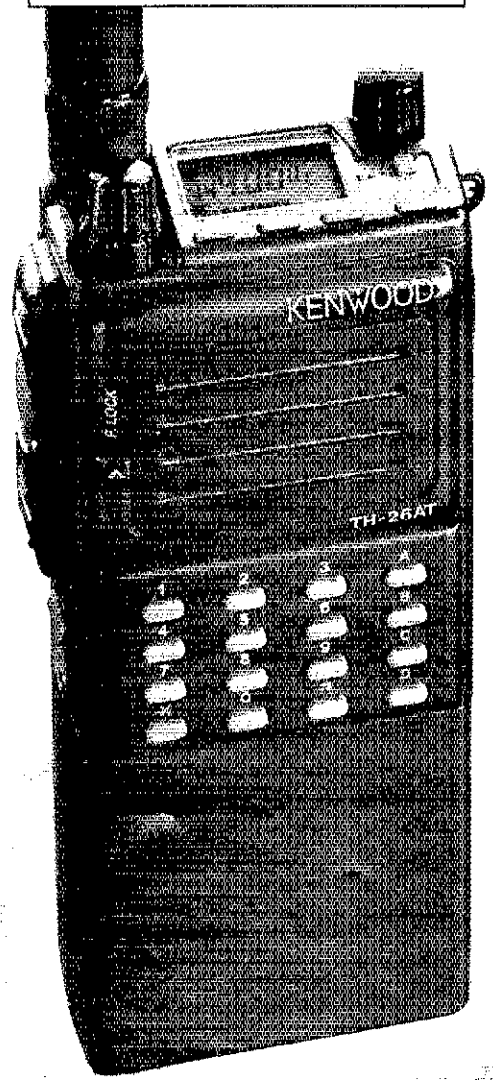
TH-26AT/46AT

144 MHz/440 MHz

Compact Portable FM Transceivers

Select the radio that lets you choose who can call *you*. The new DTMF encode/decode squelch system (DTSS) gives you selective calling—either "single page" or "group call". You also get a four 15 digit auto-dialer, DC direct-in capability (with optional PG-3F or PG-2W), versatile scanning functions, wide-range of DC power sources, 5 W capability, and an extensive list of exciting accessories!





- **Frequency coverage:**
  TH-26AT: 136–173.995 MHz;
  TH-46: 438–449.995 MHz.
  (TH-26AT modifiable for MARS/CAP. Permits required.) TX on Amateur band only.
- **DTSS Dual Tone Squelch System (DTSS):**
  Enables selective calling with 3-digit DTMF codes! The DTSS codes can be stored in channels 1–3.
- **Multi-function scanning.**
  Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **21 memory channels.**
  Store everything you need, including CTCSS and DTSS codes. Ten channels can store RX and TX frequencies independently for odd split operations.
- **Auto-dialer function.**
  Four 15-digit DTMF codes can be stored for auto-patch use.
- **Frequency step selectable for each CH.**
  Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
  Five watts output when operated with PB-8 battery pack or 13.8 volts.
  Large top mounted LCD display, with night-light.

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

- Automatic repeater offset.
- **T-ALERT for quiet monitoring.**
  Tone Alert beeps when squelch is opened.
- Auto battery saver, and economy power mode to extend battery life.

- **Supplied Accessories:**
  Flex antenna, PB-10 battery pack (7.2 V, 600mAH), wall charger, belt hook, wrist strap, bottom cover.

Optional Accessories:

- **PB-5** 7.2 V, 200 mAh NiCd pack for 2.5 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
- **PB-10** 7.2 V, 600 mAh (works with BC-2 wall charger)
- **PB-11** 12 V, 600 mAh **OR** 6 V, 1200 mAh, for 5 W **OR** 2 W
- **BC-10** Compact charger
- **BC-11** Rapid charger
- **BT-5** AAA battery case
- **BT-7** AA battery case
- **DC-1/PG-2W** DC adapter
- **EMC-2** Headset with VOX and PTT
- **SC-25, 26** Soft cases
- **SMC-31** Speaker mic.
- **SMC-33** Speaker mic. w/remote control
- **TSU-7** CTCSS encode/decode unit
- **PG-2W** DC cable w/fuse
- **PG-3F** DC cable with filter and cigarette lighter plug
- **WR-1** Water resistant bag

NOTE: The BC-11 and BC-10 stand chargers can charge all NiCd packs except the PB-10.

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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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THE AMERICAN RADIO RELAY LEAGUE, INC

The American Radio Relay League, Inc, is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

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

A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA.

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"It Seems to Us . . ."

The Goodwill Dream

Something very important in Amateur Radio occurred the weekend of July 20.

Not the ARRL Board Meeting, important as these meetings always are. In fact, a number of us who were at the Board Meeting would have preferred to have been at this other event, 2500 miles away: the World RadioSport Team Championship (WRTC), organized as a Goodwill Exchange Event in conjunction with the 1990 Goodwill Games™.

It happened in Seattle. It happened because a couple of years ago a core group of talented people got the idea to do something that was very ambitious, something that had never been done before. But they didn't stop there; they followed through to turn the idea into reality. In the process they spread their infectious enthusiasm to countless others in the Pacific Northwest, throughout the country, and abroad. They overcame seemingly insurmountable financial and regulatory obstacles. They wrote rules and solved logistical problems to provide, for the first time, a reasonably level playing field for an international, competitive operating event. They hosted dozens of guests from more than a dozen countries, breathing life into the FCC rule that speaks of "the amateur's unique ability to enhance international goodwill." They didn't feed their own egos or line their own pockets, and that's about all they didn't do.

With a little help from favorable geopolitical currents and generous financial backers, and with a lot of hard work, the organizers of the WRTC fulfilled their dream. In the article that begins on page 43 of this issue, John Crovelli, W2GD, conveys the flavor of the event about as well as can be done on the printed page. But John would be the first to say that to fully appreciate what happened in Seattle, you have to talk to someone who was there and was a part of it. In doing so, you get the feeling that their view of the world, their appreciation of Amateur Radio's possibilities, will never know the same limits. Few of our undertakings achieve as much.

To Danny Eskenazi, K7SS, and his multinational force of volunteers go our sincere congratulations. One measure of the success of the WRTC is the momentum it has created. Having experienced what is to now a unique event in Amateur Radio history, the participants are not about to let it die. If they succeed, and their track records suggest they will, some day we will look back on what happened at Seattle not as a one-time event, but as a beginning.—*David Sumner, K1ZZ*

WELCOMING MESSAGE FROM THE PRESIDENT, ARRL

July 16, 1990

To the World RadioSport Team Championship
Participants, Organizers, and Friends:

On behalf of the American Radio Relay League, it is my great pleasure and privilege to extend greetings to you on the opening of the World RadioSport Team Championship. For the first time in history, this pioneering event brings together leading Amateur Radio operators from many countries to compete in making two-way contacts under controlled conditions. ARRL is proud to have played a part in making this day possible.

All of you also should be proud—especially the competitors, for having earned the right to be here, and the organizers, for having turned a dream into reality through patience, persistence, and sheer hard work.

Even the government of the United States has recognized the special significance of this event. Last week, the Federal Communications Commission announced that it was waiving its rules to permit our guests to compete, even if a formal reciprocal operating agreement did not yet exist with their countries. Perhaps one day, in the not too distant future, we will remember this gesture as having paved the way for agreements that will make such visits a matter of routine.

Because of an unfortunate scheduling conflict with the meeting of the ARRL Board of Directors, it is not possible for the officers and directors of the League to be present for your opening ceremony. Past Director Rush Drake, W7RM, has graciously agreed to represent the League. I can think of no better emissary; there are few call signs that are better known than W7RM in the international radio contesting community.

To the competitors, best wishes for success. No matter what the score, I am confident that all of you—as well as Amateur Radio—will emerge next week as winners.

73,

Sincerely,

Larry E. Price, W4RA
President, ARRL

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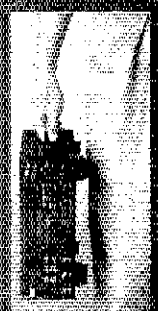
100 Watts Power

Noisy, crowded frequencies are about as productive as freeways at rush hour. Now, you can skip the jam-ups and head for the wide-open spaces with the FT-650 from Yaesu.

The three-frequency operation lets you win the battle of the bands and communicate clearly on 6m, 10m and 12m frequencies. These less crowded bands put your transmission high in the sky and above the noise.



The FT-650 packs substantial communications power in a stream-lined, compact case. A flip-out handle makes it the perfect portable, while a built-in power supply (AC or DC) lets it function as a base station. Broadcast from anywhere—mountain tops, remote islands, boats, vehicles or just the suburbs—and hear the difference with the FT-650.

Jump on the FT-650 three-band wagon and get above the crowds and noise.

- 100 Watts on all modes*
- DDS—Direct Digital Synthesis.
- Superior Receiver Performance — Low noise (NF 1.2dB) RF preamp with switched 5MHz bandwidth BPF, veractor tuned.
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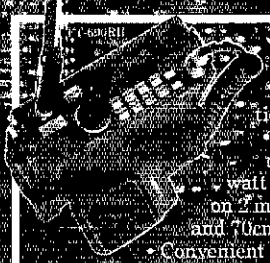
- Optional accessories: DVS-2 Digital Voice Recording System module • MD-1B8 Desk top microphone • SP-5 External speaker with AF filter.

For complete information about these and other Yaesu products, call your local Yaesu dealer today.



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- All-mode 6 meter (690RII/10 watt mobile...25 watts on 2 meter (290RII) and 70cm (790RII).
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The FT-690RII is the only single band transportable 6 meter radio now available.

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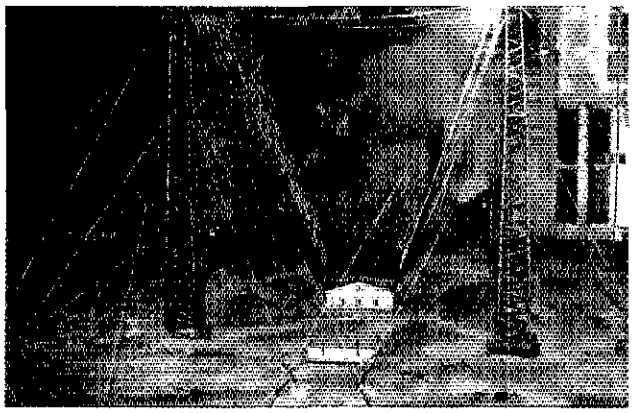
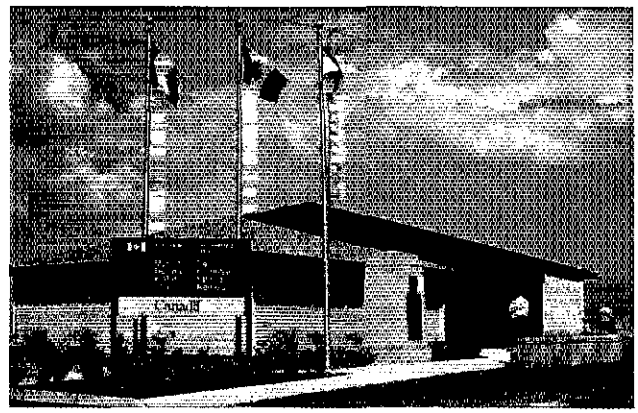
*25 Watts on AM

UP FRONT in QST





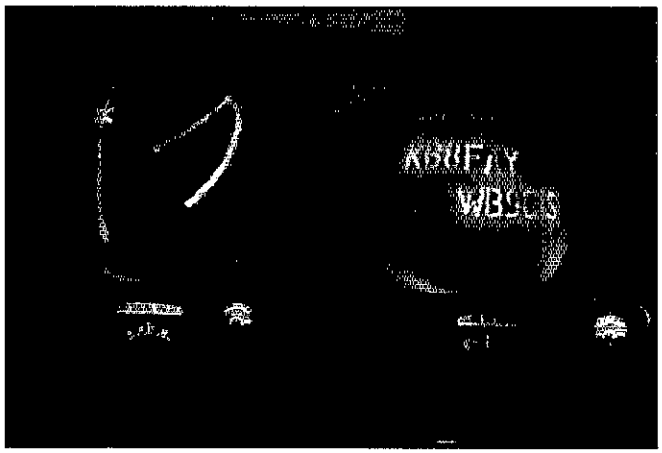
Where radio began: Where would we be if it weren't for the genius of a young Italian named Guglielmo Marconi? Probably collecting stamps...certainly not chasing DX! This year, amateurs celebrated International Marconi Day (the Saturday closest to his birthday) on April 21 by setting up stations on both sides of the Atlantic at sites where Marconi installed his early experimental stations. One station, VE1IMD, operated from the Marconi Museum at Table Head in Glace Bay, Nova Scotia. It was from this site on December 15, 1902, that Marconi successfully spanned the Atlantic by radio from west to east. The museum officially opened in a ribbon-cutting ceremony on August 21, 1989, by Marconi's daughter, Gioia Bragga. It houses some of Marconi's original radio equipment, photographs, newspaper clippings and this striking scale model of the Table Head station with its four 200-foot wooden towers and inverted-pyramid copper-wire antenna. The museum also houses Sydney ARC station VE1VAS (to retain Marconi's original VAS call sign, which stood for Voice of the Atlantic Seaboard). *(photos courtesy of VE1XT)*



Flying from 2 meters to 200 meters: The Aviation Net had its unassuming beginning in April 1968 on the WA2PNU repeater (147.21 MHz) in Huntington, New York. The net was eventually carried by six stations from Philadelphia to Boston. A nonham listener suggested bringing it to commercial radio so the unlicensed public could call in with questions and comments. Now, well-known flight instructor Don Lewis, K2DKR, hosts "In the Air" every Sunday from 4:30 to 5 PM on WTHE 1520 kHz AM in Mineola, New York, and expects the program to be expanding to a network and perhaps distribution via satellite. *(photo courtesy of K2DKR)*



Perfect for outdoor QRP fans: Everything but the antenna is packed into this sophisticated 1-watt CW transceiver. The dual-conversion design uses transverters to bring the art of multiband home-brew down to earth. The Safari Four QRP transceiver will appear in the October, November and December issues of *QEX*. *(N6KR photo)*



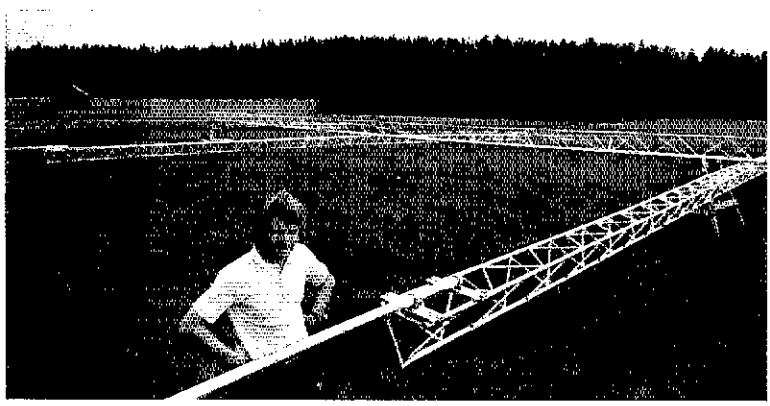
CQ Boo! John Harper, WB9CIS, of Morton, Illinois, uses his call sign and that of his friend Nancy Kott, KB8FAY, of Hadley, Michigan, to scare up some rare DX for Halloween. *(WB9CIS photo)*



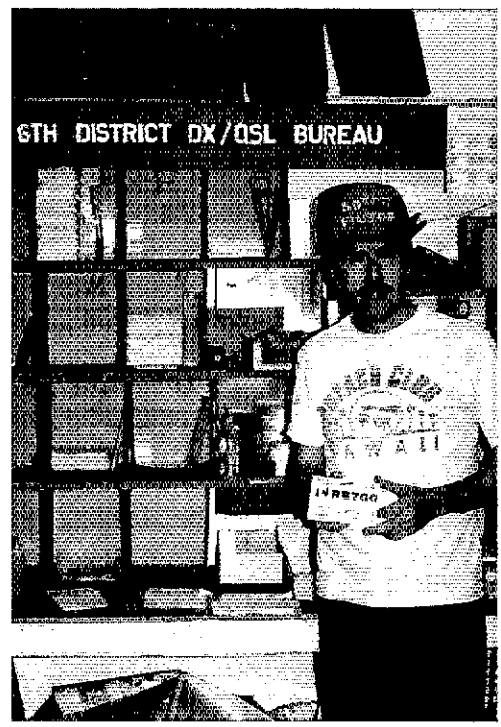
Do you take this ham... This "pileup" helped complete a solid two-way contact on April 21 in Dallas, Texas. The all-DXer wedding photo shows (l-r) Mary, WB8WNJ, and Maria, HC1MM (seated); Jeff, KRØY; Ralph, N5RZ; bride Suzanne (Novice call sign pending); groom Ron, AA5DX; Mike, K9MK; Rick, NE8Z/HC1MD; Lanny, W5BOS; Dan, N5AR; and Bob, WD5F. The groom is President of the Lone Star DX Association. *(photo courtesy of NE8Z)*

Up Front Invitation

Do you have something that belongs in Up Front in *QST*? Do you have a dynamic, striking photograph depicting an exciting facet of Amateur Radio? We're looking for reader submissions of material for this column. If you have a quality color photo or slide of amateurs in action, or a well-composed shot of an unusual or interesting Amateur Radio-related subject, please send it in. We prefer slides or transparencies, but we can also use glossy color prints. Submissions will be acknowledged, but will not be returned. Send to ARRL, Up Front in *QST*, 225 Main St, Newington, CT 06111.



Largest contest effort ever? Touko Kapanen, OH6RM, of Istunmaki, Finland, prepares for the upcoming CQ World-Wide SSB/CW Contest from Radioteam Finland's (RTF) multioperator station in Curacao. He built this full-size three-element 80-meter Yagi antenna as well as three three-element directional arrays on 40 meters, more than 20 beams for 10, 15 and 20 meters and other dipoles and verticals for operation down to 160 meters. The 55 operators and 40 support persons slated to run the RTF station will use 15 Yaesu FT-1000 transceivers with amplifiers, 19 crank-up towers from 60 to 150 feet tall, separate generators for each operating position and miscellaneous accessories. You may not beat PJ9W (SSB)/PJ9A (CW), but you sure will hear 'em! If you'd like to work the Netherlands Antilles, before and after the contests, the OH gang will be on all bands from October 20 through the end of November. *(photo courtesy of K4EIH)*



So, we meet again: Victor Tkachenko, RB7GG, of the Ukraine, was visiting California with his host, Andy Romanisky, WA6WXD, when they stopped to see the 6th District Incoming QSL Bureau. Manager Archie Willis, W6LPJ, invited Victor to sort a few cards and, upon opening a sealed box, RB7GG pulled out a handful of his own cards! *(K6YE photo)*

League Lines

In early August, the FCC announced that ***the deadline for comments on PR Docket 90-356, its proposal to relax Morse testing of disabled persons, is September 24***, just about the time you receive this issue. The deadline for reply comments is October 9. The notice says "Extensions of time are not contemplated" (see p 58).

The future of Amateur Radio may change on February 3, 1992. Less than 18 months from now, representatives from nearly every government in the world will gather in Spain to attend the 1992 World Administrative Radio Conference (WARC-92) of the International Telecommunication Union (ITU). The changes made at WARC-92 could reduce your access to the radio spectrum, particularly to the amateur 40-meter band. Nor are 75, 30 or even 20 meters "safe." ARRL is working to protect your interests.

Preparations for WARC-92 are expensive and place a significant drain on ARRL resources. You can help cover the cost with your generous contribution to the ARRL Fund for the Defense of Amateur Radio Frequencies.

On August 6, ARRL Counsel Chris Imlay, N3AKD, submitted comments to the FCC on behalf of the ARRL concerning the creation of a codeless license. The League's comments were exactly as directed by the Board of Directors and as published in September *QST*, pp 54 and 57. Now that the comment period has ended, the FCC will review the comments it has received and make a decision in the coming months.

AMSAT has announced that ***the 1990 AMSAT Space Symposium will be held at NASA's Johnson Space Center Visitor's Center in Houston October 19-21*** and will be hosted by the Johnson Space Center Amateur Radio Club (W5RRR). The symposium will feature talks on amateur space communications and related subjects, including the new Microsats. Additional talks are tentatively scheduled on SAREX shuttle flight STS-35. For more information, write AMSAT or call 301-589-6062.

The ARRL's "All Risk" Ham Radio Equipment Insurance Plan increases from $1.25 per $100 of equipment insured to $1.50 October 1, the first increase in three years. Those currently enrolled in the plan will be notified of the increase in their next premium notice. For information on the insurance plan, write to Albert H. Wohlers & Co, 1440 N Northwest Highway, Park Ridge IL 60068 or call 800-323-2106.

It's time to start planning for the 57th ARRL November Sweepstakes! This year's CW Sweepstakes is November 3-5 and the phone Sweepstakes is November 17-19. Special band segments are suggested for slow-speed CW (up to 13 WPM). Make 100 or more contacts on CW or phone, send $2 and an SASE with your SS entry and you'll get a special commemorative pin. The pins will be dated each year, making them unique collectors' items (see p 93).

On July 26, the US Department of State announced that ***the US government has recognized the Republic of Yemen***, formed by the union of the former Yemen Arab Republic and the People's Democratic Republic of Yemen. The names to be used for this nation are Yemen (short form) and Republic of Yemen (long). ARRL's DXCC branch has asked that no QSLs be submitted for the former or current Yemen(s) until the DXCC status of the new country is determined.

The National Disaster Medical System (NDMS) will hold a major exercise October 10-13, based on an "earthquake" along the New Madrid Fault in the Central Mississippi Valley. NDMS coordinators from around the country planned for the emergency simulation at their annual conference in Memphis in early August.

ARRL Section Managers are advised to contact their local NDMS coordinating center for information on how ARES groups can play a role in the exercise, which falls within the window for the annual ARRL Simulated Emergency Test.

For more information on NDMS, see *QST*, Feb 1986, pp 80-81 and Sep 1989, p 68.

Amateur Radio at the Olympics? In the wake of the success of the World Radiosport Team Championships (see p 43), the wheels have begun turning in the creation of a World Radiosporting Federation. A draft proposal has begun circulating in the US and other countries. Bob Cox, K3EST, who played a pivotal role in the World Radiosport Team Championship in Seattle in late July, and others are heading the effort to form the Federation, which is a requirement of the International Olympic Committee to consider making Amateur Radio a "demonstration sport" at the 1996 Olympic Games.

At press time, the ARRL learned that ***several amateurs have been cited by the FCC for causing deliberate interference on 20-meter SSB and could face monetary fines.*** Details will appear in November *QST*.

There's an opening in the Technical Department at ARRL HQ in Newington, Connecticut, for an Assistant Technical Editor. The successful candidate will write and edit technical books, with an emphasis on the League's licensing material (the *License Manual* and *Instructor Guide* series, and *Tune in the World* and other publications for those just entering Amateur Radio). We're looking for a licensed, experienced amateur (Advanced or Extra Class preferred) with a Bachelor's degree in science, engineering or education, or equivalent experience. The successful candidate will have demonstrated an interest in Amateur Radio instruction, will have a solid electronics background, and will have experience in preparing material for publication and with word-processing on a personal computer. Excellent benefits. Starting salary range $27,300-$30,000. For more information, contact Joel Kleinman, N1BKE, at ARRL HQ.

The Club Bouvet, 3Y5X, Story

Every so often, a DXpedition commands the attention of hams worldwide. The 3Y5X operation was controversial, dazzlingly expensive and ultimately successful. Here's the inside story!

By Einar Enderud, LA1EE, and Kare Pedersen, LA2GV

Bouvetoya (Bouvet Island), a snow-capped and almost extinct volcano in the South Atlantic, has for many years been an attractive target for DXers and adventurers because of its remote and cold location, its wild and inaccessible nature and its position high up on the list of most-wanted DXCC countries.

Norwegian governmental expeditions in 1977 and 1978-79 included radio amateurs, but they made only a small number of QSOs. Bouvet was in great demand. There was a need for a major DXpedition, but none was in sight.

Would a private DXpedition be possible? It would obviously cost a lot of money, $330,000 as it turned out. DXpedition members would have to contribute personally, and the whole operation would hinge on worldwide support from hams and others. We made up our minds to give it a try.

To gain the necessary support, we (LA1EE, LA2GV and LA6VM) founded Club Bouvet in May 1989. We also formed a project team to prepare for landing on Bouvet in December 1989. By going in '89, the DXpedition would be able to celebrate the discovery of the island some 250 years earlier. We would also be taking advantage of the sunspot-cycle peak and could expect good band conditions.

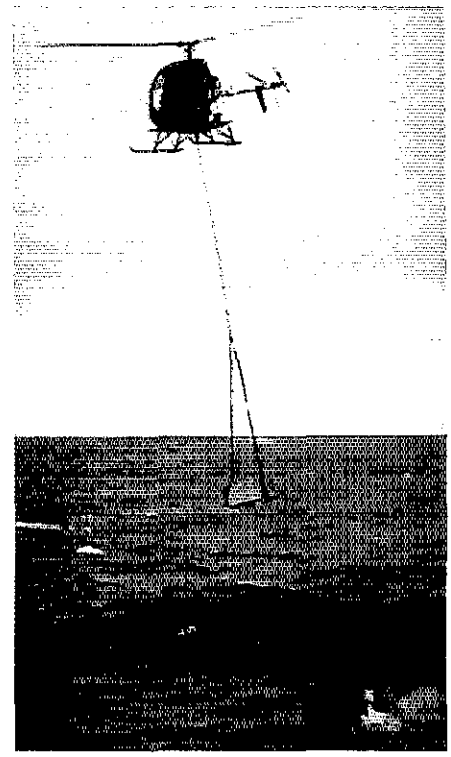
Plans, Ships and Permits

In early July, we made our plans public by distributing News Release #1, in which we solicited support from hams around the world. Club Bouvet grew and correspondence with all supporting members—nearly 1000 hams in more than 30 countries—took up all our leisure time for months.

Transportation was the major issue. How would we get to Bouvet? Because the island has no natural harbor, and because the weather is often severe, it would be necessary to use a boat with helicopter for a safe and efficient landing and departure. That would lead to high costs, but the size of such a boat would allow for more participants and a broader funding base.

We contacted governments, embassies and private companies in our search for a suitable vessel. We also were approached by an American group about possible cooperation which, unfortunately, did not materialize. In the end, we got the best deal by chartering the *M/V Aurora*. We knew this boat from our previous DXpedition to Peter I in the Antarctic three years earlier.

Scientists (two), a film team (two), guest operators (three) and a camp assistant were invited to join our DXpedition. At the end of October, a lot of our funding was still outstanding. We knew we would be taking a personal economic risk, but we had to make a decision to keep the DXpedition on schedule.



Too heavy to be carried to the helideck, the box with the coax and barrels of petrol are lifted to the dinghy where the helicopter can pick them up and take them ashore. *(LA2GV photo)*



A swell fills the dinghy as it hits the unprotected shore. This was the only landing attempt made by boat. Escaping from the island was even more difficult. *(LA1EE photo)*

We had only two weeks to prepare all kinds of equipment, and petrol to be taken on board. Nevertheless, on November 14, the *Aurora* sailed from Sandefjord on its long trip to Montevideo, Uruguay, where it would pick up the DXpedition crew four weeks later. Necessary landing permits, including authorization to use the helicopter, had been obtained from the Ministry of Environment. (The Ministry asked us to update its 11-year-old map of bird and seal colonies in the Bouvet wildlife refuge.)

Aboard the *Aurora*

Aurora left Montevideo on December

14, bound for Bouvet. We had 19 men on board, including the ship's crew of seven and a two-man helicopter crew.

Through Raol, CX7BY, we received a lot of valuable assistance from the CX DXers in the days prior to departure. We also enjoyed the hospitality and friendship of the local hams and the CX League.

The guest operators were Jacky, F2CW; Willy, HB9AHL; and Jin, JF1IST. They joined the expedition on the condition that they bring substantial funding to the project from sponsors, primarily in their own countries.

During the 11-day sea voyage we had time to get to know each other and to check out all the ICOM transceivers, amplifiers and tuners—there were six complete stations in all. Most of us were sick for several days in the heavy sea, but we still got on the air a lot and worked at preparing field equipment, practicing tent installation, playing with the Inmarsat satellite communication system and watching movies on video. The biologists were excited about seeing so many unfamiliar species of birds and whales. Each new one was duly noted in their logs, just like new countries among DXers.

A pine tree that Jin bought in Montevideo sat on a table in the mess. We knew that Christmas was drawing near. We all had a chance to say hello to our families via Norwegian and other European coastal stations. On Christmas eve, the Captain turned *Aurora* into the wind to keep her steady in the heavy sea during the traditional Norwegian Christmas supper. Later, Father Christmas came to see us, bringing presents for everyone on board.

While operating LA5X/MM, we really felt how DXers the world over were sharing our expectations and excitement as we approached the island.

Bouvet, at Last

The weather did not look promising. The winds were increasing and the waves were long and heavy, and at least eight meters high. The barometric pressure fell about 100 millibars in 24 hours, putting us in the middle of a 949-millibar low.

Thanks to navigation satellites and radar, we sailed through the fog and reached the west side of the island on schedule the afternoon of December 25th. Landing by dinghy through the heavy waves breaking on the shore was completely out of the question. We couldn't even launch the lifeboat or mount the helicopter because *Aurora* was rolling too much.

We found a suitable place to anchor the first night just south of the Christensen glacier. On the 26th, the wind turned more southerly and we moved east and then north of the island, where we spent the second night onboard waiting for the wind and sea to subside.

On the afternoon of December 27, after an exciting reconnaissance trip in the lifeboat, *Aurora* continued its circumnavigation of the island and moved toward Nyroysa to find shelter behind a stranded iceberg less than 1000 meters from the planned camp site.

The helicopter, which had been brought all the way from Norway, was prepared for flight and the landing team got ready to disembark. We were determined to accomplish as much as possible before dark. At 1850Z that evening, Einar set foot on Nyroysa, the only location on the island where a camp is possible. Kare remained on board *Aurora* to organize the loading operations, while Einar coordinated the work onshore. Two hours later, nine men and most of the field equipment were ashore, but Kare, the generator fuel and some equipment remained onboard until the day after.

It was overcast and just below freezing. With the biologist from the Norwegian Polar Research Institute, we located a small area where we could pitch our tents without disturbing the birds' hatching areas and get the best possible radio take-off to Europe, Japan and the US.

Before dark, we were provisionally installed in our tents, which were pitched amidst the rough boulders—not an ideal site for a bed and a good night's sleep!

We were lucky to be able to fly again the next morning. Ten barrels of petrol were brought in, along with the generators and the rest of the equipment. Kare made a reconnaissance tour around the island with *Aurora* to look for possible escape routes for the planned eastern glacier camp. (We had planned to establish a second camp on the eastern side of the island: The steep mountain effectively screened our view toward Japan, Australia and New Zealand from the base camp.) Unfortunately, after surveying the island in person, we found that a second site would be too dangerous. There would be only one camp.



Kare's tent, pitched among the boulders at 3Y5X. *(LA2GV photo)*

We were faced with a new challenge: to try to make a reasonable number of QSOs with Japan, Australia and New Zealand when the long path to these areas was open only a few hours a day—when the bands were also wide open to North America. We knew this would be putting the understanding, cooperation and patience of operators in North America to the test.

Preparing for the Onslaught

On the evening of December 28, the entire landing team of 10 men and all the



Jin operates in Einar's tent to work 10-meter long path QSOs with Japanese stations. The PC is used to log contacts and communicate via Inmarsat. *(LA1EE photo)*



Espen, biology student and camp catering assistant, checks out some of the island's native inhabitants. *(LA1EE photo)*

equipment was ashore and installed. Four stations were ready for operation; the fifth was ready the next day.

After more than 25 hours of hard labor, punctuated by only a few hours of sleep, we were quite exhausted. Happy and ready for the DX operation, we moved up to 14.145 MHz and Einar worked LA6VM as the first station. Some minutes later, we had four stations on the air. We were in business, at last!

The five stations were arranged in separate igloo tents which became our "private homes" for our 17-day stay. The tents were designed to resist strong winds and to avoid condensation. Each tent contained two small camping tables with a radio station, a camping chair, a field bed with a sleeping bag, a 220-V ac heater and a lamp.

A typical station consisted of an IC-751A transceiver, IC-2KL amplifier, tuner, keyer, microphone, headset and heavy 12-V battery. Some of the equipment, including the Tono RTTY terminal, was recycled from the Peter I DXpedition. Einar used a PC and LA9UX software to log thousands of QSOs. Our antennas included four triband Yagis for HF, plus three HF-6V Butternut verticals. Kare also used a WØCD Battlecreek Special antenna for 40, 80 and 160 meters. On 6 meters, we tried a 5-element Yagi and 100 watts, but no QSOs were made and no beacons were heard.

Our two Honda 3-kVA generators worked well, but two others caused a few problems. We used about 1800 liters of 100-octane fuel to satisfy all of our electrical requirements: ham gear, heating, lighting and some electric tools.

The five stations were quite close together, so interference problems sometimes hampered our daily operating. The interference could often be eliminated or reduced, however, by changing antennas or beam headings.

New Year's Eve was celebrated with meatballs and Bouvet wine. (The French winemaker had granted funding *and* wine.) We also celebrated the 250th anniversary of the island's discovery and the first Norwegian landing by the Norvegia expedition in 1927. The Club Bouvet bronze plaque commemorating Consul Lars Christensen, from Sandefjord, who equipped that expedition, was unveiled and bolted to a rock.

The new Inmarsat satellite system was impressive, providing two-way public telex service from our laptop computer via a tiny omnidirectional antenna for weather reports, press releases and other project correspondence. We also had an HF voice link to Norway on frequencies outside the ham bands.

On certain days, when low-pressure areas were passing north of the island, strong gusty winds from east hit us with tremendous force, tearing tent guys, creating loud noises and forcing a lot of extra work and discomfort in the camp.

More pleasant were the hot meals served each evening. Our camp assistant, Espen, a young biology student, also provided self service around the clock in the kitchen tent.

The departure schedule was discussed and agreed days in advance. We decided to leave the island on January 13 if weather allowed. That morning, there was considerable wind and moderate visibility, but the weather improved and flying started at 1345Z. All equipment and personnel were brought back to *Aurora* in one smooth five-hour operation which included more than 60 trips with the small helicopter. We were happy to be back aboard, knowing that everything had gone according to plan.

The Aftermath

As we returned to Norway, the logs were handed to QSL manager LA6VM, who organized the computerization through club stations LA1K and LA1T. Some 700 pounds of 3Y5X QSL cards were printed in Japan and sent to Norway by air and sea for further processing. Incoming cards arrived in large quantities, peaking at 800 a day. More than 30 enthusiasts volunteered to help with logs and QSL cards.

We were obliged to take up a major loan after our return to fulfill our commitments with our contractors. We hope to balance our books before the project's completion. The generous support of others is essential for the success of an expedition of this magnitude. Major sponsors and contributors for the Club Bouvet 3Y5X expedition are listed in Table 1. Companies and the public sector contributed about 50% of the

Table 1
Major Sponsors and Supporters

Norway:

A/S Thor Dahl
A/S Ambra
A/S Bulls Tankrederi EB Norsk Kabel A/S
Hvalfangstens Sekretariat
Hvalfangernes Assuranceforening
Jotun A/S Levahn Industrier
Sandefjord Kommune
TBK
Televerket
Victor Norse A/S

Others:

Bouvet-Ladubay S. A. (France)
Clipperton DX Club
CQ ham radio (Japan)
Danish DX Group
EUDXF
Ham Radio Outlet—W6RJ & WB6RZK
Heard Island DX Association
Hidaka Denki Works (Japan)
ICOM America Inc.
INDEXA
JA DXers
LA-DX-GROUP
Lake Vettern DX Group
Lynx DX Group
Maspro Denko (Japan)
Nagara Denshi (Japan)
Northern California DX Foundation
OH DX Boys
59 Magazine (Japan)
JA1BK, VE3MR, K2ON and KA8ANQ



This Macaroni Penguin, found on the western shore of Bouvet, was raising its only offspring while we were working the pileups. *(Vidar Bakken photo)*

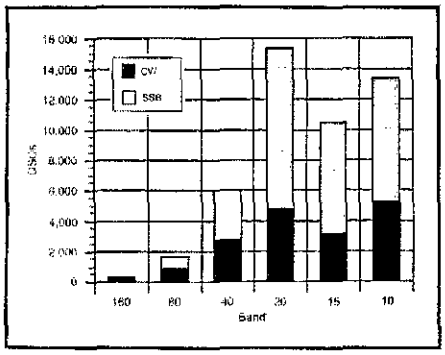


Fig 1—3Y5X QSOs by band and mode.

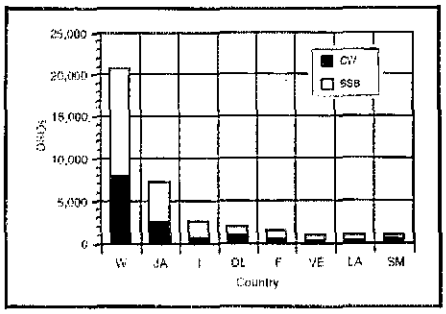


Fig 2—3Y5X QSOs by area.

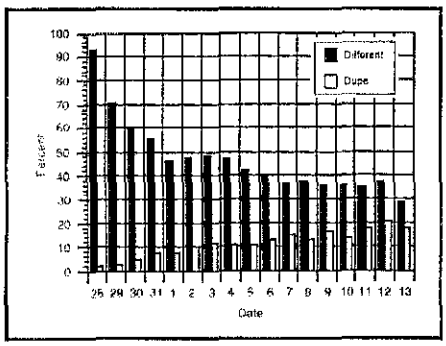


Fig 3—Percentage of duplicate QSOs and different call signs worked during the course of the operation.

3Y5X: In Retrospect

It was obvious from the start that the 3Y5X operation was not going to be routine. Bouvet, near the top of many DXers' most-needed lists, hadn't been on the air for more than 10 years. It seemed *everyone* wanted to work it. Given the superb band conditions near the peak of the sunspot cycle and the magnitude of the operation, everyone would have a chance. With so many stations seeking contacts, and with the excellent conditions, it's no wonder that the initial pileups were immense.

Then things turned ugly. As David Sumner, K1ZZ, noted in the March 1990 *QST* editorial, "While it's not the only current example and the situation is hardly the fault of the organizers, the New Year's DXpedition to remote Bouvet Island, 3Y5X, inspired some of the worst on-the-air conduct ever heard on the amateur bands."

Letters complaining about the situation flooded ARRL HQ and the amateur media. The FCC issued more than 240 citations to people calling 3Y5X out-of-band. The credibility of Amateur Radio suffered. After nine months, the controversy has abated but not yet disappeared. DXers and non-DXers alike continue to debate the issues and to plead for better education about pileup management—from both ends of the circuit.

There seem to be two issues: The intentional jamming and QRM, and the DXpedition's ability to control the pileups. Some say that the 3Y5X operators themselves are to blame, in part, for the jamming and QRM. A common gripe is that stateside ops were frustrated because the 3Y5X operators worked Asians for hours on end, long path over the US, or that they didn't always listen on their announced frequencies. As Einar Enderud, LA1EE, says in a letter to ARRL's DX Advisory Committee, "Ultimately, every operator must be responsible for his own actions on the band. If you go on an expedition and provoke me to the boiling point [with operating practices I don't approve of], that must never give me the right to interfere with your operation...." He's right: There is no excuse for deliberate interference. Period. Enderud continues, "I have noticed that it sometimes does ease the pressure just to imagine that the DXpeditioner has some good reasons for doing what he does, reasons that I have no right to know."

Pileup control is something that all parties—DXpeditions and those chasing DXpeditions—can do better. DXpeditioners can benefit from G3SXW's excellent guidelines for pileup management that appear in the August 1990 How's DX? column. These guidelines, most of which are common sense, will help an expedition maximize QSOs while minimizing the impact on others using the bands.

Those trying to work a DXpedition can benefit by *listening* more and transmitting less. Propagation between the US and Bouvet was excellent; almost anyone with a dipole and barefoot transceiver had enough signal to make the path. The trick was transmitting in the right spot. Successful operators patiently listened and learned the expedition's operating patterns, transmitting a few well-timed calls after zeroing in on the right frequency. Others simply called blindly, sometimes for hours on end, in the wrong part of the band. Or, they didn't let the DXpedition operators work stations efficiently (hundreds of responses to "the KA9XX station only, please"). Or, they worked the DXpedition more than once on the same band and mode, thereby depriving others of a contact.

The kinds of problems that, at times, plagued the 3Y5X operation can be resolved with patience, common sense and good operating. LA1EE says, "[I believe] that a ham's behavior and procedure on the occasion of a DXpedition ought to be part of the lessons, training and exams of hams in every country. DX clubs, groups and individuals can also play an important role in setting good examples."—*AA2Z*

funding. We also appreciated the company of World Wide Fund for Nature (WWF), the Norwegian Polar Research Institute, the University of Trondheim and Nordnorsk Filmsenter as partners for this multimission operation.

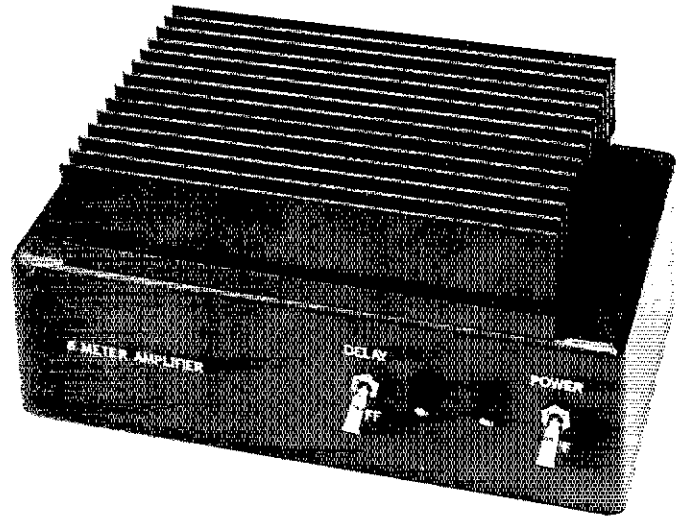
In all, we made more than 47,000 QSOs. About 30,000 were on SSB, 16,800 on CW and 291 on RTTY. Some 47.3% were with stations in North America, 31.3% with Europeans, 15.8% with stations in Asia, 3.9% with Central and South Americans, 0.9% with Oceania stations and 0.8% with Africans. Figs 1 and 2 show a breakdown of our QSOs by band and area.

Of the total, 11.8% were duplicate QSOs (dupes). West Germany and Japan had the lowest percentage of dupes. West Germany had the highest percentage of different call signs logged. As expected, the dupe rate increased and the rate of different call signs logged decreased as the operation progressed. At the end, as shown in Fig 3, every fifth QSO was a dupe on average, and every third QSO on average was with a call sign not already in the log on another band or mode.

Perhaps the most frustrating part of the operation was having to work Asia and the Pacific over the long path across North America. Short-path operation to these areas was virtually impossible because of the mountain in the way. When we had long-path propagation to Asia and the Pacific, we had to ask the loud North Americans to stand by so we could work the weaker long-path signals. The great majority of North American hams cooperated. We suppose they realized that North America had good openings to Bouvet 24 hours a day on one band or another, while the long-path opportunities to Asia and the Pacific were limited. Some operators, though apparently did not see clearly, or did not care, what was happening and did not cooperate. Or perhaps they panicked in fear of missing their opportunity to work Bouvet. After all, there might not be another chance in their lifetime.

This challenging expedition succeeded thanks to a number of individuals who had faith in the project from the very beginning, and carried it through the critical phases to the end. The nearly 1000 supporting members of Club Bouvet laid the foundation and became essential parts of this operation. The project team wishes to take this opportunity to thank everyone who helped.

A Compact "Brick" for 6 Meters



Does your six-meter signal need some extra kick? This inexpensive amplifier bridges the gap from 10 to 100 watts.

By Pat Bunn, N4LTA
171 Spring Lake Dr
Spartanburg, SC 29302

Most transceivers available for the 6-meter band provide 10 W output. This power level provides satisfactory communications during good sporadic-E openings, but is not adequate for making long-haul contacts on meteor scatter or during F-layer openings. For the average station, an output level of 100 W seems to be a reasonable compromise between a 10-W exciter and a kilowatt amplifier. Unfortunately, 50-MHz amplifiers in this power class are not readily available.

I began operating on the 6-meter band a few years ago, near the lowest point in sunspot cycle 21. Sporadic E kept my interest high, and soon it became evident that I needed an amplifier. Being a builder at heart, I decided to "roll my own" and began to search the Amateur Radio literature for design examples. I found very few solid-state amplifiers, and only one in the 100-W class.[1]

I built the amplifier as specified, and I got good results. My 6-meter effectiveness made a quantum leap! One highlight was working Europe with a 12-foot-boom Yagi. The amplifier performed so well that several of my friends asked me to build them duplicates of it. With each revision, I tried to add design innovations, including on-board TR relays, a carrier-operated-relay (COR) circuit and transistor biasing, as well as low-pass filtering and more compact packaging. The product of these efforts is described in this article. At least 25 of these units have been constructed and are now in use. Several of these amplifiers have been used on DXpeditions, in beacon service, and as drivers for kilowatt-class amplifiers, and results have been excellent.

[1]Notes appear on p 21.

If you are looking for a low-cost 100-W amplifier, this proven design would make a nice addition to your 6-meter station. This circuit can also be adapted for use with an MRF140 FET, which produces over 160 W output with less than 10 W drive. See the sidebar for more details.

Circuit Highlights

The amplifier circuit, shown in Fig 1, is a single-stage, 10-dB-gain, class-B design using the popular Motorola MRF492 transistor. The RF circuitry is based on a test circuit in Motorola's *RF Device Data* book.[2] Input and output impedance matching is done with low-Q lumped circuits rather than with broadband transformers. The amplifier's bandwidth is about 1.5 MHz, which covers the DX portion of the 6-meter band with plenty to spare. And, the output network has a secondary dip at about 53 MHz, allowing CW/SSB work and FM operation without the need to retune the amplifier. The narrowband nature of the matching networks helps reduce harmonics. A half-wave low-pass filter in the output circuit further reduces harmonic content to meet current FCC specifications (see Fig 2).

The COR circuit is based on a high-gain operational amplifier that provides the sensitivity required for SSB operation. This circuit is much more effective than the Darlington-transistor COR circuits found in most commercial amplifiers. It works well with low-power SSB rigs that do not have easily accessible PTT lines, although a separate **PTT** input is also included.

The amplifier PC board[3] is mounted in a die-cast aluminum box (Hammond 1590R, Bud CU-247 or Jameco® part no. B5006) with an extruded-aluminum heat sink bolted to the bottom. (I used a 6-inch length of Wakefield no. 1527 heat sink. Any aluminum heat sink with similar dimensions should work fine.) The completed amplifier is operated inverted, with the removable lid serving as the bottom. The enclosure is painted flat black and labeled with white rub-on lettering. Stick-on rubber feet are attached at the corners of the bottom cover. The finished product looks professional, and also does a good job of cooling the power transistor and bias diode.

Construction

The amplifier is assembled on a double-sided printed circuit board. All RF components are surface-mounted on the component side of the PC board (see Fig 3). The COR components, including the relays, connect to traces on the other side of the board. The remaining non-component-side foil serves as a ground plane, and is electrically connected to the component-side ground plane via plated-through holes. If you make your own PC board, you can replace these plated-through holes with no. 18 AWG wires soldered to both sides of the board, or, preferably, copper rivets such as those available from Frontier Microwave and Down East Microwave.[4] The relays also mount in plated-through holes. The PC-board patterns and part-placement overlay are available from the ARRL Technical Department Secretary.[5]

Drill the case for the switches, connectors and indicators you'll use. Begin PC-board construction by mounting the parts that are soldered to traces on the other side of the board. This includes the COR parts and relays, the RG-174 jumper, and diode D1. Make sure that the diodes and Q2 are properly oriented.

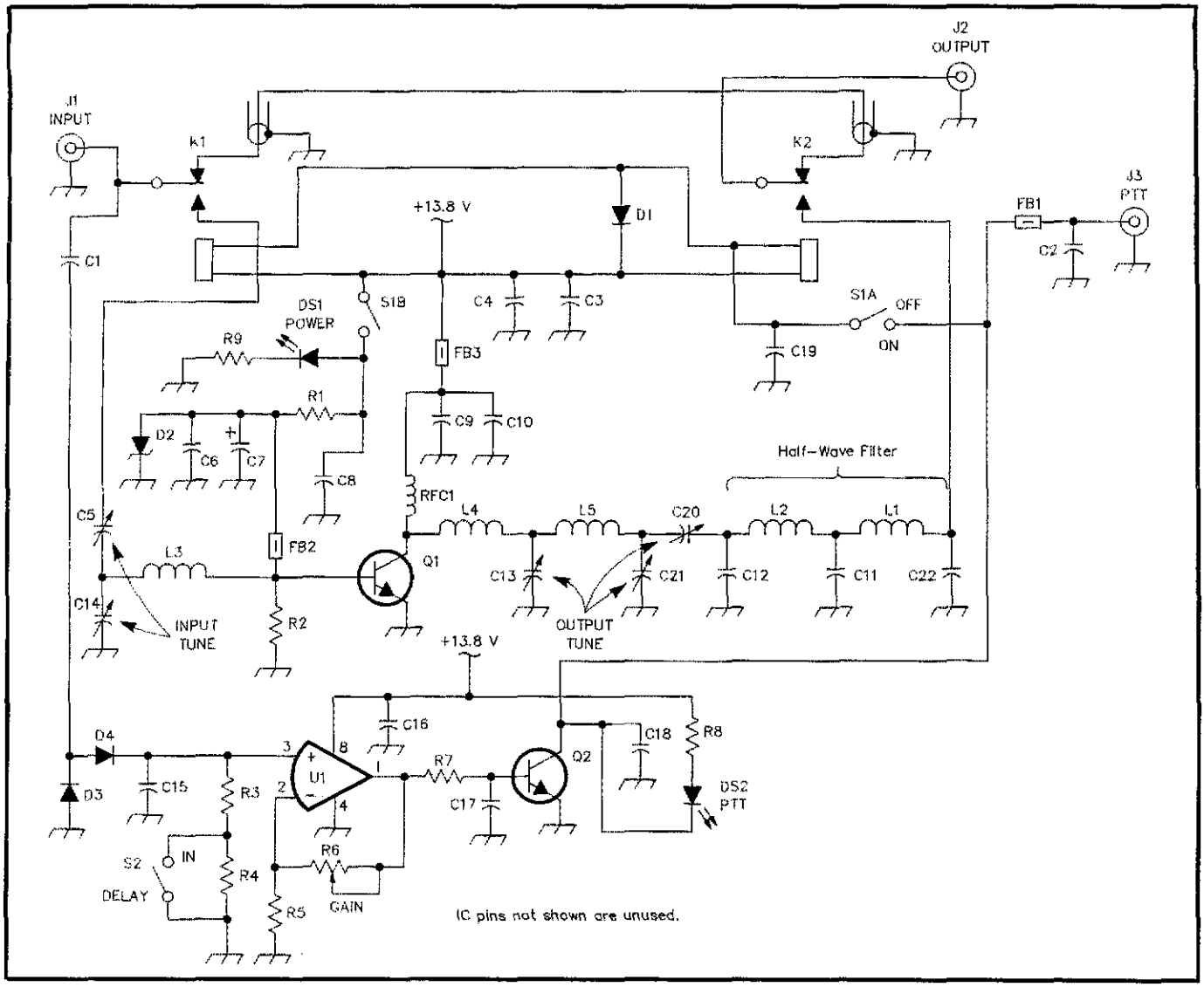


Fig 1—Schematic of the 100-W 6-meter amplifier. Liberal use of bypass capacitors and ferrite beads helps ensure stability and keeps RF out of the power supply.

C1—10 pF, ceramic disc.
C2—0.01 μF, polyester film.
C3, C10—0.001 μF, ceramic disc.
C4, C6, C8, C9, C15-C19—0.1 μF, polyester film.
C5—9- to 180-pF mica compression trimmer, Arco no. 463.
C7—1000 μF, 6.3 V, aluminum electrolytic.
C11—120 pF, 100 V, silver mica.
C12, C22—62 pF, 100 V, silver mica.
C13, C14, C20—50- to 380-pF mica compression trimmer, Arco no. 465.
C21—25- to 280-pF mica compression trimmer, Arco no. 464.
D1—1N4002.
D2—1N1200 stud-mount diode.
D3, D4—1N4148.
DS1—Green LED.
DS2—Red LED.
FB1, FB3—Ferrite bead, Amidon no. FB43-901 or similar.
FB2—VK-200 wide-band choke, 2½ turns no. 24 solid wire on Amidon no. FB43-5111 ferrite core.
J1, J2—Female RF connector (UHF, BNC, N, etc).
J3—Phono jack.
K1, K2—SPDT relay, 12-V dc coil, Omron no. G5L112P-PS-DC12. Available from Digi-Key.
L1, L2—4 turns no. 14 enam wire, 7/16 in. diam, 3/8 in. long.
L3—2 turns no. 14 enam wire, 3/8 in. diam, ½ in. long.
L4—no. 14 U-shaped wire loop, 3/8 in. diam, 9/16 in. finished length.
Q1—MRF492.
Q2—2N2222A.
R1—5-W bias resistor (see text).
R2—10 Ω, ½ W, carbon comp.
R3, R5—10 kΩ, ¼ W, carbon comp.
R4—1 MΩ, ¼ W, carbon comp.
R6—100-kΩ PC-board potentiometer.
R7-R9—1 kΩ, ¼ W, carbon comp.
S1—DPDT miniature toggle.
S2—SPST miniature toggle.
U1—LM358.

Miscellaneous

Suitable die-cast-aluminum enclosure and heat sink.
Pair of binding posts or other suitable dc-supply connector.
Two 1- × 3-in. strips of double-sided foam tape.
Two LED holders.
Seven no. 4-40 × ¼ in. machine screws.

The solder-side parts are surface-mounted. Keep lead lengths to a minimum (no more than 1/4 inch) on these parts. The bypass capacitors should have the shortest possible leads, and should be surface-mounted on the PC board.

Wind the coils using 1/4- and 3/8-inch drill bits as temporary forms. Cut the coil leads to 1/4 inch, bend them 90°, scrape the insulation off the ends and solder the coils to the board. Some of the coils may need to be compressed or spread during tune-up to get maximum output power, so allow for this when mounting them. Use Fig 3 as a guide. Mount the mica trimmers by bending the solder tabs parallel to the board and surface-mounting them. (Some trimmers have extra tabs that may short to the PC board; I cut these off with side cutters to eliminate this risk.) When surface-mounting the larger components, a high-

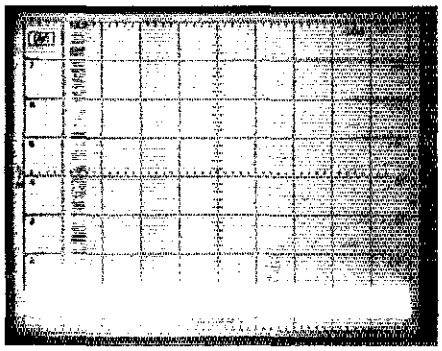


Fig 2—Worst-case spectral display of the 100-W 6-meter amplifier. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power was approximately 100 W at 50.2 MHz. All harmonics and spurious emissions are at least 60 dB below peak fundamental output when the amplifier is tuned as described in the text. The 100-W amplifier complies with current FCC specifications for spectral purity for equipment in this power-output class and frequency range. Better spectral purity can be obtained by using an external output filter (see the referent of note 1 for a suitable filter circuit).

wattage soldering gun is useful, but be careful: The traces may separate from the PC board if excessive heat is used.

When the PC board is complete, temporarily place the MRF492 in its mounting hole in the PC board, making sure to orient the transistor properly (the beveled lead is the collector). Place the PC board inside the box assembly. Carefully mark the transistor-mounting holes and the single PC-board mounting hole on the enclosure, through the PC board. Remove the PC board from the case, then drill and tap these holes for no. 4-40 hardware. Mark and drill the heat sink using the enclosure as a guide.

Drill and tap four more no. 4-40 holes, near the corners of the case, through the case and into the heat sink. Apply heat-sink compound between the die-cast box and the heat sink, then use no. 4-40 screws in these holes to secure the heat sink to the case.

Place the PC board into the case/heat-sink assembly again, and mark the location of the stud-mounted bias diode. Remove the board and drill and tap a 3/8-inch-deep no. 10-32 hole in the case/heat-sink assembly. The diode's threaded stud is more than 3/8 inch long, and should be carefully cut off (with a hacksaw) to 5/16 inch.

The rear of the PC board must be insulated from the box assembly, because many of the COR-circuit traces on the underside of the board are not at ground potential. I use 1/8-inch-thick double-sided foam tape to cover the solder-side traces and to support the board away from the case. Make sure the component leads are cut off closely at the rear of the PC board so that they don't punch through the foam tape and short to the box assembly. Mount the board inside the case, then screw the bias diode snugly into its mounting hole in the case/heat sink assembly.

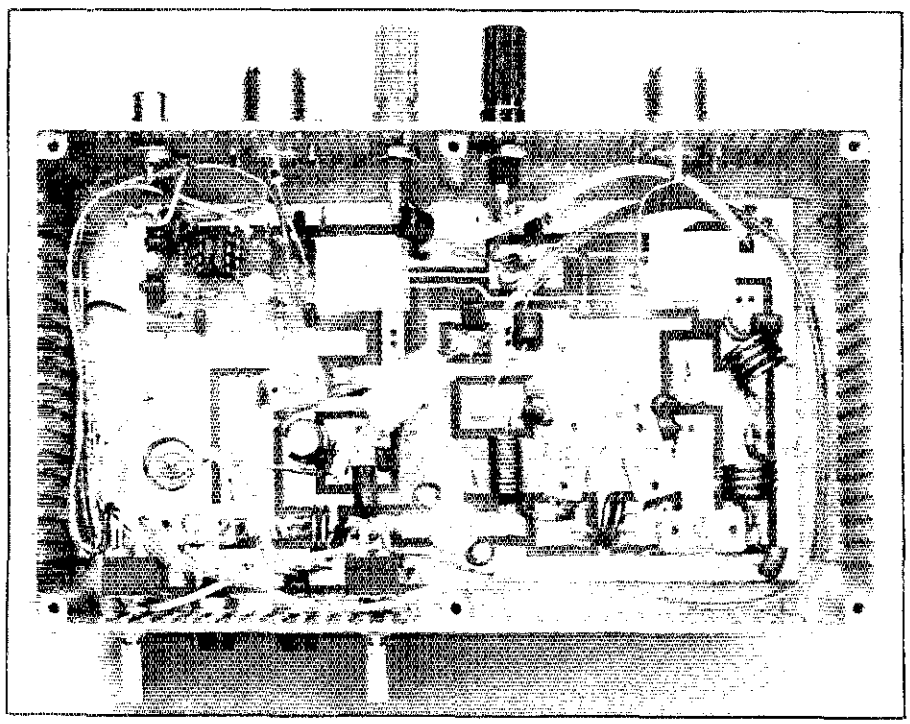


Fig 3—This inside view of the 100-W amplifier shows the circuit's simplicity. On the PC board, counterclockwise from upper left: the COR circuit; input-matching and bias networks, switches and indicators (lower left); MRF492 (lower center); collector choke and output network (lower right). The TR relays and connectors are at the upper center, and bias resistor R1 is just to the left of center.

Solder the MRF492 onto the board as the last step, *after* the transistor case has been mounted in the board and screwed into place. (This eliminates the possibility of cracking and ruining the $15 device!) Be sure to use a liberal amount of silicone heat-sink compound between the transistor and the box.

Mount the front-panel LEDs, switches and the RF connectors of your choice to the box. Any suitable RF connectors can be used. The connectors are wired to the PC board with no. 18 tinned bus-wire jumpers. Make these as short as possible. I used no. 24 insulated hookup wire to connect the switches and LEDs to the PC board. Finally, mount the dc-power binding posts to the rear panel. These are wired to the PC board with no. 18 bus wire run through FT-43-801 ferrite beads.

Initial Testing

After the switches, LEDs and connectors have been wired, carefully check all connections. Make *certain* that the jumper from the PC board to bias diode D2 is connected! If all looks good, connect the amplifier to a 13.8-V power supply capable of sourcing 1 A. (If you have one, a small, current-limited power supply is best for testing.) If your power supply does not have reliable current metering, a meter capable of measuring 0-500 mA should be placed in series with the positive supply lead.

With the amplifier turned off, turn on the power supply. The meter should indicate 0. Turn on the amplifier and note the total indicated current. It should be between 50 and 300 mA. If it is much greater than 300 mA, quickly turn off the power supply and look for problems.

If the current is within these limits, you can go about setting the operating bias. This involves changing the value of R1 until the collector current is between 75 and 175 mA. Note that this is *not* total circuit current, which includes the diode current and **POWER** LED current. The best way to measure collector current is to lift FB3 and insert a milliammeter in series with the collector-supply lead at that location. An alternative method is to use the following equation to approximate collector current:

$$I_C = I_{TOTAL} - [(V_{R1} \div R1) + ([V_{CC} - 1] \div 1000)]$$

where

I_C = collector current in milliamperes
V_{R1} = measured voltage across R1
V_{CC} = measured supply voltage

This equation lets you calculate collector current by subtracting the current through R1 ($V_{R1} \div R1$) and the current through the **POWER** LED ($[V_{CC} - 1] \div 1000$) from the total supply current.

Using either method, substitute different resistors at R1 until the collector current

falls into the 75- to 175-mA range. In almost every case, a 5-W resistor of 82, 91, 100, 110, 120 or 130 Ω will bring the current into that region. (I have never had to substitute more than three resistors to arrive in this bias-current range.) These 5-W resistors can be purchased for less than $0.40 each, so, although a 200-Ω, 5-W wirewound potentiometer could be used for R1, all six resistors can be purchased for far less. And, these days, high-wattage potentiometers are hard to find.

Tune-Up

When the bias current has been set, the amplifier can be initially tuned. For this procedure, the amplifier should be connected to a power supply capable of delivering at least 15 A at 13.8 V. A power meter capable of indicating at least 100 W at 50 MHz should be connected at the amplifier output, and the meter's output to a 50-Ω load. It is also desirable to measure input power from the exciter, as well as amplifier-input SWR, but these can be measured after initial tune-up if two meters aren't available.

Set the input-circuit trimmers (C5 and C14) near midrange. Because the output circuit can be tuned several ways for the proper impedance transformation, it's important to preliminarily adjust the output circuit by compressing C13 all the way, then backing off one full turn, before beginning tune-up. Do the same for C21, then back C20 out almost all the way. Turn on the amplifier and apply about 2 W drive. The COR should sense the input RF and switch immediately into transmit. Using a nonmetallic tool, tune the two input-circuit trimmers for maximum power output, then tune the three output trimmers (C13, C20 and C21) for peak output. These adjustments interact, so continue tweaking for maximum power.

During tuning, pay attention to the temperatures of these variable capacitors. If heating is noticeable (especially in C13), reset these capacitors and start again. Limit key-down periods to 10 seconds, and allow for cooling in between. Increase drive to about 9 W. Output should be 95 to 105 W, and the output-tuning capacitors should be cool to the touch just after RF drive is removed.

Input SWR should be less than 1.2:1. If not, adjust the input-circuit trimmers for the best compromise between low input SWR and maximum power output. The amplifier is now ready for operation. Some MRF492s seem to be "hotter" (exhibit more gain) than others; I have seen some devices produce 115 W easily and others strain to put out 95 W. On the air, the difference is so slight that it can't be detected. For best IMD performance, I recommend running the amplifier at about 85 W output on SSB.

FM Operation

This amplifier also works well on FM, but the power output should be limited to about 75 W because of FM's more demanding duty cycle. As mentioned earlier, the amplifier's bandwidth characteristic is double-humped; if it's tuned up at 50.1 MHz, the second hump falls in the 53-MHz area, allowing for SSB and FM operation without retuning.

If the amplifier is to be used for beacon, CW or FM operation exclusively, I suggest you configure it for class-C operation. Efficiency in class-C operation is in the 72% range, versus 60% for class B. To configure the amplifier for class-C use, connect the inductor using FB2 (the multi-hole ferrite bead) from Q1's base to ground, and eliminate all of the other bias components, including D2. If you like, you can add a panel switch to change between class-C and class-B operation.

The amplifier should *never* be operated class C on SSB. Doing so results in severe distortion.

Conclusion

I hope that you enjoy building this project, and will be motivated to try 50-MHz operation. As I write this, Japanese stations are being worked on the East Coast, and all continents are frequently heard. In the years to come, the regular occurrences of sporadic-E openings and meteor scatter will help fill the nulls between F-layer openings. Hurry and get in on the excitement on the "Magic Band"!

Using a MOSFET to Get More Power from the Basic MRF492 Amplifier Circuit

The MRF492 amplifier circuit described in the main text is easily modified for use with an MRF140 VMOS power FET, which has about 15 dB gain and over 160 W output—substantially more than the MRF492. Even the device cases are the same, so the changes required to operate this circuit with an MRF140 are quite straightforward. Specific details of the modifications required, including a schematic diagram, are available from the author for an SASE.

The main differences between the devices are that the MRF140, a MOSFET, needs different biasing and a higher supply potential (28 V) than the MRF492, and is more expensive ($88 versus $15 for the MRF492, at this writing). But if you have a 28-V supply and need more than 100 W or have a 5-W exciter, the change is probably worthwhile. The MRF140 is easily biased with a three-terminal regulator (an LM317T works well), and requires very few component changes other than those in the bias circuit. An additional capacitor and inductor are also required at the MRF140's gate.

Because the modified amplifier requires a 24- to 28-V supply, different TR relays must be used, or, alternatively, 12-V-coil relays can be wired in series. (The COR circuit needs no modification because the LM358 works fine at 28 V.)

Good heat sinking is more critical to amplifier performance at the higher power level, so I used a 3- × 5- inch slab of 1/8-inch-thick copper between the device and the case as a heat spreader. A larger heat sink and/or forced-air cooling are also desirable.—*N4LTA*

Although he's been licensed for only five years, Pat Bunn has been an avid electronics experimenter since grade school. He's currently an Advanced class licensee, and his operating interests lie mostly at VHF—especially six meters. He is assembling a 2-meter EME (moonbounce) station, and plans to do some microwave work in the future. His other interests include his family, digital electronics, outdoor sports and photography.

Pat was a 1973 graduate of North Carolina State University, where he earned a BS degree in electrical engineering. He's presently employed as the Engineering Group Manager at R. R. Donnelley and Sons Co at its Spartanburg (SC) Gravure Division. (QST is printed by R. R. Donnelley's Glasgow, Kentucky, facility.—Ed.

Notes

[1]T. Tammaru, "A Solid-State 6-Meter Linear Amplifier You Can Build," *QST*, May 1982, pp 11-14. This circuit was based on an MRF492 test circuit in Motorola's *RF Device Data* book.

[2]*Motorola RF Device Data*, Fourth edition (Motorola Inc: 1986), pp 3-552 through 3-555.

[3]A set of PC-board parts, including a high-quality PC board with plated-through holes, is available from the author for $100 (UPS delivery included). Switches, LEDs, enclosure, terminals, heat sink and connectors are not included. The PC board alone is available for $17 postpaid, and a black anodized-aluminum heat sink is available separately for $12 postpaid. (The ARRL and *QST* in no way warrant this offer.)

[4]Frontier Microwave, RD 1, Box 467, Ottsville, PA 18942, evening tel 215-795-2648; Down East Microwave, RR 1, Box 2310, Troy, ME 04987, tel 207-948-3741.

[5]Send a business-size SAE with return postage for 1 ounce with your request. Specify the information package for the 6-meter linear amplifier from October 1990 *QST*. This package includes full-size etching patterns for the front and rear sides of the amplifier PC board and a part-placement overlay.

A Laser-Communications Primer—*Part 2*†

Anxious to start DXing with your own laser system? Here's how!

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

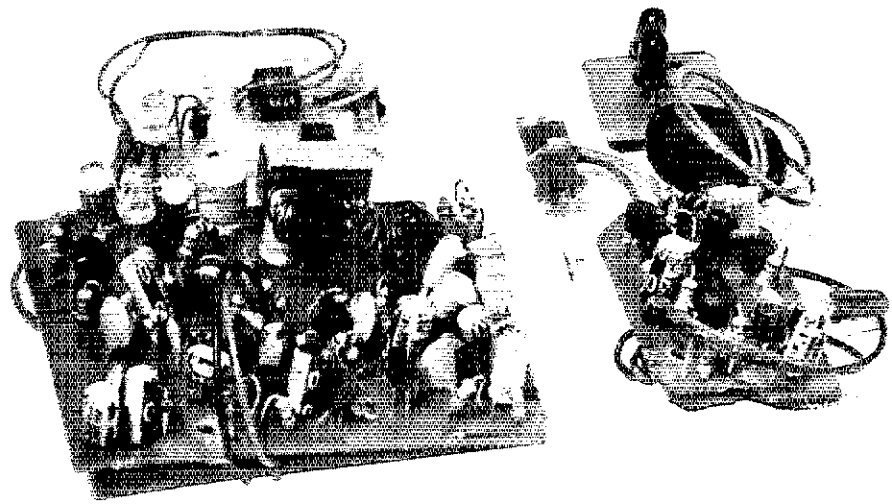


Fig 8—A complete optical communications system, based on a modified IR-laser-tag game. The receiver circuit board (left) has been modified for low-level visible-light work through the addition of a visible-range photodiode and op-amp-based preamplifier (on the perf board to the rear of the main receiver board). The smaller transmitter board (right) has been modified for visible-light operation by substituting a pair of high-output red LEDs for the original IR set (on the small board to the rear of the main transmitter board). The transmitter is useful for testing the receiver and associated optics, because it eliminates the need to work with high-power laser light at close range. *(NU1N photo)*

For the amateur interested in experimenting with optical communications, there has never been a more opportune time to enter the field. Lasers, optical-fiber assemblies and optical-communications technology in general have advanced to the point where the hardware required to build a laser-communications system is not only readily available, but is also *affordable* for the average amateur.

This article builds on last month's introduction to laser light, optics, laser sources and detectors.[21] I'll describe the basics of light propagation and detail practical and affordable laser-based communications systems you can build, such as the modified laser-tag transceiver shown in Fig 8.

Light Propagation

To fully exploit the potential of free-space laser communications, you need to understand how light propagates from a source to a receiver. In an excellent *QST* article,[22] Bob Atkins, KA1GT, pointed out that laser-communications range is not only a function of output power and receiving-optics area, but is also affected by atmospheric transmissivity, receiving-optics quality, optical-detector sensitivity and laser-beam divergence. As one would expect, the more sensitive the receiver and the greater the output power, the greater the maximum theoretical range. As Atkins also reveals, the best approach to designing optical-communications systems is to develop the most sensitive detector you can, because large receiving lenses, like high-power lasers, are expensive and difficult to manage.

As in Amateur Radio RF communications, despite our efforts at developing or acquiring the best transmitter, receiver and antenna system possible, nature sometimes doesn't cooperate. Just as we use our understanding of the interplay between the sunspot cycle and the state of the ionosphere to plan our MF/HF activities, by understanding how light propagates through the atmosphere, we can better select laser-communications sites and times.

Transmissivity of receiving optics is determined by the quality of the construction materials used, and the propagation of light through the atmosphere is affected by moisture and dust content, as well as turbulence. Rain, snow and other precipitation can absorb, refract and reflect light, significantly reducing communications range.

Even relatively clear, calm air can diminish the intensity of a laser beam via *scattering*. Scattering is caused by the irregular arrangement of the atoms that constitute air. If a photon from a laser beam strikes an atom, the atom gives off another photon, at the same frequency, but in a different direction.[23] That is, the photon will be diverted away from the desired receiving site. Because scattering is proportional to the fourth power of the frequency, blue light—about twice the frequency of red light—is scattered *sixteen times* as much as red light. (This scattering accounts for the sky's blue color on clear days.) Rain and water vapor also scatter light, and smaller droplets affect blue light more than red light. That is, as droplets increase in size, blue light disappears first, enhancing the reds. Luckily for both IR- and HeNe-laser enthusiasts, the IR and red regions of the spectrum are relatively unaffected by atmospheric scattering.

Although it's not a factor in short-range communications, light bending is a consideration in longer-range (over 5 miles) laser work. Light, whether from a laser or the sun, travels faster through less-dense hot air than denser cool air. In much the same way that the refractive differences in optical fiber effectively constrain light to travel within the fiber core, temperature differences in the atmosphere can cause light to travel in curved paths.[24] For example, the optical illusion of distant water on a hot road—a mirage—is simply sky light reflected on the road. Light from the sky, originally headed for the road, bends upward toward the observer.

Light bending is especially important when working with IR laser systems. Because an IR beam may be bent to a greater or lesser extent than visible light, simply aiming your IR laser at the receiver site may not be sufficient. Don't immediately suspect component failure if you can't quickly make contact with a distant station; try

†Part 1 of this article appeared in *QST*, Sep 1990, pp 19-24.

[21]Notes appear on p 26.

aiming your laser a bit high or low to take advantage of bending.

Laser Power Supplies

The power required by a low-power semiconductor laser can be provided by any regulated supply capable of driving a common LED (for example, a battery with an appropriate series resistor). At the other extreme, HeNe lasers, as well as some optical detectors, require a supply capable of delivering 2 to 3 kV dc at several milliamperes. Fortunately, a number of power-supply alternatives are available, including surplus high-voltage "bricks," kits and new commercial supplies.

My first HeNe-laser power supply, which survived for about 5 years, was based on a portable black-and-white TV set. I tapped the HV directly from the picture-tube anode connection—with the tube still attached. The tube's capacitance provided the needed filtering. Obviously, this approach requires the usual attention to HV-shock precautions.

My current HeNe laser supply was described in a recent *Radio-Electronics* article.[25] It is also available as a complete kit (from General Science and Engineering, PO Box 447, Rochester, NY 14603, tel 716-338-7001) for about $40. This switching supply uses a 555 timer chip running at 16 kHz. I found the kit lacking in a few areas, but it is a good basis upon which to build. After substituting no. 12 wire for the no. 22 wire supplied for the 12-V dc input, I had little trouble using the supply to power my 5-mW HeNe laser tube. I solved a corona-discharge problem by covering all exposed HV connections with a generous amount of silicone sealant. Sudden HV discharges are fatal to 555s—I went through three ICs before stabilizing the supply. If you plan to purchase this kit, you might want to pick up a few extra 555s.

As with all HeNe laser systems, you'll need to insert a ballast resistor between the HV power supply and the laser tube. Unless you have the tube's data sheet, you will have to use a trial-and-error approach to determine the needed resistance. The kit described above includes a number of 2-W carbon resistors for use as ballast. I found that two 100-kΩ resistors in parallel were optimum for my 5-mW tube.

My HV switching power supply has a potentiometer for adjusting the pulse width of a 555-generated square wave (Fig 9A shows how the 555 can be used as a pulse generator). This square wave drives a high-current switching transistor connected in series with the switching-transformer primary, which regulates the current flow through the laser tube. In my system, I use another 555 to drive the LED in an optocoupler (TIL111, Radio Shack® no. 276-1654) at 700 Hz (see Fig 9B).

The phototransistor's collector and emitter are connected across a 1-kΩ resistor in series with the pulse-width potentiometer. Decreasing the effective resistance of the series resistor decreases the supply's pulse width, so increasing drive to the optocoupler LED decreases power-supply output. In configuring the system, I increase the 700-Hz drive to the optocoupler LED until the laser just begins to sputter from lack of current and then back off the drive. This setting represents the 15% modulation limit.

If your laser supply is encapsulated—providing access only to the 12-V dc input and 2- to 4-kV output—you'll have to resort to other means of varying the HV output. I've found that modulating the 12-V dc input to these switching supplies is useless, especially in well-designed units. A simple and inexpensive approach that works for continuous tones as well as voice modulation is inserting the primary or secondary of a suitable transformer in series with the HV supply (see Fig 10). The transformer, which should have adequate primary-to-secondary isolation, and the characteristics of your particular laser tube, define exactly how much audio drive is required to realize full (15%) modulation. I use the primary of an old 6.3-V filament transformer as the series element, driving

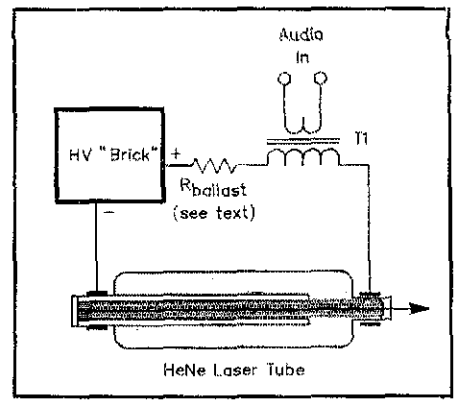


Fig 10—Voice and tone modulation of a HeNe laser tube can be easily accomplished, even when the power supply is encapsulated. The primary or secondary of transformer T1 is inserted in series with one of the HV lines to the laser tube. An audio tone or voice signal fed into the unused primary or secondary winding causes an instantaneous change in laser-tube supply voltage, varying the laser's output power accordingly.

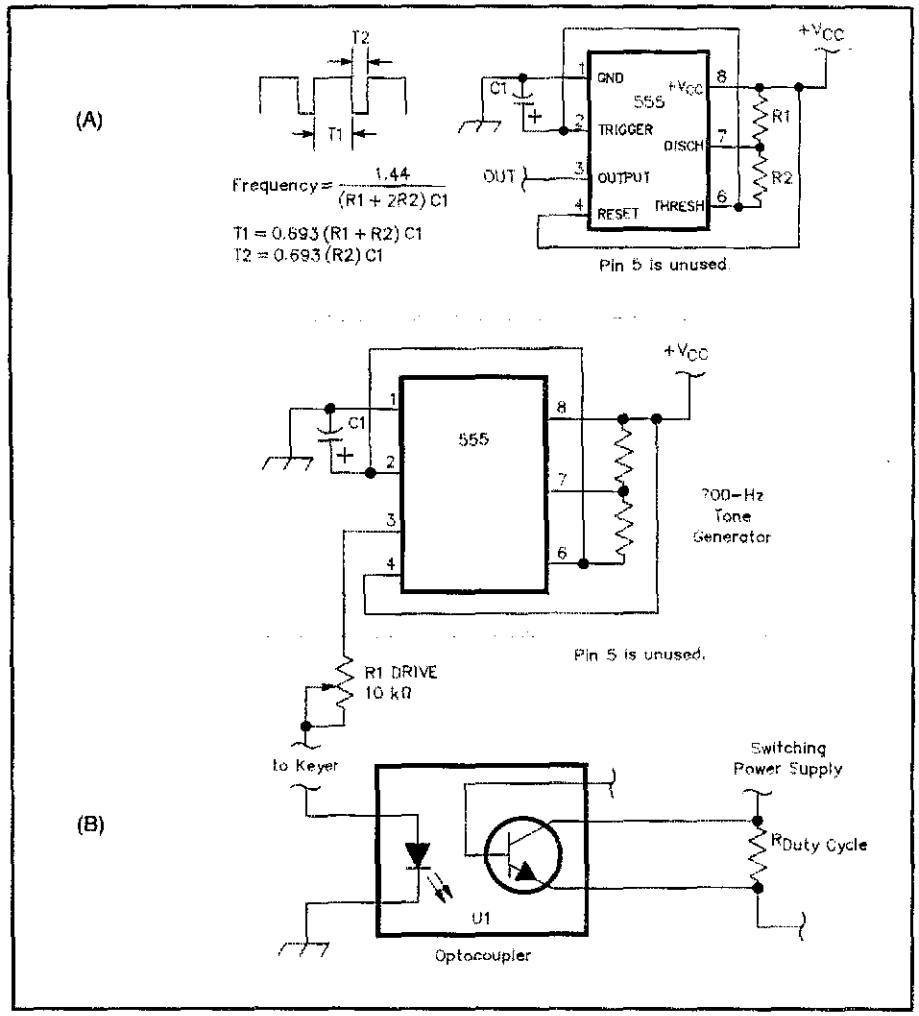


Fig 9—Configured at A as an audio square-wave generator, the popular 555's output-waveform characteristics are defined by only three external components. This circuit (or a derivative) is commonly used to provide the clock for switching power supplies. A good way to tone-modulate a HeNe laser beam is to modulate the HV power supply's duty cycle, as shown at B. In this example, a 555 configured as a tone generator modulates the power supply at 700 Hz. Adjust R1 for optimum drive. A common optocoupler (U1) provides an added layer of safety, isolating the straight key or keyer from potentially damaging voltages in the HV-supply circuit.

the secondary with a simple 555 tone generator and an LM386 audio amplifier.

Because most HeNe-laser power supplies are switching types, the carrier is usually modulated at the switching frequency. In my system, a simple low-pass audio filter on the receiver output easily removes the 16-kHz switching modulation, as it is relatively far removed from the normal CW and voice frequency ranges (700 and 300 to 3000 Hz, respectively).

HeNe lasers are designed to be run continuously, but semiconductor-diode lasers are generally designed for pulsed operation. As such, your diode laser system should be pulse-width modulated to realize the best communications results and diode life. You can easily pulse-width modulate a laser diode through the use of a circuit similar to that used to modulate the pulse width of a HeNe-laser switching power supply (see Fig 9B). For low-power laser-diode applications, simply substitute a laser diode for the optocoupler LED. Higher-output (more than a few milliwatts) diodes require the addition of a series switching transistor.

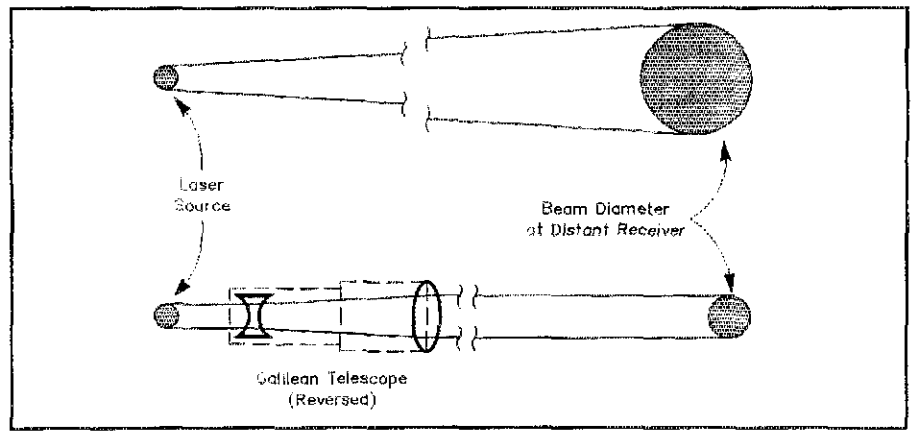


Fig 11—Given enough distance, even the relatively parallel light from an adjusted HeNe laser light disperses to the point that the light intensity is too small to detect, even with the best receiver system. To minimize light dispersion, and therefore increase laser-communications range, a collimating system, based on a common Galilean (spotting) telescope, can be used.

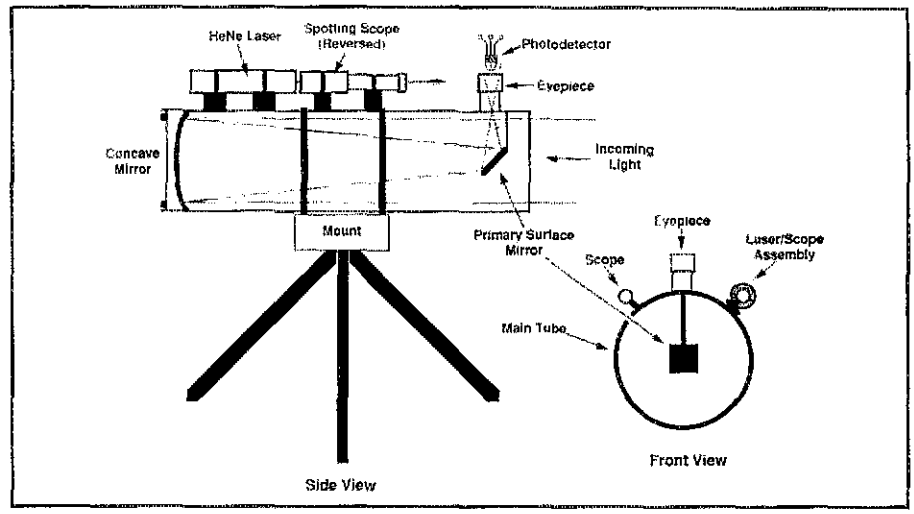


Fig 12—Reflecting telescopes make excellent laser-communications platforms. By mounting the HeNe laser on the main telescope tube, you can avoid the hassles of independently aiming the transmitter and receiver systems. Don't use the telescope's spotting scope for the transmitter-beam collimator; use it to aim the transmitter/receiver assembly.

Optical Assemblies

Designing and constructing the optics for a laser-communications system from scratch can be an enjoyable and rewarding experience, but unless you have some experience with lenses and other optical devices, you are probably better off using a preassembled system. As you gain experience, you can modify and adapt the system to suit your needs.

Used telescopes, of both refractor and reflector designs, make excellent, preassembled optical "antennas." Refractor telescopes, which are designed much like single-lens-reflex (SLR) telephoto camera lenses, with glass lenses at either ends of an adjustable-length tube, make excellent collimating devices. As shown in Fig 11, refractor telescopes, sometimes sold as "spotting scopes," can be used in reverse (with the laser light entering the *ocular*, the aperture usually placed closest to the eye) to produce a more parallel—collimated—beam.

For example, a 10× telescope or spotting scope can be used to collimate a HeNe laser beam such that, at 100 yards, the illuminated disc that would normally be 4 inches in diameter is reduced to only 0.4 inches in diameter. The result is a more intense beam at a given distance, and therefore greater possible range.

Reflector telescopes, usually more compact for a given aperture than refractor types, make use of a primary-surface curved mirror to gather light. As shown in Fig 12, many reflector (and refractor) telescopes have integrated spotting scopes designed to aid in aiming the larger telescope. These integrated units make excellent laser communications assemblies. The smaller spotting scope, which should be inverted from its normal position, can serve as the laser collimating assembly, and the larger-aperture main telescope can be used for the receiver. An added bonus to using a telescope assembly, especially one of the better models, is the (usually) excellent support system. A good, stable tripod or other such mount is essential for long-distance work.

Laser Accessories

Just as an assortment of instruments—such as a good SWR bridge and VOM—are essential for the day-to-day operation and maintenance of an amateur RF communications system, there are a number of indispensable tools for laser-communications enthusiasts. These tools can be broadly categorized as either focusing aids or power-measurement devices.

Focusing Aids

Focusing aids, valuable in any optical system, are especially useful for IR work. Because IR light is invisible, some means of visualizing the beam must be provided, unless you want to work with a trial-and-error approach. There are two basic types of IR focusing aids: IR-detecting cards and IR-to-visible-light converters. Detector cards, designed for testing IR remote appliance controllers, are available for about $7.[26] Before use, these phosphor-coated cards must first be sensitized by exposing them to ordinary white light for about one minute, thereby allowing the phosphor to absorb energy in both the UV and visible ranges. Then, in subdued light, stimulating the phosphor by IR light causes the phosphor to release energy in the form of a pale red, orange or yellow glow. Exercise caution when you use one of these cards with high-power beams, so as not to damage the phosphors. If you must work directly with a high-power beam, expose the card to IR light for only brief periods at a time.

IR-to-visible converters, like IR-detecting

cards, rely on phosphors to convert IR to visible light for tuning, focusing and aiming IR lasers. Unlike IR-detecting cards, however, these converters do not block the light path, but effectively replace the invisible IR beam with a beam of visible light. More sensitive and capable than simple IR detecting cards, IR-to-visible converters can be expensive, with prices varying as a function of sensitivity and the length of time the converter can be used before recharging. For short-duration (10-s) converters with a minimum-detectable-power rating of 8 $\mu W/cm^2$, the price for a new unit is approximately $25 from Edmund Scientific Co.[27] For a converter with a 3 $\mu W/cm^2$ sensitivity, you can expect to pay $200 and up (Edmund Scientific Co). On the high end, new converters that last up to 2 minutes before recharging cost from $400 to $1000.

Although not really a staple of optical-communications experimenters, night-vision systems can also be used to transform IR-laser output into visible light. However, these tend to be expensive when new ($1000 and up).

Power-Measurement Devices

Most commercial laser-power meters are designed to measure the outputs of laser devices used in audio- and video-disc players. Many, such as the Leader LPM-8000 (about $240), are calibrated for both IR-diode lasers and HeNe lasers with power ranges from 0.3 to 3.0 mW full scale. Metrologic also sells a HeNe-laser power meter with full-scale ranges of 200 μW to 20 mW ($350). If you're planning to purchase a new or used laser-power meter, look for one with an acceptable frequency response, ie, 0 to 20 kHz, if you plan to use voice modulation.

If you can't locate a surplus power meter, general-purpose photographic light meters provide a less costly alternative. These devices, which are usually very compact and lightweight, typically sell for around $70.

Setting Up a Laser-Communications Station

As a firm believer in "repurposing," I suggest that the simplest, most economical way of acquiring a functional optical-communications system is to modify the transmitter and receiver from one of the popular laser-tag games (see Fig 8). These toys, available from over a dozen manufacturers (including some Radio Shack stores), typically contain two IR-LED transmitters and two IR receivers, all for under $30.

The receivers in these systems seem designed with the CW operator in mind, since they typically come equipped with on-board, 555-based tone generators that are triggered by the receipt of a pulsed-IR light beam. By modifying one or two resistor values, you can easily adjust the length of the tone (normally a few seconds—to signal that the receiver wearer has been "tagged") to the duration of the received signal. These units have a nominal range of about 50 feet, but I have used a simple 2-inch lens system to extend that range over tenfold. The successful use of simple, low-power IR systems consisting of IR LEDs and phototransistors with small-diameter lenses, has been described in Amateur Radio literature.[28]

For serious communications work, you will need to replace the transmitter's IR LEDs with visible or IR laser diodes, and perhaps add a more sensitive detector to the receiver. In the system shown in Fig 8 (taken from a $9 laser gun/target toy), I replaced the original IR phototransistor with a visible-light PN photodiode and a 741 op amp. With the addition of a 10-inch Fresnel receiving lens, I have used this receiver to consistently receive a 5-mW HeNe laser/spotting-scope transmitter from a distance of over 6 miles. (I use identical transmitter/receiver systems, with one placed on a hill and the other on the roof of my apartment building.)

Even if you opt to use a HeNe laser instead of upgrading the LED transmitter, it is a good idea to keep the transmitter around as a test instrument (for tuning the receiver without the potential hazards of working with higher-powered HeNe lasers). You can easily replace the original IR LED with a red LED for a light source that operates near the HeNe's operating frequency. Similarly, an IR remote TV controller can be used to test IR (and, at close range, visible-light) receivers. Upon pressing a button on the control, you should hear a short burst, followed by a series of low-frequency (< 5-Hz) pops or clicks (if the button is held down), corresponding to the control's digitally encoded signals.

If you already own a laser-light source and only need a receiver to complete your communications system, you should consider using a self-contained IR receiver, such as the one marketed by Sunset Unlimited.[29] This $15 device, designed for testing remote-control units, contains a built-in audio amplifier and speaker. With the addition of a 2- or 4-inch lens from a hand magnifier, this unit makes a good IR-laser receiver. Adding an earphone jack is a simple matter, as is replacing the IR phototransistor with a visible-range photodiode for visible-light operation.

If you like to build, consider the simple receiver schematic shown in Fig 13. Nothing more than a high-gain audio amplifier, this circuit makes use of a common 741 op amp (U1) and an LM386 audio amplifier (U2). Powered by a 9-V battery, the amplifier can be used with a variety of optical detectors, including solar cells, photoresistors, photodiodes, LEDs and phototransistors. The audio-amplifier stage from a portable radio could also be used.

Once you have a good, basic laser transmitter and receiver, the next step is to mount them, with their accompanying optics, so that they are both portable and easy to use. As mentioned earlier, a high-quality reflector telescope for receive, coupled with a spotting scope mounted on the main telescope tube, makes for an excellent optical-communications-system platform (see Fig 12). A lightweight and inexpensive transmitter/receiver platform can also be constructed from ordinary PVC tubing and an inexpensive spotting scope (such as the models sold for BB and pellet rifles).

As shown in Fig 14, a lightweight Fresnel lens can be cemented (with silicone sealant) to the front of a PVC tube with a diameter appropriate for the Fresnel lens. Cut the PVC tube such that its length is slightly longer than the Fresnel lens' focal length, and place a PVC cap on the end opposite the lens. Drill a hole in the center of the end cap to accommodate the optical detector assembly, making certain to allow for slight adjustments in the optical detector's position and orientation. Surplus telescope hardware, such as the ocular drive mechan-

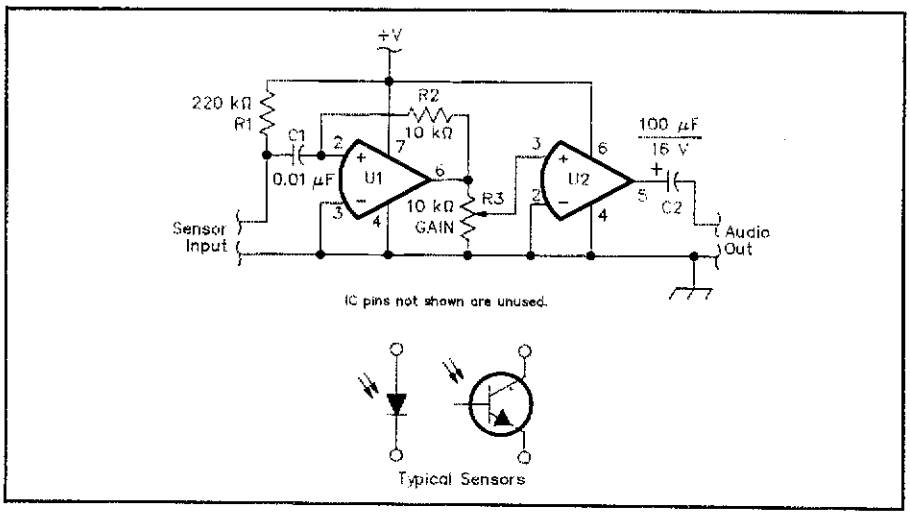


Fig 13—A simple laser receiver. U1, a 741 op amp, amplifies the output of a photodiode, phototransistor or other optical detector, and drives U2, an LM386 audio amplifier. Resistors are ¼ W, and capacitors should have a rating of 16 V or greater. +V is supplied by a 9-V battery.

Lasers and You: Peaceful Coexistence Depends on Safety

Novice laser experimenters should not attempt to work with high-power visible or IR lasers of any type, but should instead start with a low-power (1- or 2-mW), visible-light laser system. *Only* after you understand the physics and biological hazards associated with a relatively safe system should you consider moving up to more powerful—and potentially more hazardous—systems. For my high-power visible (11 mW) and IR (9 W, pulsed) lasers, I have two sets of laser safety goggles, one for IR and one for visible work. You can never be sure that your eyes are not exposed to a direct or indirect invisible IR laser beam, so full wrap-around laser safety goggles are a must for IR work. If you manage to locate a surplus set of goggles, make certain that the blocking frequency corresponds *exactly* to the frequency of your laser system. I purchased my goggles for $10 per pair at a local swapfest; new goggles can be expensive (on the order of $150 from Edmund Scientific Co [see note 27]), but laser safety is *necessary.—NU1N*

ism from a reflector or refractor telescope, can make a great optical-detector mount.

When working with your completed laser-communications assembly, be careful not to point the front end at the sun. Doing so on a clear day could easily result in the destruction of the optical-detector assembly. Remember, Fresnel lenses are commonly used to make solar furnaces for high-temperature applications!

The Future of Laser Communications

For the laser communicator, the future looks very promising. Not only are compact semiconductor lasers becoming less expensive, but those for use in the visible spectrum are also becoming available. For example, because optical-disk data-storage capacity for computers is a function of the wavelength of the laser system used for write operations, there is considerable pressure on the laser-diode industry from computer manufacturers to produce inexpensive visible-light laser diodes with higher output.

Laser *repeaters* may also be possible in the not-too-distant future. Free-space IR-communications networks are already commercially available for computer networks (the IR transmitters and receivers are directed at a nearby wall for operation). In addition, semiconductor optical amplifiers are currently used as repeaters by the telecommunications industry to extend the range of their fiber-optic network.[30]

Resources

To adequately cover optics, light propagation, lasers, telescope design, and so on, would require several volumes. I hope that this article gets you started in the right direction. Check your local library for further relevant information.

To apply the theoretical background provided by texts, you'll need to identify resources that are able to supply optics, lasers and other hardware. Perhaps the best single source of laser and optical supplies, including texts on telescope design, lasers and optics, is Edmund Scientific Co. (Expect to pay top dollar for their products, however.)

MWK Industries[31] is a good source for surplus power supplies and laser tubes. All Electronics Corp[32] sells assorted optical sensors, including phototransistors, photodiodes and photoresistors, for less than $1 per component. Radio Shack sells IR phototransistors, solar cells and IR diodes, and also carries a small, inexpensive book on optoelectronics that is worth having (part no. 276-5012).[33] Reference texts covering all aspects of astronomy, including the design of telescopes, optics, etc, are available from Willman-Bell, Inc.[34]

For listings of used and new astronomy equipment, consult two excellent monthly periodicals, *The Starry Messenger*[35] and *Sky & Telescope*.[36] For new telescopes and other optical supplies, contact Lumicon[37] and Kenneth Novak & Co.[38] In the monthly *Nuts & Volts* Magazine,[39] many sellers advertise new and used laser components.

For the kit-building enthusiast, Heath®[40] sells a complete laser-training system for under $300. You can supplement this complete HeNe-transmitter, semiconductor-receiver system with Heath's laser-technology course.

Texts on optics and light propagation can be helpful, but the best resource is likely to be your local amateur astronomy group. Not only will you gain a good practical understanding of optical systems from such groups, you might even pick up another hobby in the process!

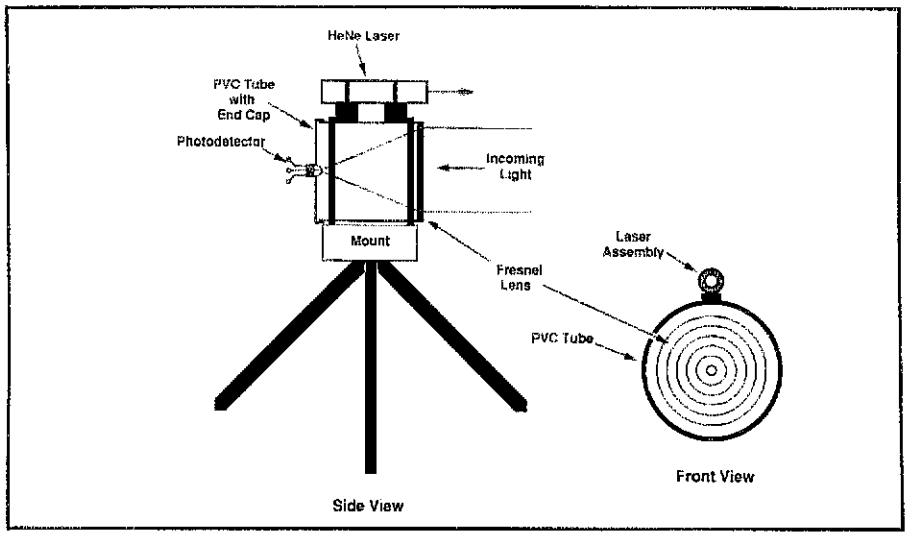


Fig 14—Plans for an inexpensive, home-brew optical-communications platform, based on a HeNe-laser transmitter and a Fresnel-lens-based receiving system. Drill a small hole in the bottom of the main PVC tube to allow moisture to escape.

Notes

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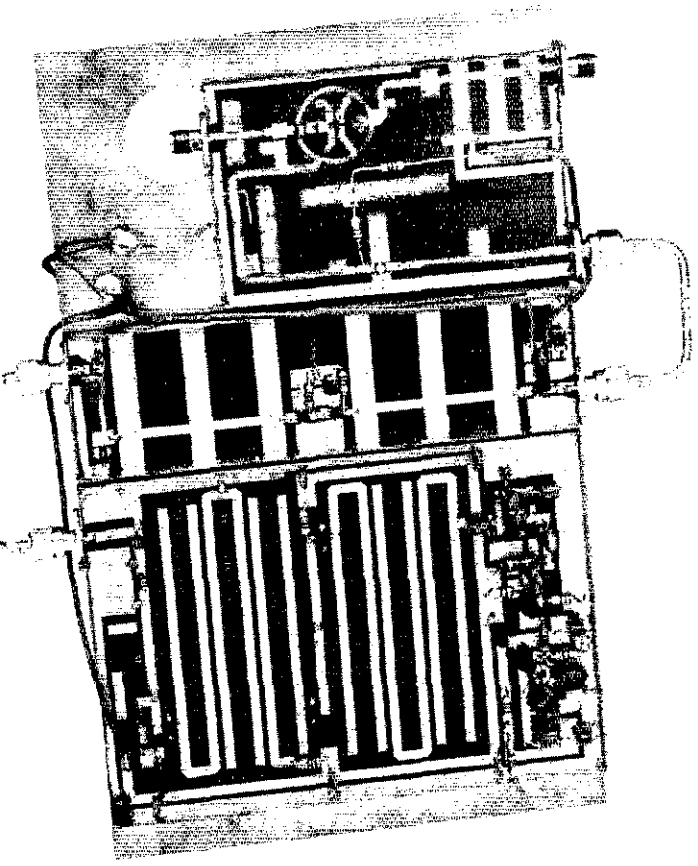
[32]All Electronics, PO Box 567, Van Nuys, CA 91408, tel 800-826-5432
[33]F. Mims, *Engineer's Mini-Notebook: Optoelectronic Circuits* (Fort Worth, TX: Radio Shack, 1986).
[34]Willman-Bell, Inc, PO Box 35025, Richmond, VA 23235, tel 804-272-5920.
[35]*The Starry Messenger*, PO Box 4823-N, Ithaca, NY 14852, tel 201-992-6865.
[36]*Sky & Telescope*, PO Box 9111, Belmont, MA 02178, tel 617-864-7360.
[37]Lumicon, 2111 Research Dr, no. 5S, Livermore, CA 94550, tel 415-447-9570.
[38]Kenneth Novak & Co, Box 69W, Ladysmith, WI 54848, tel 715-532-5102.
[39]*Nuts and Volts*, PO Box 1111, Placentia, CA 92670, tel 714-632-7721.
[40]Heath Co, Benton Harbor, MI 49022, tel 800-253-0570.



A Single-Board Bilateral 5760-MHz Transverter

Here's a project to get you started on an exotic microwave band with little investment in time and money, and *no* test equipment.

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Michigan Technological University
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The KK7B 5760-MHz transverter (top board), along with its companion LO (bottom two boards) offers a no-tune approach to microwave operation.

Single-board, no-tune transverter designs for the 902, 1296, 2304 and 3456-MHz bands have been published in recent years.[1-4] These boards follow a common theme: They use printed-circuit filters and inexpensive plastic monolithic microwave integrated circuit (MMIC) gain blocks to achieve good performance at low cost. The use of printed-circuit filters and broadband MMICs also eliminates the need for RF alignment or microwave test equipment for proper operation. Low cost and ease of assembly and operation have tempted many amateurs to experiment with the microwave bands.

This article describes a single-board transverter for 5760 MHz. Design and construction are similar to that of the 3.4-GHz transverter described by Jim Davey, WA8NLC, in June 1989 *QST*.[5] I won't repeat many of the design and construction techniques described in Jim's article, so a review of that information will be helpful if you're unfamiliar with the single-board transverter concept.[6]

In addition to the transverter board described here, you'll need a local oscillator (LO), 1296-MHz IF radio and antenna. Information on completing your 5760-MHz station is presented later.

Design Considerations

In attempting to push the single-board design concept to the 5760-MHz band, two difficulties were encountered:

- The performance of currently available silicon MMICs used in the transmitter and receiver gain stages rapidly deteriorates at this frequency.
- No-tune printed-circuit filters provide insufficient image rejection and LO rejection for use with a 144-MHz IF transceiver.

The problem of image and LO rejection was solved by designing the 5760-MHz board for an IF of 1296 MHz. A single three-section printed-circuit filter with 10% bandwidth provides image and LO rejection of more than 30 dB with a passband insertion loss of less than 1 dB.

The problem of obtaining suitable devices for the gain stages has two attractive solutions. One solution is to simply set the project aside for six months until inexpensive plastic gallium-arsenide (GaAs) MMICs are available. The other solution, presented here, is to integrate everything except the gain stages into a single circuit board, with each port matched to 50 ohms. Then you are free to use any external gain blocks that may become available.

The basic transverter board—without additional gain stages at 5760 MHz—provides a transmit signal of −6 dBm (250 μW) at the 1-dB compression point (−4 dBm saturated) and a receiver noise figure of 9 dB (assuming that the 1296-MHz IF rig has a 2-dB receiver noise figure). This is acceptable performance for line-of-sight contacts over distances of many miles when used with a small dish antenna. Leaving the gain stages off the transverter board solves another problem: You don't need to worry

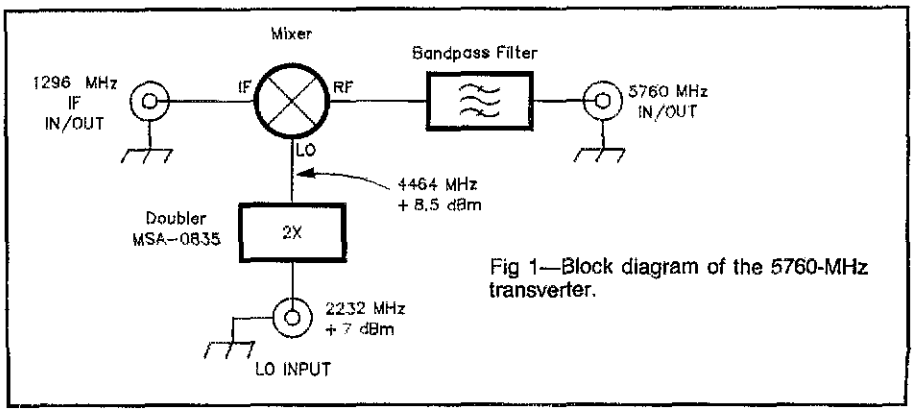
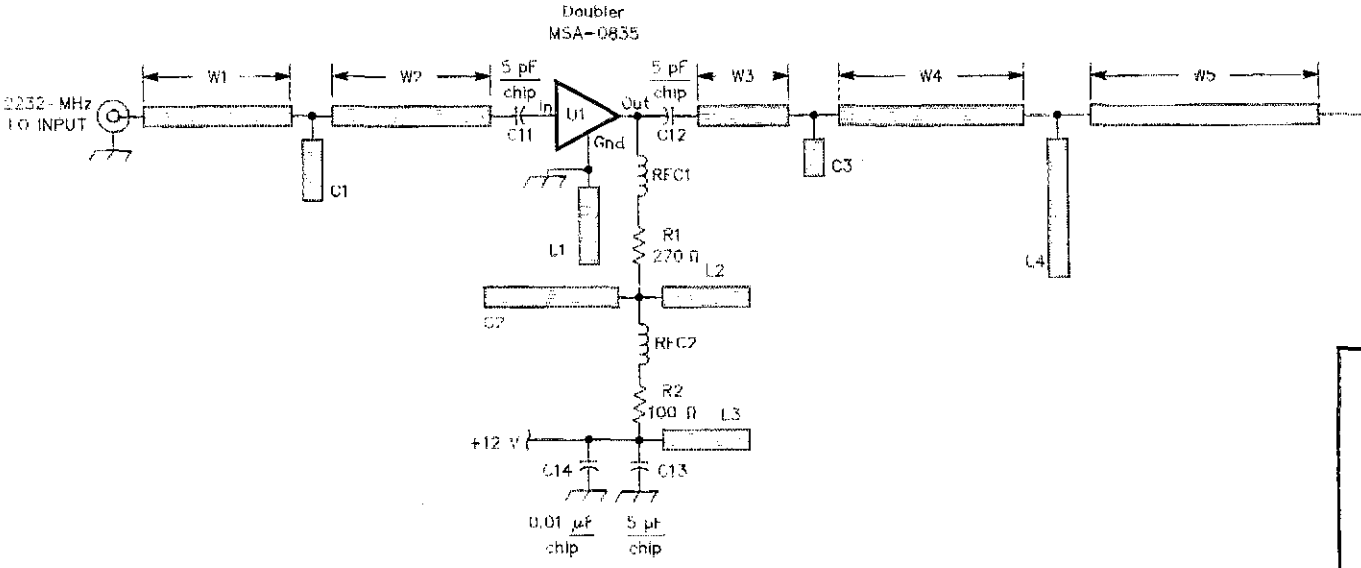


Fig 1—Block diagram of the 5760-MHz transverter.

[1]Notes appear on p 31.

Fig 2—Schematic of the 5760-MHz transverter. R1 and R2 are ¼-W carbon-film types.

C1-C10—Capacitive stub printed on circuit board.
C11-C13—5-pF, 50-mil-square microwave chip capacitor.
C14—0.01-μF chip capacitor.
C15—18-pF microwave chip capacitor.
D1—HP-2822 diode assembly.
L1-L3—1/4-λ open-circuit stub etched on PC board.
L4—1/4-λ stub at 2232 MHz (and 1/2-λ stub at 4464 MHz) etched on PC board (see text).
L5, L6—Broad tuned circuit at 4464 MHz (and short circuit at 1296 MHz) etched on PC board (see text).
RFC1, RFC2—inductance of R1 and R2 leads (not critical).
U1—Avantek MSA-0835 MMIC.
W1-W12—Tuned lengths of 50-Ω microstrip transmission line etched on PC board.



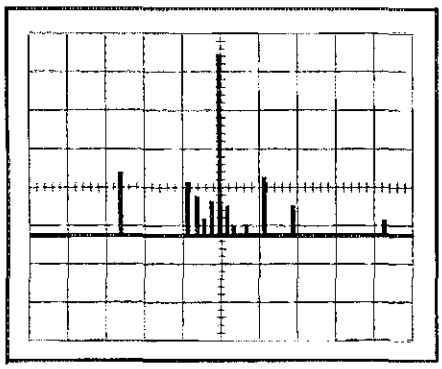


Fig 3—Output spectrum of the 5760-MHz transverter. Each vertical division is 10 dB; each horizontal division is 500 MHz. The pip at the center of the display is the 5760-MHz signal. All other outputs are more than 30 dB down.

about finding a suitable 5760-MHz TR relay; the antenna connects to a common filter for transmit and receive.

There are several external gain blocks from which to choose. An excellent one is the 5760-MHz preamplifier described by Al Ward, *WB5LUA*, in May 1989 *QST*.[7] This preamplifier can also be biased for maximum power and used as a transmit amplifier. Another choice for a transmitter gain block is the Avantek MGA-64135 GaAs MMIC.[8]

Design Notes

Fig 1 shows the block diagram of the 5760-MHz transverter board, and the schematic is shown in Fig 2. There are three basic sections: LO doubler, mixer and bandpass filter.

A 4464-MHz LO signal is mixed with a 1296-MHz IF signal for operation at 5760 MHz. The transverter requires an external 2232-MHz LO; an on-board MMIC doubles this signal to 4464 MHz at +8.5 dBm for mixer injection.

Although you can use any 2232-MHz source, I highly recommend the no-tune LO system described in July 1989 *QST*.[9] The no-tune LO with a 93-MHz crystal delivers a 2232-MHz, +7-dBm signal.

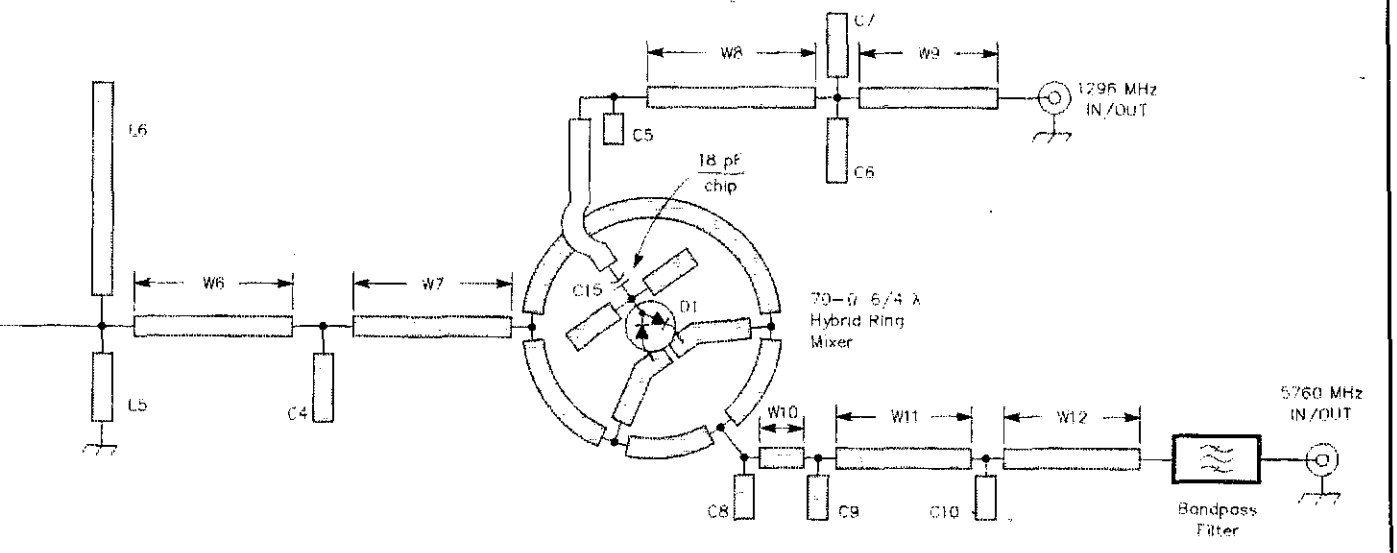
An on-board doubler using an Avantek MSA-0835 MMIC provides an output of +8.5 dBm at 4464 MHz, with all other outputs more than 30 dB down. The second harmonic of the drive signal is obtained by overdriving the MMIC amplifier. The harmonic output is increased by reducing the MMIC bias below the value recommended for linear operation. In the reduced-bias condition, the MSA-0835 will oscillate if the drive signal is removed. A 2232-MHz drive signal of −8 dBm or more is sufficient to stabilize the MSA-0835, and the 4464-MHz output varies little for drive levels between +3 and +10 dBm. The MSA-0835 doubler should be driven by a broadband, flat 50-ohm source. The MMIC in the output of the no-tune 2232-MHz LO is ideal.

The output of the doubler passes through a 2232-MHz notch filter (L4 on the schematic) and a single-tuned circuit at 4464 MHz (L5 and L6). L4 is an open-circuit 1/4-λ transmission line at 2232 MHz, so it appears as a short circuit at the drive frequency. L4 is an open-circuit 1/2-λ transmission line at 4464 MHz, so it appears as an open circuit at the desired second harmonic. The open circuited end of L4 is one-half wavelength away from the output of the MSA-0835 at 2232 MHz and one wavelength away at 4464 MHz, so the MSA-0835 does not see a short circuit at either frequency.

The MSA-0835 is a broadband amplifier, with a noise output from dc to more than 6 GHz. If the MSA-0835 noise output at 1296 MHz is passed to the mixer, some of it will appear at the IF port. This noise will directly add to the receiver noise figure. The broadband 4464-MHz single-tuned circuit (L5 and L6) was added to the artwork to stop the 1296-MHz noise component from getting to the mixer. Careful measurements with the single-tuned circuit indicate that the noise figure is approximately equal to the mixer conversion loss. Without L5 and L6, the noise figure is about 10 dB worse.

When properly driven, this frequency doubler is well behaved, clean and stable. The six versions constructed to date have shown less than 0.5 dB variation in output level when driven from the same 2232-MHz no-tune LO.

The mixer is a standard design, except that the HP-2822 diode pair is used well above its specified frequency range. On the assumption that the imperfections of the diodes were reactive and relatively uniform from part to part, I built a standard 6/4-λ



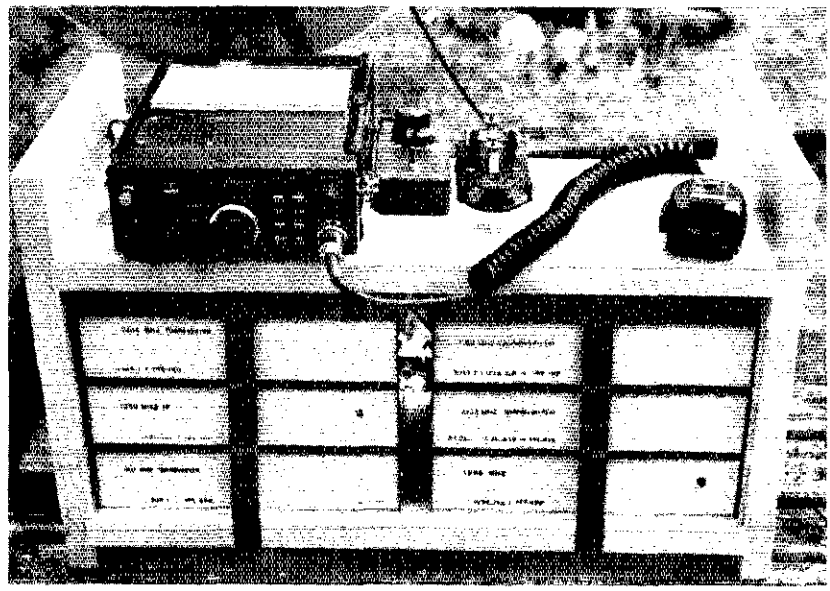
Microwave Grid Hopping

June in Michigan's Keweenaw Peninsula (grid squares EN56, EN57 and EN67) is perfect for any kind of outdoor activity. Previous experience with communicating over 10-mile paths using 19-inch dishes and 3456-MHz mixer-only rigs proved that microwave hilltopping is a great way to spend an afternoon.

With a quick introduction to the "KK7B 9EFGH† Bandswitched Rover" station (it works on 902, 1296, 2304, 3456 and 5760 MHz), Jim, K8OSF, set off in his pickup truck for the wooded hills of EN56 in search of his first microwave contacts. After locating a likely spot with only a few trees (there are trees all over upper Michigan), he connected the 12-V battery and antenna cable to the rig and began listening. For Jim, an experienced Morse operator, making a microwave SSB or CW contact was similar to operating on the HF bands, except that the complete absence of QRM made it easier to dig for weak signals. The only signal on the 5760-MHz band that afternoon was KK7B, a few decibels above the noise. After making a minor adjustment to the tripod-mounted 19-inch dish, the signals came up to 10 dB above the noise, and both K8OSF and KK7B switched to SSB.

The K8OSF hilltop location was 7 miles from my home QTH. There were a few small trees at both ends of the path. The two stations were virtually identical: K8OSF used a camera-tripod-mounted 19-inch dish, a 5760-MHz no-tune transverter board, a no-tune 1296-MHz transverter board for the first IF and an FT-290R for the 2-meter IF transceiver. Everything was the same at KK7B except for the TR-751A 2-meter IF. Neither station used 5760-MHz amplifiers for transmit or receive.

Contacts like this are a good way to get started on the higher microwave bands. As you gain experience, contacts over greater distances will be easy.—*KK7B*



The KK7B rover station contains everything you need for low-power hilltopping on 902, 1296, 2304, 3456 and 5760 MHz.

†Each character of this group is an ARRL Contest Branch band designator: 9 = 902, E = 1296, and so on.

mixer, then added tuning "confetti" empirically to improve the conversion loss. The confetti was then added to the mixer artwork, and subsequent mixers show good uniformity.

The IF port is also empirically matched to 50 ohms at 1296 MHz. The bare mixer displays a conversion loss of only 6.5 dB at 5760 MHz, which is much better than many commercial mixers designed for broadband performance in this range.

The filter is an off-center-tapped 0.16-dB-ripple Chebyshev type designed using the procedure described by Beebe.[10] It is exceptionally flat, has steep skirts and a loss of well under 1 dB in the passband.

After I integrated the doubler, mixer and filter onto a single board, the interconnec-

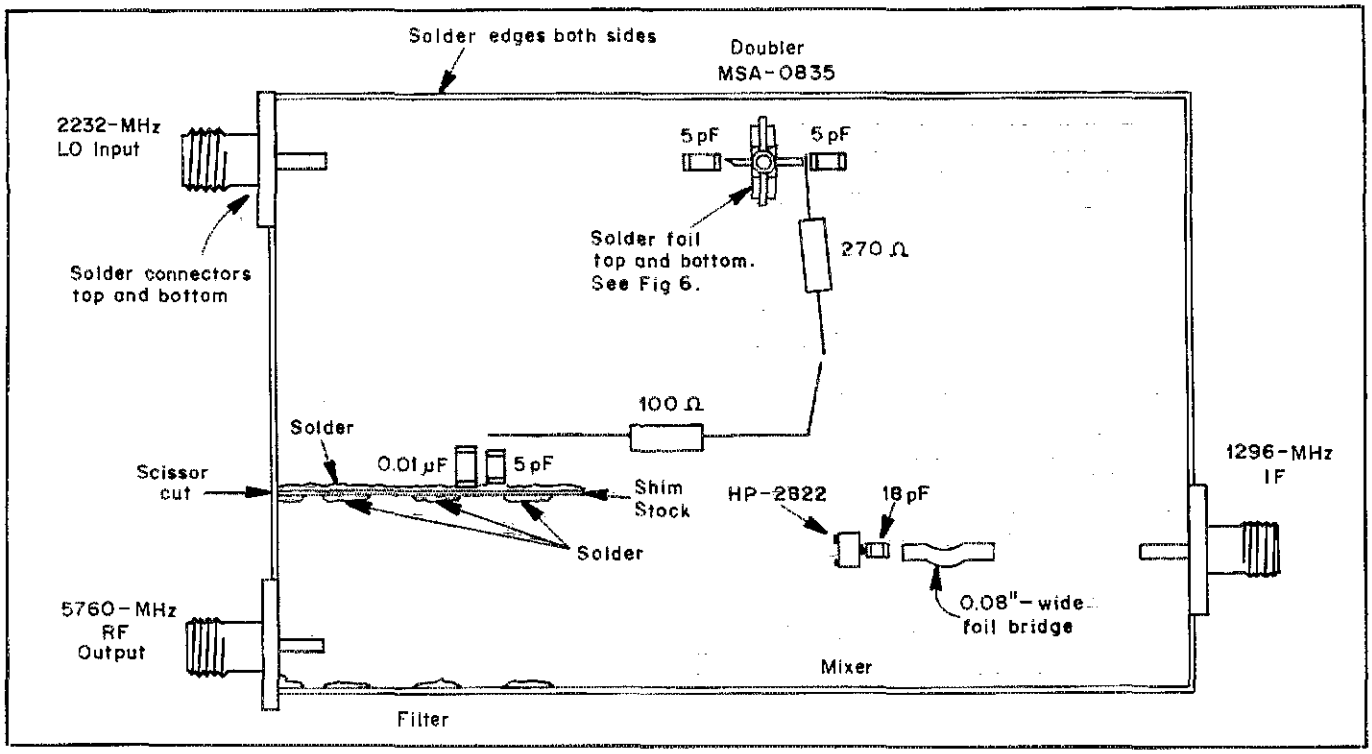


Fig 4—Part-placement diagram for the 5760-MHz transverter board (not shown actual size). All components mount on the etched side of the board. See Fig 6 for mounting details for the MSA-0835 MMIC.

ting line lengths and tuning confetti were varied to obtain best performance with 50-ohm pads on all ports. The output spectrum at the 1-dB compression point is shown in Fig 3. The image, which is 32 dB lower than the 5760-MHz output, is off the lower end of the spectrum-analyzer range. Table 1 lists the transverter specifications.

One cautionary note: Any metal box big enough to hold the transverter board will be a resonant cavity at a series of frequencies within the gain bandwidth of the MMIC. Imagine building a 40-meter linear amplifier in a box the size of a football field! No-tune transverters and LOs that work perfectly on the bench often exhibit spurious oscillations when enclosed in a metal box. The transverter board will work fine if it is simply wrapped with plastic-bubble packaging material or nonconductive foam and mounted near the antenna feed. For permanent installations, a plastic food container works well.

If a shielded metal box is necessary, I recommend shielding individual stages with thin brass or copper shim stock and then enclosing the shielded individual stages in a larger box. Spurious oscillations in the no-tune LO or lower-frequency transverters may often be cured by replacing "hot" MMICs like the MSA-0835, MSA-0685 and MAR-6 with well-behaved parts like the MSA-0235, MSA-0285 and MAR-2.

Construction

The transverter is constructed on 0.031-inch-thick Teflon®-glass substrate with a dielectric constant of 2.5. The board is clad with ½-ounce copper on both sides.

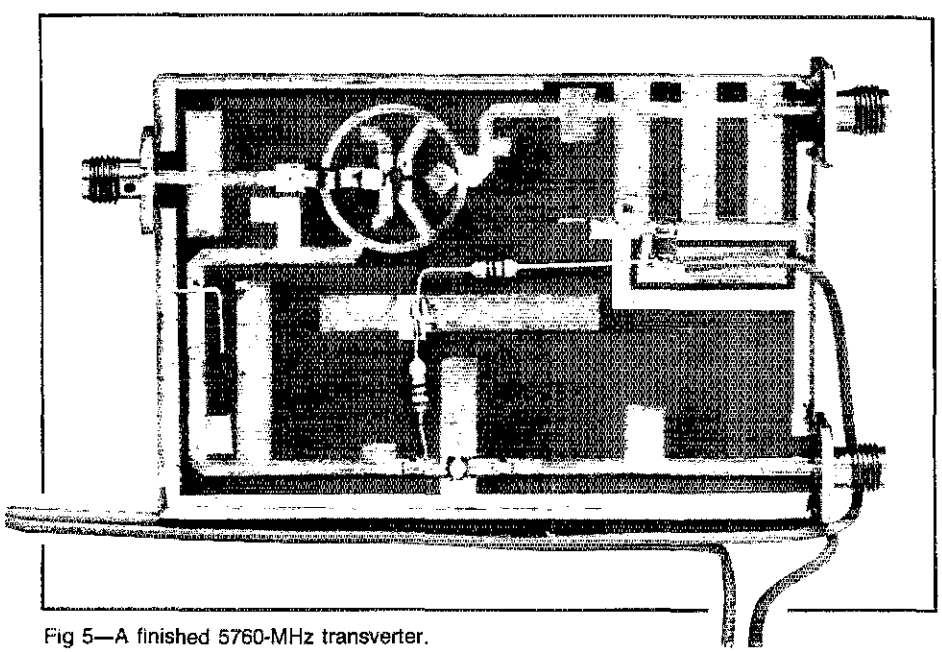


Fig 5—A finished 5760-MHz transverter.

Table 1
Transverter Specifications

General	
Frequency Range	5650-5925 MHz.
IF range	1240-1300 MHz.
LO required	2.18-2.32 GHz at +7 dBm nominal; +3 to +10 dBm acceptable.
Power requirements	12 V dc at 10 mA; 8-15 V acceptable.
Transmitter	
Output power at 1 dB compression	−6 dBm.
Saturated RF output	−4 dBm.
LO signal at RF port	−36 dBm, max.
IF drive level	approx 0 dBm.
Receiver	
Noise figure	9 dB.
Conversion loss	7 dB.
Image rejection	>30 dB.

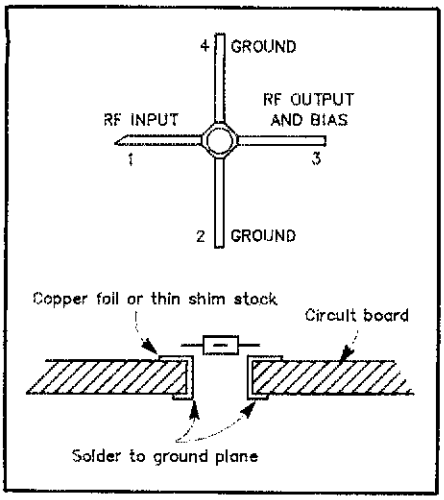


Fig 6—Mounting details for the MSA-0835.

One side is etched; the other is unetched and acts as a ground plane. The material I used is made by Taconics Plastics, Ltd, Petersburg, NY 12138, and the part number is TLX-9-0310-R5/R5. The filter requires that dimensional tolerances of ±0.001 inch or better be maintained in the fabrication of the board. (Close construction tolerances are essential for microwave filters that require no adjustments.) Because of the critical tolerances necessary and the many variables involved in the *QST* printing process, an etching pattern is not included in this article. If you are interested in making your own board, send an SASE to the ARRL Technical Department for a dimensioned copy of the artwork.[11] Or, if you wish, you can purchase an etched board from Down East Microwave.[12]

Part placement is shown in Fig 4. All components mount on the etched side of the board, and construction is conventional for microwave circuits. Additional details may be seen in Fig 5.

Brass sides enclose the board to support the SMA connectors and provide continuity between the grounds on the top and bottom of the board. The sides are made from strips of 0.032-inch-thick, ¼-inch-wide copper or brass shim stock available at hobby stores. The perimeter of the inside walls is soldered to the top and bottom of the board. This provides a ground connection to the component side in several places, as well as a ground for the connectors.

Additional grounding is needed for the MSA-0835. Cut a hole in the board as shown in Fig 6, and wrap copper foil through the hole to connect grounds on the top and bottom of the board. Then solder the foil on both sides.

Both ends of the filter elements must be grounded. The ends of the elements along the edge of the board are grounded simply by soldering them to the vertical board edge strips, which must also be soldered on the bottom. The ends of the elements toward the center of the board are grounded by making a straight scissor cut as indicated by the arrows, and inserting a strip of thin copper shim stock the full length of the slit. Then solder the shim stock to the PC-board copper on both sides of the slit, on the top and bottom of the board.

Additional copper foil is used to make a bridge between the 1296-MHz IF connector and the mixer. Cut the foil to 0.08-inch wide and solder one end to the printed trace from the IF connector. Then bend the foil into an arch over the printed mixer ring and solder it to the pad leading to the 18-pF coupling capacitor.

Completing Your 5760-MHz Station

In addition to the transverter and LO boards, you'll need an IF radio and antenna. There are two convenient approaches to the IF rig:

- Use a 1296-MHz multimode transceiver (ICOM, Kenwood and Yaesu make suitable radios).
- Build a 1296-MHz no-tune transverter board[13] to use as a first IF, and use a 2-meter multimode radio as the IF transceiver.

In either case, it's worth a look at Zack (KH6CP) Lau's transverter control circuit described in August 1988 *QEX*.[14]

Selecting an antenna for 5760 MHz is easy: Nothing matches the performance of a small dish. I've had good success with a 19-inch dish that mounts easily on a small camera tripod. It shows a 10-degree beamwidth and about 25 dB gain with a simple feed. Don Hilliard, WØPW,[15] and Tom Hill, WA3RMX,[16] have presented some excellent antenna ideas for 5760 MHz.

Conclusion

This transverter board, used with the no-tune 2232-MHz LO, provides a straightforward approach to a transceive system on the 5760-MHz band. Although it's not as attractive as the previously described transverters for 902 through 3456 MHz in terms of output level, noise figure and the use of a 144-MHz IF, it is by far the simplest board in the family. Construction of a high-performance transceive system should be relatively easy for an experimenter ready to move up to the 5760-MHz band.

Acknowledgments

I thank Tony Bickel, K5PJR, Merle Cox, W7YOZ, and Jim Davey, WA8NLC, for inspiration and encouragement, and Mark Schreiner, NK8Q, Dave Erickson, N9JBI, and Jim Berner, K8OSF, for help in evaluating the prototype 5760-MHz transverters.

Notes

[1]R. Campbell and D. Hilliard, "A Single Board 900 MHz Transverter with Printed Bandpass Filters," *Proceedings of Microwave Update '89*, pp 1-8. This book is available from ARRL for $12 (plus $2.50 postage and handling, or $3.50 for insured parcel post or UPS), or from your local dealer.

[2]R. Campbell, "A Single Board No-Tuning 23 cm Transverter," *Proceedings of the 23rd Conference of the Central States VHF Society*, pp 44-52. This book is available from ARRL for $12 (plus $2.50 postage and handling, or $3.50 for insured parcel post or UPS) or from your local dealer.

[3]J. Davey, "A No-Tune Transverter for 3456 MHz," *QST*, Jun 1989, pp 21-26.

[4]J. Davey, "No-Tune Transverter for 2304 MHz," *Proceedings of Microwave Update '89* (ARRL, 1989), pp 30-34. See note 1 for ordering information.

[5]See note 3.

[6]Copies of this article are available from the ARRL Technical Department Secretary for $2 and an SASE.

[7]A. Ward, "Simple Low-Noise Microwave Preamplifiers," *QST*, May 1989, pp 31-36, 75.

[8]Contact Avantek, 3175 Bowers Ave, Santa Clara, CA 95054, tel 408-727-0700, for the name of your local dealer.

[9]R. Campbell, "A Clean, Low-Cost Microwave Local Oscillator," *QST*, Jul 1989, pp 15-21.

[10]G. Beebe, "Analysis of a Class of Microstrip Bandpass Filters," MSEE thesis, Michigan Technological University, February 1988.

[11]Send a no. 10 SASE to the ARRL Technical Department Secretary; request the October 1990 *QST* 5760-MHz transverter template.

[12]Etched circuit boards, parts kits and assembled and tested circuit boards for this project are available from SHF Systems through Down East Microwave, Box 2310, RR 1, Troy, ME 04987, tel 207-948-3741. Circuit boards for the other transverters and the no-tune 2232-MHz LO referred to in the text are available from the same source.

[13]See note 12. Also see Z. Lau, "Product Review: SHF Systems 1240K 1296-MHz Transverter Kit," Feb 1990 *QST*, pp 33-34.

[14]Z. Lau, "A VHF/UHF/Microwave Transverter IF Switch," *QEX*, Aug 1988, pp 3-4.

[15]D. Hilliard, "Antenna Ideas For 3.5, 5.8, and 10.4 GHz," *QEX*, Jan 1988, pp 3-5.

[16]T. Hill, "A Triband Microwave Dish Feed," *QST*, Aug 1990, pp 23-27.

Rick Campbell, KK7B, earned a BS in physics from Seattle Pacific University in 1975, an MSEE from the University of Washington in 1981 and a PhD from the University of Washington in 1984. He is a faculty member at Michigan Technological University in Houghton, Michigan. His research specialty is microwave propagation and scattering in random media, and he teaches electromagnetics and wave propagation courses. Rick was first licensed as WN8VAZ in 1966 and is currently active on SSB and CW on the bands from 144 through 5760 MHz from grid square EN57 in Michigan's upper peninsula. Between VHF contests, he enjoys windsurfing, skiing and playing bluegrass fiddle.

Feedback

☐ Several builders of the transverter described in "A No-Tune Transverter for 3456 MHz," *QST*, June 1989, pp 21-26, have experienced a problem with stability in the receiver and LO amplifier. Substituting 1-pF coupling capacitors for C4 and C19-C21, inclusive, will generally cure the problem. Boards for the transverter are still available from me or Down East Microwave. Please note that my mailing address is now 340 Claire Lane, Cary, IL 60013—*Jim Davey, WA8NLC*

Parasitics Revisited—*Part 2*†

Before adding AG6K's latest parasitic suppressors for a complete cure, you may need to repair a blasted tuning capacitor or band switch.

By Richard L. Measures, AG6K
6455 La Cumbre Rd
Somis, CA 93066

Part 1 of this article reviewed the mechanism of VHF parasitic oscillation and showed how VHF parasitics damage amplifier tubes. In this article, the second of two parts, I'll describe parasitic-oscillation damage to tuning capacitors and band switches, and how to repair it; and how to build and install better parasitic-suppression networks than those I described in October 1988 *QST*.[6]

Band-Switch and Tuning-Capacitor Damage

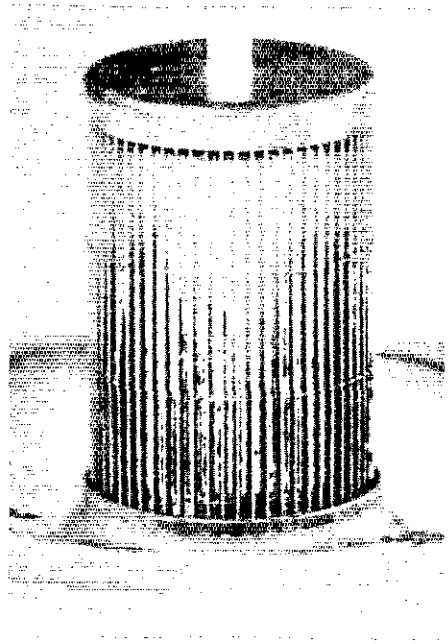
VHF-parasitic-oscillation damage to band switches and tuning capacitors is the result of high VHF voltage in the amplifier anode circuit. This causes arcing, which *melts* and/or *burns* switch and capacitor materials. Fig 6 shows band-switch sections removed from commercial amplifiers that sustained VHF parasitic oscillations.

Band-switch damage can occur in two forms:

1. Band-switch contacts burned so badly by VHF energy that they no longer make contact. In some cases, the contacts may be *missing* because the arcing vaporized them! The fix: Drill out the rivets and replace the burned contacts, or replace the defective switch wafer—*after* installing better (lower-VHF-Q) parasitic-oscillation suppressors, cathode-circuit protection and an HV fuse resistor in the amplifier.

2. Conductive material deposited by the arc on the surface of the band-switch's ceramic insulation. Even if better parasitic suppression is successfully applied to the amplifier, this problem must be corrected because such conductive paths can arc during normal amplifier operation.

When the arc vaporizes and burns band-switch contacts, carbon black and gasified metal are deposited on the switch's (usually) ceramic insulation, which is indirectly heated by the arc. These conductive substances stick to the ceramic like glaze on pottery. Cooled, the glazed-on carbon and metal are difficult to remove.



Title photo: The grid cage and cathode structure of an 8874 amplifier tube. VHF parasitic oscillation removed most of this grid's gold plating and sputtered some of it onto the cathode, poisoning the cathode and impairing the tube's performance. The grid cage is approximately 13/32 inch in diameter. *(tube courtesy of Rus Healy, NJ2L)*

The fix: If you know where the band switch arced, and minimal arcing occurred, you may be able to remove the metal particles with 400-grit wet or dry silicon-carbide abrasive paper, applied under dripping water. Polish and dry the ceramic, and coat it with suitable HV-insulating paint to reduce the possibility of the arc recurring at the original site. Frequently, however, the only fix for compromised band-switch insulation—especially if the arc has been allowed to continue for some time—is to replace the switch wafer concerned. (Don't discard the damaged wafer! You can salvage its undamaged contacts and use them to replace damaged contacts on band-switch wafers that don't have arc-contaminated ceramic.)

Tuning-capacitor problems. VHF-parasitic-voltage-related arcing can pit, blister, and even partially melt the metal plates of an air-dielectric variable capacitor. The resulting surface roughness reduces the capacitor's working-voltage rating. If the arcing was severe and occurred for a long time, the pitted plates may arc when normal MF/HF voltage is applied. Fortunately, unlike the damage caused by arcing in delicate band switches, this problem is easy to fix.

Insert a thin, flat file between the capacitor's plates. File them smooth and round their sharp edges, taking care to collect and discard the filings. Realign any bent plates with long-nose pliers; the air gap between all surfaces on the adjacent plates of the fully meshed capacitor must be equal. Don't worry if part of a plate has been destroyed: Tuning capacitors function well even when a corner of a plate has been completely burned away by the parasitic.

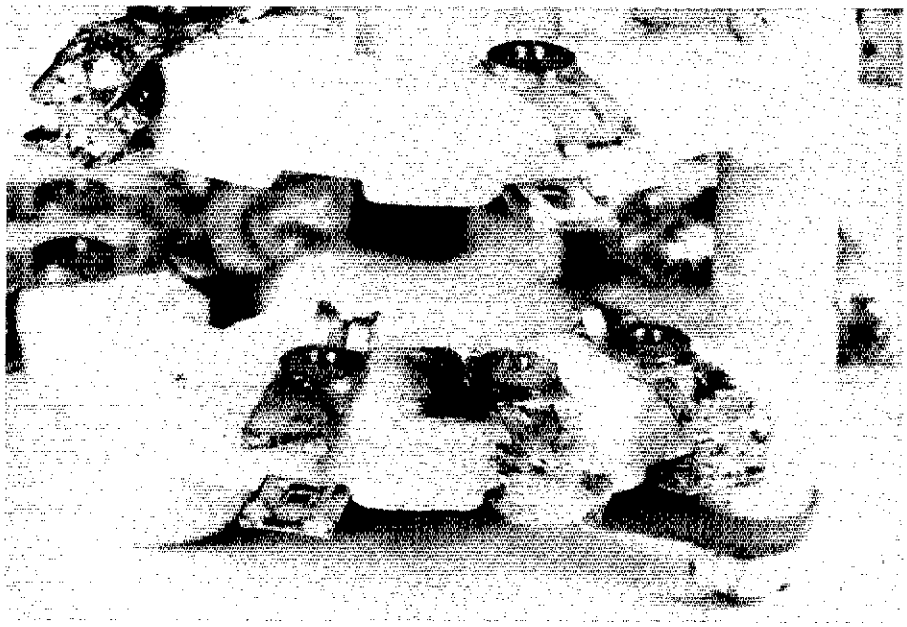
Do not repair a parasitic-damaged capacitor before you rid the amplifier of parasitics. A parasitic-oscillation arc occurs in or across the anode-circuit component with the lowest breakdown voltage. With luck, that component will be the tuning capacitor; I say "with luck" because tuning capacitors are easily repaired. If, however, you increase the tuning capacitor's breakdown rating by judicious filing and plate realignment but do *not* cure the amplifier's parasitics, the next parasitic oscillation may arc *at the output-network band switch instead*—with unpleasant and uncheap results. Replacing all or part of a band switch can ruin the better part of a Saturday morning or radio contest!

Stopping Parasitic Oscillations at the Source

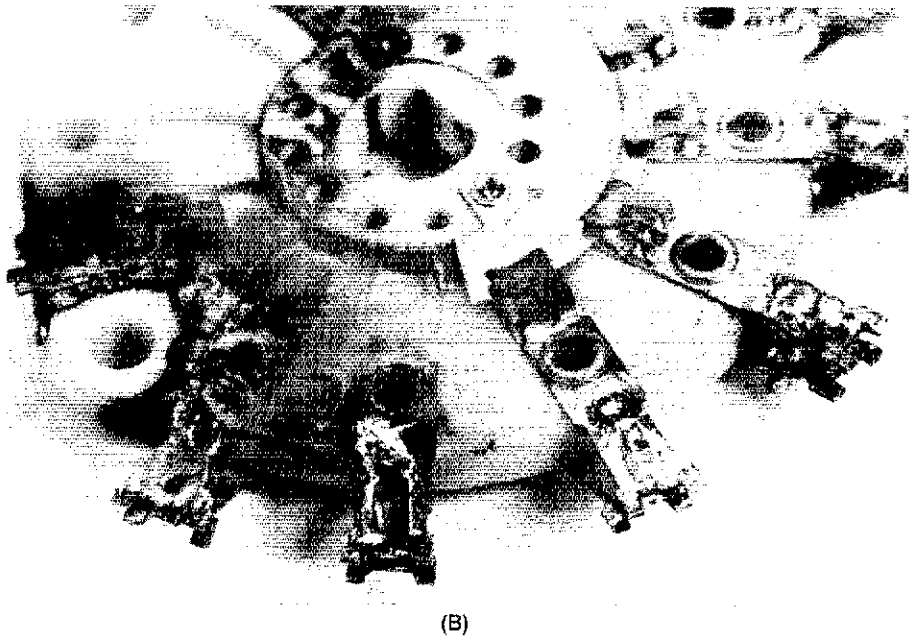
A parasitic suppressor reduces the Q of the amplifier's anode VHF parallel self-resonance, lowering the amplifier tube's load resistance at VHF. This swamps circulating current at the VHF-self-resonance frequency and—*if the suppressor is successful*—reduces the tube's VHF gain enough to keep it from oscillating at VHF.

†Part 1 of this article appeared in *QST*, Sep 1990, p 15-18.

[6]Notes appear on p 35.



(A)



(B)

Fig 6—VHF-parasitic arcing damaged these output-network band switches. A is from a Kenwood TL-922 amplifier; B is from an Amp Supply Co LK-500. Both suffer from vaporized contacts and metal contamination of their ceramic insulation. This damage was *not* caused by operating the amplifiers' band switches while transmitting!

Classical amplifier designs use copper strap, often silver-plated, between the amplifier-tube anode cap and associated components. Such conductors *support* high-Q VHF anode resonances. Coiling the strap into a few turns and connecting a carbon-composition resistor across the coil—the standard approach to VHF-parasitic-oscillation suppression in classical amplifier designs—does not appreciably lower the circuit's VHF Q because of the excellent VHF conductivity of the strap.

In the October 1988 article, I described how to construct parasitic-suppression networks that consist of *lossy, low-Q* inductances paralleled by low-value metal-film resistors. These worked better than the classical suppressors they replaced. Since the October 1988 article was published, I have learned how to build even better parasitic suppressors that are easier to make than their predecessors.

Better Parasitic Suppressors

If room in the amplifier box allows its installation, a **U** or *hairpin* inductor (Fig 7) offers some advantages over a conventional coil for use as the suppressor inductor: A **U** affords less inductive coupling with its associated suppressor resistor, and the **U**'s inductance can be adjusted without desoldering and adding or removing turns. This latter feature is useful if, for example, the suppressor inductance must be decreased slightly to reduce suppressor-resistor dissipation at 28 MHz.[7] The inductance is lowered by squeezing together, or increased by spreading, the two sides of the **U**.[8]

A metal-film resistor mounted coaxially within a solenoidal inductor tends to couple magnetically to the inductor. This is undesirable in a low-Q parasitic-suppression network because the two magnetically-coupled inductances tend to act as one inductance and sharpen the response—*raise* the Q—of the network. Two inductances—in this case, the suppressor inductance and its associated metal-film resistor—that are *not* magnetically coupled are more likely to support multiple resonances. This lowers the Q of the LR network and broadens its

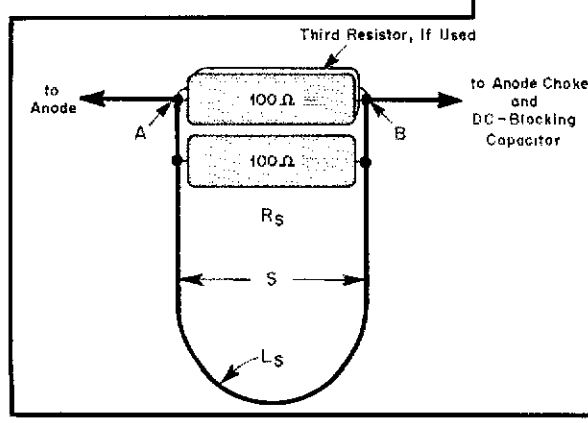


Fig 7—A **U**-inductor suppressor. The network inductor, L_S, consists of a single loop of no. 18 nichrome-60 wire; the network resistor, R_S, consists of two or three 100-Ω, 2-W metal-film resistors soldered across the **U**. For typical 3-500Z amplifiers, the wire length between A and B is ≈3.5 inches, producing an L_S of ≈60 nH; for lower-voltage amplifier tubes, you can increase A-B to 4 inches for an L_S of ≈80 nH. The maximum spacing between the inductor sides (S) is set by the length of the resistors that make up R_S. Decreasing S (by squeezing the sides of the **U**) lowers the inductance of L_S; in some amplifiers, this may be necessary to reduce the amount of energy dissipated by the network when the amplifier is used at 10 meters. (It is *normal* for an effective VHF-parasitic suppressor to get hot during 10-meter operation because this band is closest to the parasitic-oscillation frequency.)

frequency response—just what's required in a low-Q VHF-parasitic-suppression network.[9] A U-shaped suppressor inductor encourages this decoupling.[10]

In summary, the two current paths in a low-Q, LR VHF-parasitic-oscillation suppressor should be magnetically isolated. The Q of each path should be as low as possible without causing the suppressor to melt down at 28 MHz, and the inductance in one path should differ slightly from that in the other.

The lower-inductance current path is usually that through the suppressor resistance (R_S). In an LR suppressor constructed for a 3-500Z, the inductance of R_S is roughly 20 nH if the resistor is installed with nearly zero lead length, while the suppressor inductor, L_S, exhibits an inductance of 60 to 80 nH.

Applying almost any component involves trade-offs and caveats, and U-inductor suppressors are no exception. In multitube amplifiers, U inductors present a potential but avoidable problem: If the inductors are positioned so that they couple (positioning them in the same plane may support this) or talk to each other, they may encourage a *push-pull* parasitic oscillation (three symptoms of which are very high anode current and dissipation, but no arcing). This problem can be avoided by positioning the U inductors so that they are not in the same plane. (Ideally, the planes of adjacent U inductors should be at 90° to each other. This can be accomplished by rotating the plane of one U 45° to the left and rotating the plane of the adjacent U 45° to the right.) In amplifiers with three or more tubes, positioning U-inductor suppressors for minimum intersuppressor coupling may require considerable experimentation.

Solving Stubborn Cases

I have come across some amplifiers that cannot be cured of occasional parasitic oscillations by the use of a single parasitic suppressor, even if the suppressor is of an improved design with a low VHF Q. One common reason for such persistent parasitics is that, in some amplifiers, the suppressor may make up less than half of the total conductor length in the anode circuit. If most of the anode-circuit conductor has a high VHF Q, the overall Q will be higher than optimum for parasitic suppression even if a lowest-possible-Q suppressor is used. In such amplifiers, the high-VHF-Q anode conductors must be replaced with low-VHF-Q conductors. To do this, replace the anode circuit's copper straps and bus wires with two magnetically decoupled wire conductors made from a low-Q material, such as nichrome wire (Fig 8). (Although nichrome ribbon is prettier to look at than nichrome wire, don't substitute nichrome ribbon for wire in this application unless the wire overheats at 28 MHz. Nichrome wire is generally preferable to nichrome ribbon because skin effect causes round conductors to exhibit more VHF resistance and lower VHF Q than ribbon conductors of the same cross-sectional area.)

To create the desired double-resonance effect, make one of the wires as short as possible (usually straight) and the other slightly longer. Take up the slack in the longer wire by forming it into ¼-inch-ID, 1- or 2-turn coils. Use more than one coil for long runs. If most of the magnetic field around each inductor is at right angles to the magnetic field around the straight wire, the desired double-resonance/Q-lowering effect will be realized. To accomplish this, make the axis of the coils *parallel to that of the straight conductor.*

Although nichrome works well for constructing low-VHF-Q suppressors, a nichrome alloy—one containing a small amount of iron—is available that produces a lower-VHF-Q suppressor than the ordinary 80%-nickel/20%-chromium alloy.[11]

The Effect of Tube Gain

A major factor affecting the stability of an individual MF/HF amplifier is the VHF gain of the particular tube, or tubes, in the amplifier. There appears to be some tube-to-tube VHF-gain variation, even among those bearing similar manufacturing-date codes. I know of several cases where an amplifier was quite well behaved until a different, and not necessarily new, amplifier tube was installed. For example, two commercial 8877 amplifiers had played well for years, each with its original tube. When a new tube from a factory-sealed box was tested, each amplifier sustained a major—as in *big bang*—VHF parasitic oscillation. In both cases, the new tube was *destroyed.* Another new tube was tried in one of these amplifiers. The second new tube met the same fate as the first replacement.

VHF Input Loading: Another Weapon Against VHF Parasitics

Another method of reducing a tube's VHF gain is to provide a low-VHF-resistance path to chassis ground at the cathode terminal(s) on the tube socket. This swamps the VHF signal fed back from anode to cathode via the tube's internal capacitance. A practical parasitic suppressor of this type consists of a metal-film resistor in series with a small-value capacitor. (Typical values are 25 pF and 1 to 10 Ω.) The object is to find a value of capacitance that resonates with the tube's inductive input reactance at the parasitic frequency. When this is done, the series-resonant circuit consisting of the tube inductance and added capacitance looks like a low resistance and routes the VHF-feedback energy to ground through the metal-film resistor. (The resistive component is essential for another reason: A capacitor, used alone, may exhibit a high-VHF-Q self-resonance that might aggravate the parasitic problem. The resistor lowers ["kills"] the Q of the capacitor's self-resonance.)

This VHF input-swamping technique is especially useful with tubes such as the 3CX1200A7 and 3-1000Z, which exhibit about four times more plate-to-cathode feedback capacitance than other tubes of similar power capability. For these tubes, one RC network consisting of a 10-Ω resistor in series with a 25-pF capacitor, between each filament terminal and the chassis, seems to work well. Since this

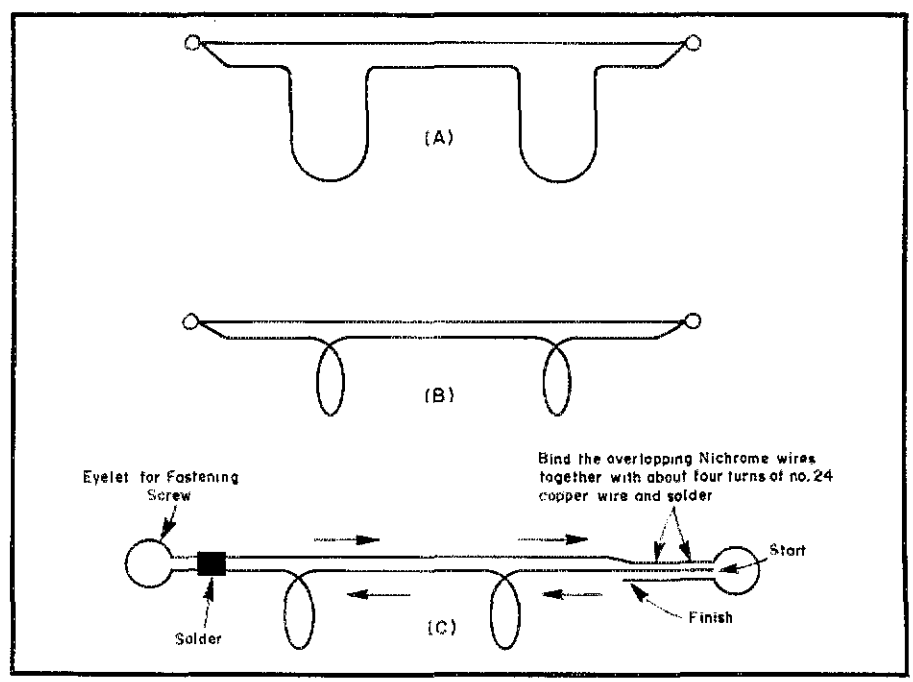


Fig 8—Killing stubborn VHF parasitics may require the substitution of low-VHF-Q conductors for an anode circuit's high-Q straps. Paralleled straight and inductively loaded nichrome-60-wire runs are one answer. The loading inductors can take the form of Us (A) or single-circular-turn coils (shown in side view, at B, as loops). C shows a method of constructing such a low-VHF-Q conductor from a single length of nichrome-60 wire.

effectively adds about 50 pF to the output capacitance of an amplifier's input π network, you may need to compensate for the presence of the suppression network by reducing the capacitance contributed by the network's stock output capacitor(s) at the upper high frequencies. Alternatively, increase the affected network's input capacitance by about 50 pF and adjust the network inductor for less inductance (and a good input SWR). Because this latter approach slightly increases the input-network Q, it usually results in a lower 10-meter input SWR than the amplifier originally exhibited.

Because the inductance resonated by the cathode-to-ground RC network is internal to the tube, the frequency of the series resonance that occurs when the cathode-to-ground RC network is installed cannot be checked with a dip meter. Thus, there is no method of optimizing the RC-network lead lengths and values for optimum VHF input loading other than to make an educated guess followed by trial and error.

I strongly recommend protecting the tube with a grid-fuse resistor during the trial-and-error period. In amplifiers that do not ground the grid directly via a spring-finger collet, connect the fuse resistor—typically, a 24- to 30-Ω, ½-W unit—from one grid pin to chassis ground. Be sure the resistor is sufficiently bypassed for RF to keep it from dissipating too much power at the amplifier operating frequency. In a typical 3-500Z amplifier, the bypass capacitance should be at least 0.0018 μF; larger tubes, such as the 3-1000Z or 3CX1200A7, require at least 0.0027 μF because these tubes' higher C_{AG} causes more output-network circulating current to flow through the grid to ground than is the case with lower-capacitance tubes.

In amplifiers that use a grid-grounding spring-finger collet, install the grid-fuse resistor between the grid-current-meter shunt resistor and chassis ground. (This case also requires a different cathode-overvoltage clamper than discussed in Part 1 [and Fig 5] of this article: Replace the series-connected 3-A diodes shown in Fig 5 with a 50-V ac MOV surge suppressor capable of carrying several thousand amperes—a less-than-two-dollar part even at single-unit prices.)

Tracking Parasitic Oscillations

VHF parasitic oscillations are difficult to document. "Sniffing" the amplifier anode circuit with a spectrum analyzer may show the parasitic—*if* the oscillation persists long enough to be picked up by the analyzer's sweep. A VHF-capable oscilloscope—preferably one capable of capturing and storing input signals—and sniffer probe *may* be able to indicate the presence of the parasitic, but it's difficult to make reliable frequency determinations with an instrument intended to display amplitude v time.

Of course, the resonant circuit that supports the parasitic is very likely to still be there when the amplifier is unpowered and unplugged, and a dip meter can reveal its resonant frequency. If you want to measure the resonant frequency of the amplifier-box cavity, all of its covers must be in place, with all of their fastening screws moderately tightened. You can couple the dip meter to the cavity via a small continuous loop of wire passed through the box's ventilation holes.

If you would like to observe the effect of installing different parasitic suppressors, check the stock anode circuit's VHF resonance before making any modifications. Couple the dip meter to the conductor between the anode connection and the output-network tuning capacitor; a spot *near* the tuning capacitor will probably provide the best indication. The anode circuit usually resonates between 65 MHz (large amplifiers) and 170 MHz (small amplifiers using a single UHF-rated tube).

In many unmodified amplifiers, the VHF anode-circuit dip is so sharp that it "sucks out"—stops—the dip-meter oscillator.[12] This indicates that the anode circuit has a very high VHF Q—not good news unless you happen to *need* a combination self-excited VHF oscillator/mini-lightning-bolt generator/tube destroyer!

After installing low-VHF-Q parasitic suppressors, recheck the dip. Usually, its frequency will not have changed appreciably, but the dip should now be smooth and broad, allowing closer dip-meter coupling without suckout. If you observe this, you have substantially reduced the VHF Q of the amplifier's anode circuit, and the amplifier should be much more stable—even at MF/HF.

Better stability directly relates to the fact that many amplifier users observe that their amplifiers tune up more smoothly and predictably after low-VHF-Q parasitic suppressors have been installed. This was the case with my Heathkit® SB-220. In its stock configuration, a disconcerting double output-power peak occurred as I tuned the amplifier on the 40-meter band. Would the real peak please stand up! For years, I was puzzled about this, and by the occasional minor arcing in its output circuitry. After I installed better—that is, low-VHF-Q—parasitic suppressors, the extra dip vanished, along with the arcing. Another example: Drake L-4B amplifiers frequently exhibit a tune-up vagary on 15 meters; this anomaly goes away after better suppressors are installed.

Summary

VHF parasitic oscillations capable of destroying expensive components are common in high-power, vacuum-tube-based MF/HF amplifiers. Although I know of no esoteric or magic amplifier layout technique for eliminating VHF resonances in MF/HF-amplifier circuitry, the ability of such resonances to support VHF parasitic oscillations can be reduced enough by simple circuit modifications that VHF parasitics do not occur. Only a dip meter is required to determine whether or not a given parasitic-reduction campaign is on the right track, and simple protective circuitry can be added to an amplifier to ensure the safety of amplifier tubes and other expensive components during the anti-parasitic R and D process. I hope that my description of these techniques will help you rid your amplifier of VHF parasitics once and for all.

Notes

[6]R. Measures, "Improved Anode Parasitic Suppression for Modern Amplifier Tubes," *QST*, Oct 1988, pp 36-38, 66 and 89.

[7]See R. Measures, "Calculating Power Dissipation in Parasitic-Suppressor Resistors," *QST*, Mar 1989, pp 25-28.

[8]Although this seems counterintuitive, reducing the space between the U's sides is not the same as reducing the interturn spacing of a multiturn coil. At any given instant, current flow through the U's strap is uniform and unidirectional. Because the strap is bent back on itself, one side's current flow (and hence, its magnetic field) *opposes* that of the other side. Opposite fields tend to cancel; reducing the space between the U's sides increases this cancellation. The net effect is that the U's inductance decreases as its sides are brought closer together.—*Ed.*

[9]This principle can be used to make a broadband 75/80-meter dipole: One ½-λ dipole, cut for 3900 kHz, is connected to the feed point of another ½-λ dipole cut for 3600 kHz. The dipoles are oriented so that they are 90° apart, such as north-south and east-west. The result is a low SWR across the entire band. If the 90° separation is reduced, the inductive decoupling afforded by the dipoles' perpendicularity is reduced, and the composite antenna's SWR bandwidth decreases.

[10]U-inductor suppressors may have another advantage: They appear to couple to the RF-deck cavity better than a solenoidal inductor. Suppressor-to-cavity coupling resistively loads the cavity and damps its ability to ring (and support oscillation) at RF. (Some commercial amplifiers accomplish this by placing a resistively loaded VHF antenna in the cavity. This appears to work well if the loading antenna is cut for the frequency at which the parasitic would oscillate if the cavity were unloaded.)

[11]Although some of the available literature suggests that iron should not have much effect at VHF, tests on a Boonton Q meter indicate a Q decrease of about 20% at 50 MHz (the upper limit of the instrument) for the nickel-chromium-iron alloy.

[12]Dip meters dip because the resonant circuit under test absorbs energy from the oscillating dip-meter circuit. Coupling the dip meter too closely to the circuit under test—that is, allowing the circuit under test to absorb too much energy from the dip-meter oscillator—can stop the oscillator or unnecessarily broaden the dip. If this happens, back the dip meter away from the circuit under test until the meter oscillates throughout the dip *and* the indicated resonant frequency is the same regardless of which way you tune the meter through the dip. ARRL

Feedback

☐ Ray Bintliff reports these corrections to "Antenna Switchers—Part 1" (*QST*, June 1990, pp 31-36): In Fig 6, K4B is identified incorrectly as K3B. Also in Fig 6, the armature of K3C is shown in the energized position; it should be shown in the normally closed position. In the parts list for Fig 6, the Radio Shack® part number for S1-S5 is listed incorrectly as 275-768; the correct part number is 275-678. (This also applies to the illuminated switches called out in the parts lists for Figs 10 and 14 in part 2 of the article [*QST*, July 1990, pp 21-27]).—*AK7M*

More "QRP" EME on 144 MHz

You're on 2-meter CW, but you still haven't tried moonbounce? Almost anyone can do it—here's what one small station has accomplished recently.

By Ray Soifer, W2RS
60 Waldron Ave
Glen Rock, NJ 07452

In February 1989 *QST*,[1] I described how I had made 23 two-way 144-MHz EME (earth-moon-earth) contacts with eight different stations. My station consisted of a solid-state, 160-W amplifier; a GaAsFET receiving preamp; and a single, 19-element, 3.2-λ-boom Yagi. The station's effective isotropic radiated power (EIRP) was 5 kW (37 dBW). Three factors were found to be important in enabling these contacts to be made with an EIRP well below what had generally been thought to be required for successful EME work. The first was ground-reflection gain, which resulted in improvements of 3 to 5 dB at appropriate elevation angles. Second, libration-induced fading enhancements, which briefly increased signal strength by as much as 7 to 10 dB, were a help. Perhaps most important was good old-fashioned operator persistence, which eventually allowed these favorable conditions to play their parts—despite the many negative factors, such as Faraday rotation and man-made noise, that work against EMEers.

The response to my article, and to the one by Dave Blaschke, W5UN,[2] was most gratifying. Not only did Dave and I hear from readers around the world who were motivated to try EME for the first time, but many of these hams tried it and succeeded! One such ham was Gary Kohtala, HL9TG, who put Korea "on the moon" for the first time with 80 watts and a single Yagi, and worked W5UN, KB8RQ, N5BLZ and VE7BQH. During 1989 and 1990, many expeditions to other rare and semirare DX locations took along 144-MHz EME equipment—often not much more than what I have been using from home—and came away with at least a handful of QSOs. And, having gotten their feet wet in EME this way, a number of one-time "QRP" EME operators have begun building serious EME stations (typically 1.5 kW output with four long Yagis—an arrangement that can produce 200-250 kW EIRP—and azimuth/elevation rotation capability), with which it is currently possible to work hundreds of stations throughout the world on 2-meter EME.

Superstations—and Small Stations, Too

So far, I've logged 43 EME QSOs with 16 different stations, including (in chronological order) W5UN, KB8RQ, VE7BQH, SM7BAE, N5BLZ, W4ZD, K1WHS, DL8DAT, KI3W, I2FAK, OK1MS, WB2JHG, HB9CRQ, SM2CEW, SM5FRH and K2GAL. Contacts made during 1989-90 are listed in Table 1, in a similar format and using the same definitions as my earlier article. Most of the antenna-gain estimates for this article were taken from a recent paper by Lionel Edwards, VE7BQH, in the *2-Meter EME News*[3] and vary slightly from those in February 1989 *QST*; the estimate for W5UN's 48-Yagi array came from Dave himself, and, using the best available sources, I estimated the gains of those antennas not covered by VE7BQH.

Most of the contacts described in my February 1989 article were with "superstations," with all but two using 16 or more long Yagis; the exceptions were N5BLZ, with 12 4.7-λ Yagis, and VE7BQH, with a 224-element collinear array rotatable in polarization as well as azimuth and elevation. Indeed, the existence of these superstations—and the ability of very modest stations to work them—was one of the points I wanted to make in my first article.

Since then, my objective has been to push the limits: to work smaller stations than I had been able to work before, to find out how small a station I could work and to learn what I could in the process. Also, before W5UN's array was destroyed by a tornado last spring (he has since rebuilt his array), he and I had been working with progressively weaker signals, including two SSB QSOs!

Working Eight-Yagi Stations

Of the eight stations I worked for the first time during 1989-90, three—I2FAK, OK1MS and HB9CRQ—were equipped with eight-antenna arrays with individual boom lengths ranging from 3.6 to 4.8 λ. These contacts, together with the VE7BQH/W2RS QSO made in 1987 (Lionel's antenna then had gain comparable to an eight-Yagi array), have demonstrated that a station with approximately 24 to 25 dBi (22 to 23 dBd) gain, of which there are several dozen currently active, can work a station such as mine—not as a one-time fluke, but through persistent application of the techniques discussed in my 1989 article. Theoretical signal-to-noise ratios of −6 to −8 dB in a 100-Hz bandwidth[4] were overcome by ground gain, libration enhancement and operator tenacity on both ends.

Four-Antenna Stations

Having proven that it is possible for a 150-W, one-Yagi station to work an eight-Yagi station, the next logical step was to try working a station with only four antennas. As I mentioned in my first article, "Scotty" Scott, KI3W, had heard my lunar echoes on several occasions with his array of four 4.2-λ Yagis (approximately 21.9 dBi gain) during my schedules with other stations, and we had always been anxious to see if we could work each other.

Because Scotty and I are located only about 125 miles apart, we can easily hear each other via tropo, and evolved a simple system for EME scheduling: If I could hear good lunar echoes from Scotty during his frequent tests and random CQ calls, I would call him on tropo and let him know. Then, we would switch to EME sequences. (EME echoes may easily be differentiated from terrestrial signals by the time delay, averaging about 2.6 seconds, and the Doppler shift, typically 300 Hz at 144 MHz during moonrise and moonset.)

Once we began trying, it turned out to be rather easy for us to work via EME—not once, but three times. In addition, one evening I heard strong lunar echoes from Mark Adams, WB2JHG, who was using an array with slightly less gain than Scotty's antenna (see Table 1). I called Mark on EME and we worked easily on the first attempt. Hank Kasper, K2GAL, also worked me on the first try with his four home-brew 6.2-λ Yagis (approximately 23.3 dBi), making five QSOs in all with three 4-Yagi stations. Thus, I found that a low-power, single-Yagi station *can* work not

[1]Notes appear on p 38.

only superstations, but also typical EME/tropo stations.

Mutual Ground Gain

The contacts with KI3W, WB2JHG and K2GAL made use of ground-reflection gain at both ends of the paths, an unusual condition requiring the moon to be simultaneously near the horizon for both stations. Up to about 10 dB total gain may be added to the circuit in this way (half at each end of the circuit), which is believed to account for the results we had. Mutual ground gain was also present during several of my other contacts, as noted in my 1989 *QST* article.

Considering path geometries, however, mutual ground gain is not available for contacts with the majority of stations. Hence, I do not believe it to be possible—at this time—for a station as small as mine to work 4-Yagi stations consistently unless their locations are such that mutual ground gain is present.[5]

A Six-Antenna Station Near the Arctic Circle

Peter Sundberg, SM2CEW, has long been one of the most active 144-MHz EMEers. From his QTH at Lulea, Sweden, about 50 miles south of the Arctic Circle, Peter has worked about 300 stations using his array of six 4.1-λ Yagis. The estimated gain of Peter's array (23.6 dBi) is about 0.5 dB less than those of OK1MS and VE7BQH, the smallest stations that I have worked so far without mutual ground gain. However, because of the difference in longitude, local moonrise for me occurs when the moon is near its highest elevation of the day at Peter's location, and mutual ground gain requires low moon elevations at both ends of the path.

On the 14-MHz EME net[6] one day, Peter suggested that, because his QTH is so far north, we might try to work using mutual ground gain during a time when the lunar declination is so negative (southerly) that the moon would never get very high in his sky. We tried it and succeeded on the third schedule, with lunar elevation of about 10° at both stations! As Peter observed, depending upon the specific path geometries involved, mutual ground gain may sometimes be available even though two stations are far apart on the earth's surface.

Two-Way SSB

As noted in my first article, I worked W5UN twice on CW during 1988 using only 50 W output to my 19-element Yagi. A third such contact was achieved in early 1989 (see Table 1). I wondered whether it would be possible to work Dave using two-way SSB.

Unlike CW, the average power output from an SSB transmitter is difficult to determine precisely. The only speech processing employed by my Kenwood TR-9000 transceiver is a rather conventional ALC circuit. Rough calculations indicate that the average power output during SSB transmissions is one-fourth to one-third that of key-down CW. My calculations assume a third—50 W—average output at the antenna; the actual figure is probably less. And, the receiver bandwidth is not 100 Hz (as on CW), but 2.1 kHz. The combination of lower average power and wider bandwidth meant that the S/N ratio Dave had to work with was approximately *18 dB* lower on SSB than with my 150 W output (at the antenna) on CW.

Table 1

Analysis of W2RS's 2-Meter EME Contacts in 1989-90

Station	Antenna	Estimated Ant Gain (dBi)	Calculated degradation (dB)	Predicted S/N Ratio (dB)	Comments
W5UN	48 × 4.7 λ	32.5	2.2	−4.2	Random, easy, 50 W output
W5UN			1.8	1.0	Random, easy, made SSB sked
W5UN			1.8	−17.0	2-way SSB
W5UN			3.1	−0.3	Random, easy, made SSB sked
W5UN			3.1	−18.3	2-way SSB
W5UN			2.4	0.4	Random on CW but SSB unsuccessful
W5UN			2.5	0.3	Random, easy
KI3W	4 × 4.2 λ	21.9	2.6	−10.5	Mutual ground gain
I2FAK	8 × 4.7 λ	25.0	1.8	−6.6	
W5UN			4.1	−1.3	Random on CW but SSB unsuccessful
OK1MS	8 × 3.6 λ	24.1	2.3	−8.0	
W5UN			1.4	1.4	Random, easy
WB2JHG	8 × 1.5 λ	21.6	2.5	−10.6	Mutual ground gain
HB9CRQ	8 × 4.8 λ	25.0	1.8	−6.6	Also copied by KI3W
KI3W			1.5	−9.4	Mutual ground gain, easy
SM2CEW	6 × 4.2 λ	23.6	2.2	−8.4	Mutual ground gain
SM5FRH	24 × 5.2 λ	29.7	1.5	−1.5	
KI3W			3.6	−11.5	Mutual ground gain
KB8RQ	24 × 4.8 λ	29.5	3.6	−3.9	Random
K2GAL	4 × 6.2 λ	23.3	3.7	−10.2	Mutual ground gain, easy

The Human Signal Processor

W5UN and I completed two SSB QSOs out of four attempts. The degradation present (per W5LUU's definition, discussed in my 1989 article) during the two SSB contacts was 1.8 dB and 3.1 dB, respectively, resulting in theoretically predicted S/N (signal-to-noise) ratios of −17.0 dB and −18.3 dB, respectively (assuming 50 W average power and a bandwidth of 2.1 kHz—see Table 1). How were contacts possible under such conditions?

We can assume that ground gain of about 5 dB at W2RS improved the −18 dB figure to about −13 dB. Some additional enhancement was also provided by libration fading. Given the rapid data rate inherent in voice communication, it may be possible to take advantage of the greater libration enhancements which exist for shorter periods of time; DL7QY has calculated that, of the 10-dB libration enhancement that's theoretically possible, actual enhancement is less than 7 dB 99% of the time and less than 4.5 dB 90% of the time.[7] However, even assuming libration enhancements of 7 to 10 dB, the predicted S/N would still fall in the −3- to −6-dB range in a 2.1-kHz bandwidth.

From these results, it seems that the highly sophisticated signal processor comprised of the human ear and brain must be able to act as an adaptive filter which reduces the necessary bandwidth of an SSB channel from 2.1 kHz to as little as 500 Hz, enabling voice signals to be understood. This finding is consistent with the early work done on narrow-band voice modulation.[8] Thus, the common assumption of an effective bandwidth of 2.1 kHz for SSB communications may not be strictly true in practice.

How About You?

It's clear from my experiences and other articles that have appeared in *QST* in recent years that we still have a lot to learn about EME communications. I hope that this continuing work helps to dispel the myth that high power and very large antennas are required in order to make EME contacts, and helps attract more participants to this challenging and fascinating facet of Amateur Radio. Should you wish to give EME a try, you can make schedules with some of the larger stations (listed in Table 2) which are, at this writing, active on 2-meter EME. Operators of these and other EME stations may be contacted on the 2-meter EME net.[9] Good luck!

Feedback

Since the publication of my earlier article, the following has come to my attention: The 90-watt, single-Yagi contest contact with W5UN which my earlier article had credited to K5WE was in fact made by WD5AGO. Apologies to all concerned.

A computer simulation showed that the

(continued on page 38)

New Books

TALK TO THE WORLD: CANADIAN AMATEUR RADIO LICENSING MANUAL

Edited by George Spencer, VE3AGS; Assistant Editor, Dana Shtun, VE3DSS. First Edition, 1990. Published by The Canadian Radio Relay League, Inc, The CRRL Bookshelf, PO Box 7009, Station E, London, ON N5Y 4J9, Canada. Softcover, 8-1/2 × 10-7/8 inches, 214 pages. $20 Canadian (plus postage).

Reviewed by Larry Wolfgang, WA3VIL, ARRL License Manuals Editor

Canada's Department of Communications (DOC) recently restructured the Canadian Amateur Service. Effective October 1, 1990, there will be a single Canadian Amateur Radio Operator's Certificate, with up to four qualification levels: Basic, Morse Code 5 WPM, Morse Code 12 WPM, and Advanced. The Basic qualification requires passing a written exam of technical knowledge and DOC radio regulations, but no Morse code exam. The Basic license will serve as an entry point into Canadian Amateur Radio.

In response to this change in the licensing structure, the Canadian Radio Relay League has developed a new licensing study guide. The CRRL based their effort on the highly successful *Tune in the World with Ham Radio* from ARRL. *Talk to the World* is not just a slightly modified version of *Tune in*, however: The text has been completely revised and updated to cover the Canadian license exam. Operating examples given in the text involve Canadian operators and activities, and most of the text concentrates on the material required for the Basic written exam. The book covers station assembly and serves as an operating guide for the beginning amateur. One chapter is devoted to the additional technical material required for the Advanced qualification, and another chapter covers techniques for learning Morse code.

A prospective Canadian amateur operator will need several items in addition to a copy of *Talk to the World*, and the book clearly points this out. After the Preface is a section entitled "About 'Talk to the World'" that explains, "the prospective amateur should obtain a copy of two Radio Information Circulars (RICs) from their office of DOC." These are RIC 24 and 25, which contain the current syllabus for the exams and extracts from the radio regulations used on the tests. The *CRRL Regulations Book* includes actual DOC questions about radio regulations, and a copy of the questions on technical material found in CRRL's *Canadian Advanced Question Bank*. (In Chapter 4, Understanding Basic Theory, you learn that there is a *CRRL Questions Book* for the Basic Level, too.) Armed with these publications, you'll be ready to begin your trek towards earning any Canadian Amateur Radio license you desire.

Using ARRL's *Tune in the World* as a basis, and drawing on other books in the ARRL License Manuals series for supplementary text, *Talk to the World* is organized in a fashion very similar to the ARRL books. The 13 chapter titles tell much about the organization and content of this study guide: Exploring Ham Radio, The Radio Spectrum: A Limited Resource, Radio Wave Propagation, Understanding Basic Theory, Circuit Components, Practical Circuits, Selecting Your Equipment, Choosing an Antenna, Putting it all Together, Operating Procedures, Interference Problems, Learning Your New Language (CW), and The Advanced Certificate. There are also five appendices: Helpful Data Tables, Metric Conversion, Schematic Symbols, Typical Block Diagrams, and an Index.

Each chapter begins with a list of key words. These are important terms that appear in the text for that chapter. Along with each word or term is a simple definition that will aid your study and understanding of the material presented in that chapter.

Lots of drawings and illustrations supplement the text. (Most of these are from ARRL's *Tune in* and License Manuals.) There are also numerous black and white photographs throughout the book. (The printed quality of most of the photos is a bit less than one might hope for, but they illustrate the points and show examples of various pieces of equipment just fine. Given the cost and production limitations that CRRL was under to put this book together, and for the intended purpose of the book, the photos are quite adequate.)

The final chapter of the book covers the additional technical material needed for the Advanced qualification. Detailed explanations of the component-level operation of several circuits are also included. The Advanced question bank includes these schematic diagrams, although I am uncertain what types of questions may be asked about them on an exam. The diagrams include such circuits as a simple crystal-detector receiver, a class-C frequency multiplier, a VHF amplifier, a simple CW transmitter, an audio-clipping circuit and a full-wave-rectifier power supply.

A number of questions with regard to the DOC's implementation of this new licensing structure appear to be unresolved as of late summer, 1990. The October implementation date, however, required the CRRL to publish their new licensing guide with the information available at that time. The actual Basic question bank had not yet been released, nor was there a revised bank for the Advanced exam.

Full details of the testing process were also not available when the book went to press. Chapter 2 tells us that the DOC has been using volunteer examiners for Morse code testing for some time. They have also experimented with a system of volunteer examiners for the written exams in some large urban areas. This volunteer system is expected to be expanded, with responsibility for nominating qualified examiners being given to radio club presidents. DOC is then expected to establish a certification process whereby Advanced Class amateurs will become volunteer examiners. Apparently DOC will continue to administer the exams at their offices at certain scheduled times.

Anyone who wants to become a licensed Canadian amateur should obtain a copy of *Talk to the World* and the other publications listed. This book provides the technical information needed to pass the exams, and will also assist the newly licensed ham in setting up a station and making those first on-the-air contacts. QST

More "QRP" EME on 144 MHz

(continued from page 37)

224-element collinear array that VE7BQH used to work me actually had approximately 0.8 dB less gain than we had initially thought, putting its actual gain at about 24.1 dBi. Also, a photo I saw of DL8DAT's old 16-Parabeam array caused me to revise my gain estimate for that antenna upward from 25.3 to 26.0 dBi; both Lionel (VE7BQH) and Manfred (DL8DAT) have since replaced these antennas with larger ones (see Table 2).

Table 2

Some Large 2-Meter EME Stations

Station	*Present Antenna*	*Estimated Gain (dBi)*
W5UN	48 × 5.0 λ	33.3
SM5FRH	24 × 5.2 λ	29.7
KB8RQ	24 × 4.8 λ	29.5
DL8DAT	16 × 4.8 λ	27.8
W4ZD	16 × 4.8 λ	27.8
N5BLZ	16 × 4.7 λ	27.8
K1WHS	24 × 2.2 λ	27.0
SM7BAE	16 × 3.1 λ	26.3
VE7BQH	336-el collinear	25.7

Notes

[1]R. Solfer, "'QRP' EME on 144 MHz," *QST*, Feb 1989, pp 28-32.

[2]D. Blaschke, "The Evolution of the Mighty Big Antenna," *QST*, Jan 1989, pp 15-19.

[3]L. Edwards, "2 Meter EME Antennas," 2-Meter EME News, no. 8, May 1990. This publication, edited by John Carter, KØIFL (PO Box 554, Union, MO 63084), is the successor to the now-defunct *2 Meter EME Bulletin.*

[4]See note 1.

[5]Nonetheless, were I to go back to the old Rhododendron Swamp VHF Society of the early 1960s and tell Sam Harris, W1FZJ (then-conductor of *QST*'s "The World Above 50 Mc." column—*Ed.*), and the others that 144-MHz moonbounce QSOs had been made between four-antenna stations and one with a single Yagi and a solid-state "brick," I wonder what they would have said. The state of the EME art certainly has come a long way in the past 30 years!

[6]The 2-meter EME net meets on Saturdays and Sundays on 14.345 MHz, just after the 70-cm EME net ends (usually around 1700-1800 UTC).

[7]C. Nele, "Libration Fading," *2 Meter EME Bulletin*, Oct 3, 1988.

[8]R. W. Harris and J. F. Cleveland, "A Baseband Communications System," *QST*, Nov 1978, pp 14-21.

[9]See Note 6. QST

Product Review

Conducted By James W. Healy, NJ2L
Assistant Technical Editor

Cushcraft R5 Multiband Vertical Antenna

Reviewed by David Sumner, K1ZZ

Let me begin this review with a confession: I like big antennas. The larger and higher they are, the better. A well-engineered stack of HF monobanders is to me a thing of beauty the equal of Eero Saarinen's best work.

So, how did the boss come to review a little bitty thing like Cushcraft's R5 vertical antenna? When the review assignments came around, did he draw the short straw? No. Actually, I asked for the job. With an ulterior motive, of course. Maybe two.

My first motive was selfish: My wife, Linda, KA1ZD, and I were planning a week's vacation which, for the first time in several years, would include some portable hamming. The last time, we had headed to a place with lots of trees and there was no problem stringing a dipole to get on the air. Our new destination, which neither of us had ever seen, reportedly had no trees. So, other antenna possibilities had to be explored. I'd had some experience with multiband quarter-wavelength verticals, and, although they're fine for some applications, portable operation from an unfamiliar location isn't one of them; good performance depends too much on what sort of ground, real or artificial, you can provide the antenna to work against. Laying a lot of radials, even temporary ones, doesn't square with my idea of a vacation.

The R5, less than 17 feet tall, is electrically a half-wavelength antenna on each of the five bands it is designed for: 20, 17, 15, 12 and 10 meters. Therefore, a ground system aside from that needed for safety is not required. Also, the height of such an antenna above ground shouldn't make a lot of difference as long as it's in the clear and out of reach of curious passersby, human or otherwise. If it worked passably well, the R5 would solve the antenna problem on five bands—and I was looking for a chance to get a feel for how well it would do by comparing it to the regular home-station antennas at K1ZZ/KA1ZD.

My second reason for being interested in the R5 was a little different. The middle school in the town where I live has a terrific teacher who, though not yet a ham himself, has gotten quite a few kids interested in ham radio through shortwave listening. He's organized a Novice class and has found some money for equipment, but the school is about to undergo major renovation and it will be a while before a permanent, rotary antenna can be installed. So, I thought, I'd test the antenna at home, then bring it over to the school and let the kids use it.

The antenna arrived by UPS in a 50 × 7 × 3½-inch box weighing less than 11 pounds. The R5 uses loading elements near the top of the antenna to allow a short overall length. Four 48-inch radials mount at the antenna base, adjacent to the matching network and mast-mounting location. The R5 can be mounted to masts from 1½ to 1¾ inches in diameter. Putting the R5 together took all of 45 minutes, thanks in large part to Cushcraft's clear and detailed instructions. One thing I especially liked about the instructions, in addition to their beautifully presented parts lists, their accurate, informative drawings and their precise use of English, was the special care Cushcraft has taken to emphasize safety. *Read the instructions.* It could save somebody's life.

The most convenient way for me to install the R5 at home, and one that would put it at least 200 feet from my other HF antennas to eliminate interaction, was to mount it on top of a ten-foot section of TV mast strapped to my daughter Deryn's swing set. I wouldn't recommend this as a permanent solution (see the preceding paragraph about safety), and besides, being a child of the '80s, she charged me rent. But it was a fine test setup, since the tests took place in March—and that's not a month when swing sets get a lot of use in Connecticut!

Once the coax was hooked up, I was pleasantly surprised at how well the R5 worked. The SWR was no higher than 1.8:1 on any part of any band except in the CW portion of 20 meters, and that was easily adjusted by lengthening the topmost piece of tubing according to the instructions. In most parts of the bands, the SWR was below 1.5:1. The first call, running 25 watts on ten-meter phone, brought back an Italian station. Other Europeans and South Americans quickly found their way into the log. With 100 watts on 15-meter SSB, it was no problem to work lots of stations in Japan, not that easy a path from New England.

The initial Cushcraft design for a multiband half-wave vertical, the R3 (for 20, 15 and 10 meters), used a remotely tuned variable capacitor at the base of the antenna to adjust it for use at different frequencies. In the R5, that matching system has been replaced with one that requires no tuning. The system has three elements. Working from the feed line toward the antenna, the first is a 1:1 balun to isolate the feed line. The second is a transformer to match the resistive part of the antenna's impedance to 50 Ω. The third is a network designed to cancel the inherent reactance of the antenna. The matching system works: The antenna covers all five bands with no adjustment or outboard matching network, and with no apparent loss of efficiency.

I tested the R5 with up to 1100 watts output (the most I'm equipped to generate) to make sure it could handle high power, but I mostly operated "barefoot." Wet weather had negligible effect on the R5's SWR. The antenna worked fine on all five bands, but I had the most fun with it on 18 MHz. Gain antennas are still a bit rare on this newest of our HF bands, so a half-wave vertical can hold its own in most company.

The regular antennas at K1ZZ/KA1ZD are monoband Yagis about 90 feet high and a tribander (20, 15 and 10 meters) at 50 feet. Did the R5 outperform any of these? Of course not. The laws of physics haven't been repealed. But occasionally the vertical surprised me by working just as well, and it provided lots of solid QSOs. There was no problem in conducting intercontinental CW ragchews while operating barefoot.

Transplanted to the top of a two-foot mast on the roof of the school, the R5 duplicated its previous performance: It loaded up nicely on all bands, and provided an inaugural 10-meter QSO with Liberia for the school's IC-725. While the kids awaited their Novice licenses, the antenna was so popular for shortwave listening, and is so unobtrusive, that the school has decided to keep it—even if they get a rotary antenna later.

Some users of the R5 have found that installing it too close to a ground system of resonant radials (such as might be installed under a quarter-wavelength vertical) detunes the antenna, making readjustment necessary. Since such a radial system is not needed with the R5, the easier solution is to move the antenna or remove the radials. The only other caveat about installation is that the base of the antenna should be at least four feet off the ground—but you'd want it higher than that anyway, for safety's sake. (The short, stainless steel radials at the base of the antenna are hot with RF when you're transmitting.)

How did the R5 work on vacation? It did everything I hoped, and more. We took along two five-foot sections of TV mast, cut down slightly to fit easily in the back of our small station wagon. Onto these we mounted the R5 and strapped the assembly to a fence post, putting the base of the antenna nine feet above ground. The R5 was fed through 100 feet of good-quality coaxial cable. In 27½ hours of operating over 5½ days, we made 2788 CW QSOs with 87 countries, mostly on 14, 18 and 21 MHz, but with a healthy number on 24 and 28 MHz as well. Oh, yes, the call sign didn't hurt: Courtesy of Bob Morrison, VY2ZZ, and the Canadian Radio Relay League, we used CRRL's Prince Edward Island call sign, VY2QST. The VY2 prefix (which is not a special one—it's been

the regular prefix for PEI since late last year) attracted a lot more attention than I had expected! If you heard or worked VY2QST between August 5 and 11, you heard the antenna for yourself; it's the only one we used. Ten minutes after securing operation, the R5 was dismantled and stowed in the back of the car, ready for the trip home. By any standard, that's a pretty high performance-convenience product.

In short, the R5 is a no-hassle solution to five bands' worth of antennas. It's easy to put together and even simpler to use. It can be installed just about anywhere as long as it's out of reach of curious fingers, and should work well at any height above ground provided it's in the clear. It's a natural for portable operation, and for home-station use when a rotary antenna isn't practical, or to add coverage of the 18- and 24-MHz bands (plus an omnidirectional backup antenna for the other three bands) to an existing antenna farm.

Manufacturer's suggested retail price: $340. Manufacturer: Cushcraft Corporation, PO Box 4680, Manchester, NH 03108, tel 603-627-7877.

CUSHCRAFT D3W WORLD RANGER 12, 17 AND 30-METER ROTATABLE DIPOLE

Reviewed by David Newkirk, AK7M

Let me begin *this* review with another confession: I *don't* like big antennas. I freely admit to believing that if I can't enjoy and be amazed by radio without erecting hundreds to thousands of pounds of aluminum and galvanized steel in my backyard, radio is too hardware-intensive for me. QRP hamming—*QRP* meaning, to me, *quietly reduced pretentiousness*—is my thing. I differentiate AK7M QRP from the mainstream variety by calling it QRP[2]—optional, *low-field-strength* Amateur Radio communication for fun.[1] You'll usually find me QRP[2]ing at 10 or 18 MHz[2]—often with home-spun radio gear.

A typical AK7M QRP[2] antenna consists of an end-fed random wire. (Okay, okay: Occasionally I take a walk on the wild side and install a tuned-feeder doublet.) Buying a commercial antenna, no matter how closely it approaches QRP[2]ness, generally doesn't occur to me. But when the Product Review editor proposed that I review Cushcraft's D3W, I bit—hard. *Sure* I'd review a commercial product that covers my favorite bands and might lure more victims into my QRP[2] clutches!

Cushcraft's D3W World Ranger rotatable dipole is simple to build, install and use. It weighs only 11 pounds when assembled and can be installed on masts up to 2-1/8 inches in diameter. It covers our three newest HF bands (10, 18 and 24 MHz). Designed for 50-ohm coax feed, the D3W is designed to exhibit an acceptably low SWR (1.5 to 1 or less) across its three bands. (And yes, it's designed to handle somewhat-higher-than QRP[2] power: 2 kW PEP. Keep in mind, however, that the US power-output limit at 30 meters is *200 W* PEP.) The D3W comes in a UPS-shippable box that's about 6 feet × 3 inches × 4 inches (LWD); its design length is 34 feet, ¼ inch long, assembled.

The D3W is a *trap* half-wave dipole. A trap is a tuned circuit that blocks the passage of energy at and around its resonant frequency; breaking an antenna element with appropriately tuned traps can allow that element to resonate on more than one band. The D3W's inner traps "disconnect" enough of the elements' tubing to resonate the antenna at 24 MHz; the outer traps disconnect somewhat less of the element material, resonating the D3W at 18 MHz; and the entire antenna resonates at 10 MHz. All *you* do to change bands with the D3W is change bands with your rig.

Assembling the D3W per Cushcraft's instructions took between 1 and 1½ hours, all told.[3] (My two stepchildren, 5 and 7 years old, helped make construction easy by occasionally diverting my thoughts elsewhere!) I installed the completed antenna atop a 20-foot TV mast bolted to the side of my radio shed. I didn't consider mounting the D3W on a rotator because I knew from studying Figs 11 and 12 in Chapter 3 of *The ARRL Antenna Book* that it would be largely omnidirectional at 10 and 18 MHz when mounted at 20 feet.

Initial SWR tests, made with a Bird 43P wattmeter at 50 watts output through 35 feet or so of RG-8 coax, revealed SWRs higher than specified: 1.8 at 10.1 MHz, 2.4 at 10.15 MHz; 1.8 at 18.068 MHz, 1.7 at 18.168 MHz; and 1.8 at 24.89 MHz, 1.7 at 24.99 MHz. I inferred from this that the D3W was resonant *below* the band at 30 meters, and *above* the band at 17 and 12. Had I goofed? Rus Healy, NJ2L, and I rechecked my installation. My element lengths and trap spacings were spot on with Cushcraft's documentation. What about the antenna height? (Cushcraft says only that "the antenna must be in a working position for a good VSWR test.") Working position? However you "de-hazify" that term, 20 feet should be plenty of feet—even at 10 MHz. Okay, okay, I'd made my coax pigtails a bit longer than directed by Cushcraft; *that* could cause that below-the-band resonance—shortening them helped, but didn't bring the 30-meter SWR into spec.

Cushcraft does not suggest what to do if the D3W's SWR is out of specification, but adjust-and-try modification of some of Cushcraft's suggested element lengths paid off reasonably well. Working from the D3W's assembly instructions, we found that lengthening Drawing 4's 98-inch dimension to 99 inches, and shortening Drawing 4's 73-inch dimension to 71-1/8 inches (an overall antenna-length change of only 1¾ inches), netted these SWRs: 1.35 at 10.1 MHz, 1.5 at 10.15 MHz; 1.9 at 18.068 MHz, 1.8 at 18.168 MHz; and 1.8 across the entire 24-MHz band. Fed through about 100 feet of RG-8, the SWR was 1 at 10.1 MHz, 1.2 at 10.15 MHz; 1.7 at 18.068 MHz, 1.4 at 18.168 MHz; and 1.3 across the 24-MHz band.

Our radio-shed R & D also indicated that the shed was buggy enough to drive *me* buggy, so I relocated my 10-watt-output transceiver to the house. This required that I feed the D3W (via the 35 feet or so of RG-8 already attached to it) with the only long piece of coax I had: A hundred-foot spool of RG-188A Teflon®-dielectric cable. Although RG-188A is high-quality stuff, it's lossy—just under 4 dB per hundred feet at 10 MHz, and somewhat less than 6 dB per hundred feet at 25 MHz. I calculated that the D3W would receive about 5 W at 10 MHz and 3.1 W at 18 MHz when fed via the RG-188A. (Receive insensitivity due to cable loss temporarily put me out of business at 24 MHz; I could hear down to the band noise at 10 and 18.)

Lossy feeder? Ha! A true QRP[2]er cares not. Within the next three days, I worked Venezuela, Mauritius, and New Zealand on 10 MHz; the Ukraine, New Zealand, Mauritius, Poland and Senegal on 18 MHz; and—after borrowing enough Belden 9913 coax from NJ2L to replace the RG-188A—the Canary Islands on 24 MHz.

Clearly, the D3W works fine. It's not a "big" antenna; it's an unpretentious, well-engineered, multiband dipole that goes together easily and affords you solid access to Amateur Radio doings on our three newest HF bands. I recommend it without reservation.

Manufacturer's suggested retail price: $210. Manufacturer: Cushcraft Corporation, PO Box 4680, Manchester, NH 03108, tel 603-627-7877. QST

[1] *Field strength at the other end of the communication circuit*—not just transmitter power, which is only one factor in the equation—is really what's at issue in comparing one transmitter/antenna to another. Never mind that no consumer-priced, off-the-shelf means of accurately measuring MF/HF field strengths in microvolts per meter are currently available to hams.

[2] By the way, I can't stand singling out 10, 18 and 24 MHz as *WARC bands*. After all, it's 1990, and WARC-79 happened almost *11 years ago!* Besides, burdening 12, 17 and 30 with this monicker isn't fair to our other "WARC" bands: We won 15 meters, for instance, at WARC-47. "Our three newest HF bands" is the phrase to use where necessary. (Disregard this diatribe if you're still referring to the Montreal Expos as an "expansion team.")

[3] When you build yours, be sure to position the traps with their drainage holes *down*—and consider applying conductive, anti-oxidant grease between the D3W's tubing sections as you fit them together. Cushcraft doesn't mention these points in the D3W's documentation, which is nonetheless first-rate.

Feedback

☐ Delete the phrase *at the transmitter side* in line 5, paragraph 3, column 1 on page 32 in August 1990 *QST*'s "The Off-Center-Fed Dipole Revisited—A Broadband, Off-Center-Fed Antenna" by John S. Belrose and Peter Bouliane.—*AK7M* QST

Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

A TNC CONNECT ALARM

☐ Missing a contact on packet by failing to see or hear a connect can be frustrating. To solve this problem on my GLB TNC, I added the circuit shown in Fig 1. When the **CONNECT** LED comes on, the buzzer sounds until the 1000-μF capacitor is charged (about 3 seconds). Pushing S1 (**ALARM**) to **RESET/OFF** disables the alarm and discharges the capacitor through the 470-Ω resistor. Except for the buzzer, all of the components mount on a PC board (mine is about 1¼ inches square) soldered to the terminals of S1.—*Al Smardon, VE3OX, RR 1, Carrying Place, ON K0K 1L0, Canada*

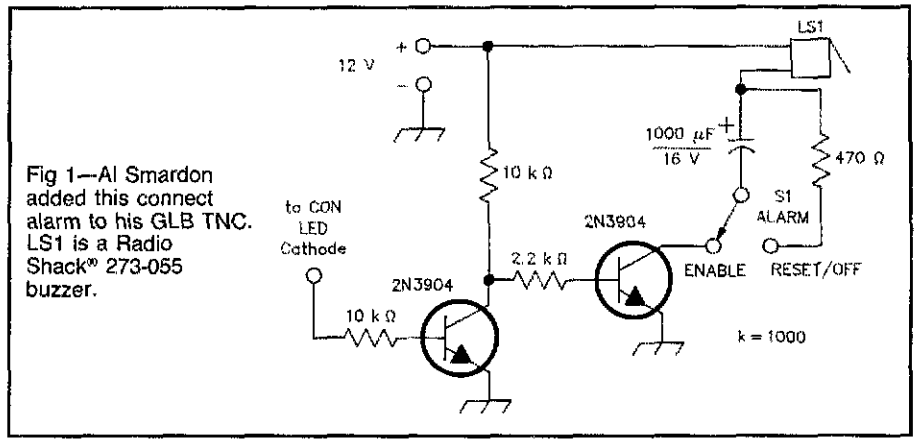


Fig 1—Al Smardon added this connect alarm to his GLB TNC. LS1 is a Radio Shack® 273-055 buzzer.

BUILT-IN GRILLE EASES MOBILE-SPEAKER MOUNTING

☐ The first day I drove my new pickup truck at work, I realized that my mobile rig needed an external speaker. After considering places to hang one, I noticed two unused speaker grilles in the truck interior. (The truck's broadcast radio uses only the dash speakers, leaving an unused grille in each back corner.) Positioned right about at ear level, they looked perfect for my application. I popped off the driver's-side grille and found that it was made for a 4- × 6-inch speaker. I drilled two mounting holes, fastened such a speaker in place with sheet-metal screws, and popped the grille back in place. My truck still looks exactly as it came from the factory, but now I can easily hear what's happening on the local repeater.—*Michael K. Clemons, KE5NU, Rte 1 Box 2380, Warner, OK 74469*

CONNECTING AN OLD MICROPHONE TO A NEW TRANSCEIVER

☐ After acquiring an ICOM IC-735 transceiver, I found that a desk microphone was desirable for use at the home station in lieu of the hand mike that came with the rig. Since my Astatic D-104 mike had served me faithfully for many years, I wanted to use it with the ICOM.

Examination of the rig's manual revealed that the IC-735 was designed for low-impedance (≈600 Ω) microphones, and that approximately 8 V dc is present on the '735's mike-audio line. Clearly, the D-104 could not be connected to the rig without some modification.

The circuit shown in Fig 2 solves this problem. All components within the shaded dashed lines are mounted on a small piece of perf board and installed in the base of the microphone. The circuit's physical layout is not critical.

This circuit has also been used successfully with an ICOM IC-761 transceiver. During testing with the '761, I found that the mike and PTT ground lines must not be connected together. (If they are, a low-level switching noise will be present on the transmitted signal.) Accordingly, the mike ground line must be isolated from the PTT ground inside the microphone.

Pin 1 of the D-104 microphone head is connected to its enclosure (PTT ground) via its mounting screw. To isolate the grounds,

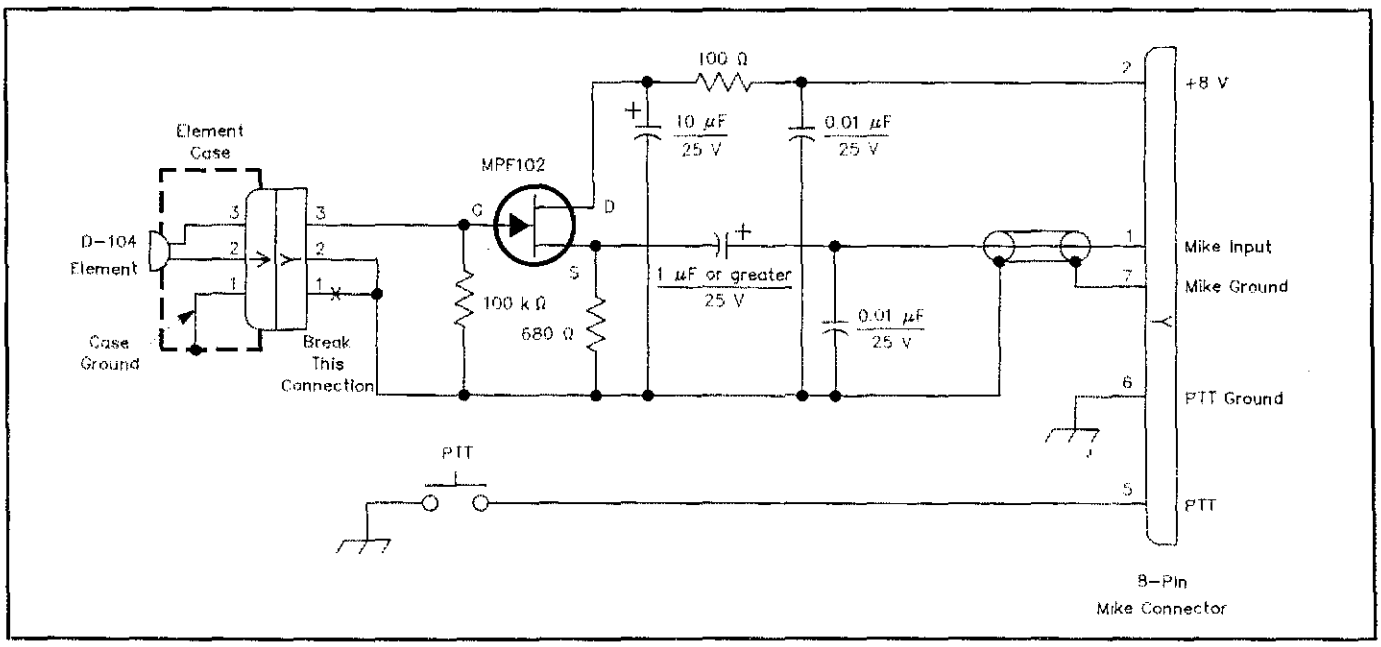


Fig 2—David Fentem connected his high-impedance D-104 mike to an IC-735 and IC-761 transceivers via this circuit, a JFET source follower that acts as an impedance transformer. The resistors are ¼-W, carbon-film units; the components shown within the shaded dashed box are contained on a circuit board mounted in the mike base. With appropriate mike-plug connections, this circuit is applicable to other transceivers.

break the connection indicated in Fig 2. This can be accomplished by removing the connector from the top of the microphone stand and rewiring pins 1 and 2 as shown.

This modification can probably be used with other transceivers having similar microphone-interface requirements. Be sure to verify the connector wiring and double check to ensure that the dc supply is not short-circuited. An ohmmeter check is also advisable to verify that the two ground lines (pins 6 and 7 of the mike connector) are indeed isolated from each other for transceivers that require this. *—David R. Fentem, KW4M, 704 Emerald Forest Cir, Lawrenceville, GA 30244*

BRIDGE RECTIFIER SOLVES KEYING-POLARITY PROBLEMS

☐ After replacing my tube transmitter with a solid-state transceiver, I found I had to devise a suitable method of enabling my keyer to switch a positive voltage instead of the tube rig's negative (grid-block) voltage. (A relay is an obvious solution, but I prefer using a solid-state device.) Gary Peterson, KØCX, suggested a simple but effective way to do this: Use a bridge rectifier across the keyer's keying transistor (Fig 3).

For this circuit to work properly, the keyed transmitter line must be connected to the keyer circuit only through U1. Although I used silicon diodes—actually a bridge rectifier from a discarded hair dryer—germanium diodes will work, and add less voltage drop to the keyed line. *—Paul Alexander, K5LZT, 1421 Valmont Dr, Hendersonville, NC 28739*

FEEDBACK: A BROKEN-SHIELD COUPLER

☐ In "A Broken-Shield Coupler,"[1] Wayne Cooper, AG4R, described a long-time interference fix: a Faraday-shielded broken-coaxial-shield coupler intended for use in coax-fed TV systems. Although a broken-shield coupler is somewhat lossy at best, it *may* help in some interference situations (Fig 4). One very common situation in which you *shouldn't* use a broken-shield coupler, however, is in coax that's part of a CATV system! Brian Hemmings, KA3CTP, of Continental Cablevision of St Louis County, Inc, St Louis, Missouri, tells why:

"If you construct this Faraday-shielded coupler for use in a CATV system, you will risk radiating the signals from the CATV system, so the method should only be used when you are using off-air antennas. If you are connected to a cable television system, it is not wise to use this method, since most cable companies use aeronautical frequencies and leakage of those signals could interfere with aircraft voice communications. CATV-system operators are acutely aware of the dangers of interfering with these services, and take the leakage seriously. Most have their hands full just maintaining the existing problems and would appreciate not having more created by amateurs. We are pleased with the assistance we receive from fellow hams in locating CATV leaks."

How much of a leak can a Faraday-shielded broken-shield coupler cause? Hugo P. Marquart, NØDYZ, of Bismarck, North Dakota, did some measurements:

"I work for Bismarck-Mandan Cable TV, and my duties are to attain minimum CLI (Cumulative Leakage Index) as required by the FCC. Using RG-59 coax, I made the coax coupler shown in Fig 3 on page 37 of July 1990 *QST*. The coupler was so lossy that, with a signal level of +9 dBmV on channel 4 and channel 11 from the signal source (0 dB = 1 mV), the signal into a TV—−5 dBmV and −6 dBmV as measured on a meter—produced 'very noisy video.'

"Using a Comsonics, Inc, 'Sniffer III' (an RF-leakage detector that includes a 1/2-λ horizontal dipole cut for 108 MHz), the CLI measurement at 10 feet was more than 2 millivolts per meter—very, very unacceptable.

"Part 76 of the FCC Rules requires that a leak of 20 microvolts per meter must be repaired within a reasonable length of time."

Bottom line: *Don't use a broken-shield coupler in a CATV system.—David Newkirk, AK7M, Assistant Technical Editor*

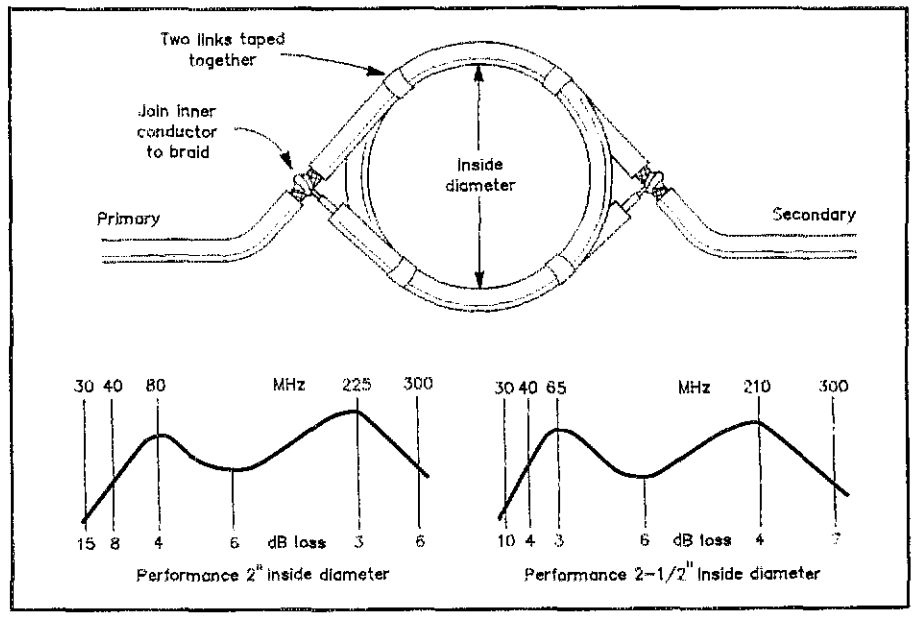


Fig 4—Known to British amateurs as a *braid-breaker*, the broken-shield coupler stymies interfering signals flowing on the outside of coaxial-cable braid by breaking the cable shield (and center conductor). As these double-humped response curves reflect, the braid-breaker restores the VHF signal path with two overcoupled, electrostatically shielded tuned circuits. Because breaking the braid also allows RF to leak out of the cable, *don't use a broken-shield coupler in a cable-TV system!* (Drawing after Fig 17.51, RSGB *Radio Communication Handbook*, 5th ed)

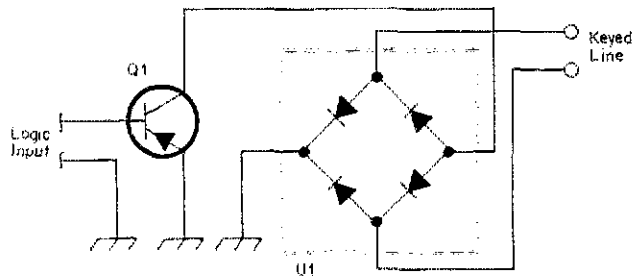


Fig 3—Paul Alexander uses a bridge rectifier, U1, to allow this electronic keyer to actuate CW transmitters with positive *or* negative-polarity keying lines. Q1 is his keyer's keying-line-switch transistor. As noted in the text, this circuit works only if the transmitter and keyer are connected to each other—via keying line *and* common leads—through U1 only. Multiple equipment grounds (through ground wires, control-lead and coax shields, 120-V ac connections and so on) may prohibit a single keyer-to-transmitter ground connection. The simplest solution to this problem is to modify the keyer circuitry to float its common—here represented by the chassis-common symbol—above chassis.

[1] W. Cooper, "A Broken-Shield Coupler Can Eliminate TVI," *QST*, Jul 1990, p 37.

The World Radi[illegible]sport Team Championship

An international field of radio racers rattle Seattle.

By John Crovelli, W2GD
200 Woolf Road
Milford, NJ 08848



Boris Stepanov, UW3AX, congratulates 1990 WRTC champions (l-r) KRØY, KQ2M, K1AR, K1DG, W9RE and K7JA. *(photo courtesy of ICOM America; all other photos by author)*

I first heard the idea of holding an in-person international radio competition almost three years ago. Danny Eskenazi, K7SS, broached the subject in a roundtable QSO. All we had was a vague knowledge of the popularity of such events in the Soviet Union and throughout Eastern Europe.

K7SS pressed the issue. "Why not a world championship event with an international field of participants, competing on-site in Seattle as part of the 1990 Goodwill Games™?"

Where do we apply?

An *ad hoc* committee soon was formed to market a proposal. After nearly 18 months of negotiations, Goodwill Games officials agreed that the World RadioSport Team Championship (WRTC) deserved official status as a Goodwill Exchange Event, and the stage was set. For the first time, the operating skills of world-class radio operators would be tested under equal conditions.

Missing the deadline for being a contestant, I decided to at least be an observer, and with surprising ease I convinced my wife Fran, KB2JAK, and son Nick, KB2JAL, to take a summer vacation in Seattle.

Meanwhile, initial euphoria in Seattle was replaced with the stark reality of a thousand details to work out in just a few months. Who should be invited? Would the FCC waive its rules for the visitors? Would a sufficient number of stations be available in the greater Seattle area?

Would enough volunteers come forward to host our international guests? What contest format would challenge the skills of our competitors and assure significant worldwide participation? How would we get the word out? Who would judge the event?

The biggest challenge of all would be finding sponsors with sufficient resources to assure success.

The WRTC Committee, under Chairman K7SS, paid special attention to issues with early deadlines. Timely invitations to foreign Amateur Radio societies were critical; how and when the radio societies would respond was also a major concern. How would each country select its team members? The list of participating countries was finalized only weeks before the competition.



The Japanese team of JM3JOW (l) and JJ3UHS model some of the official WRTC sportswear.

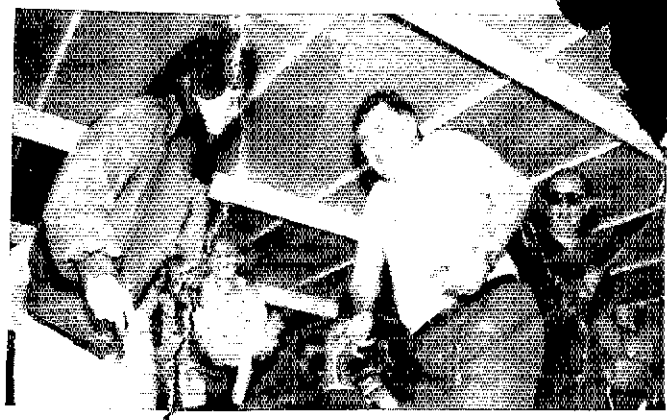
FCC licensing requirements would need to be modified, or at least temporarily relaxed. Negotiations ensued between the US State Department and four Eastern European governments for which no reciprocal licensing agreements existed. Notice of the FCC rule waiver was received just nine days before the event, granted on the basis that permanent reciprocal operating arrangements with Bulgaria, the USSR, Hungary and Czechoslovakia were imminent.

The ARRL staff and Bob Cox, K3EST, the WRTC Licensing Committee Chairman, worked tirelessly to solve what could have been the stopper.

Approaching Critical Mass

Once word got out that the WRTC was approaching critical mass, volunteer hosts came forward to open their Seattle homes to the expected 50 visitors. Even more gratifying was the number of station owners willing to make their operating positions available for the contest. Competition for bragging rights that "*my* station was used by a WRTC team" was intense.

Creating a "level playing field" was interpreted to mean supplying each team



Gene, UZ3AUS, practices a little "disco diplomacy" on the group's boat ride to Tillicum Village on Blake Island. K7LXC observes right.



I2UIY cranks up the "Italian 2-kW linear amplifier" while teammate IK2DVG operates the WRTC.

The Teams

(in order of finish)

K1AR/K1DG	I2UIY/IK2DVG
W9RE/K7JA	OH1XX/OH8PF
KRØY/KQ2M	OK1RI/OK2FD
VE7SV/VE7CC	YT3AA/YU1RL
DL5XX/DJ6QT	HAØMM/HA6NY
LZ2PO/LZ1MS	UW3AA/UA9SA
G3YDV/G4BUO	UWØCN/UWØCA
EA5BRA/EA9EO	JE1JKL/JE1CKA
UW9AR/UA9AM	PY5EG/PY4OD
W7EJ/AA4NC	FD1NYQ/F2CW
UA1DZ/RB5IM	JM3JOW/JJ3UHS

with the same radios, a tribander at 40 feet or so, and a station location with no undue advantage (competitions in the Soviet Union are run Field Day style, but difficulty in securing an adequate facility and fear of foul weather ruled out this option).

ICOM America, just across Lake Washington in Bellevue, provided IC-765 and IC-735 transceivers for each WRTC team. MFJ offered to provide the coax switches and antenna tuners and Heil Engineering provided the microphones, while Ham Radio Outlet and US Tower came through with other station accessories.

One by one, the logistical problems were solved, in large part because of the efforts of Patti Meeks, KS7L, whose committee arranged housing and transportation. But what about the contest itself? WRTC organizers had to come up with a format to assess the skills of world champions. And the search for participants was only in the planning stages.

Martti Laine, OH2BH, was appointed Operating Event Chairman. His international perspective and flair for the theatrical can be seen in the final rules, which balanced operator skills and strategic abilities. Rusty Epps, W6OAT, accepted the title of Head Judge.

A carefully planned publicity campaign, guided by Steve Morris, K7LXC, the WRTC Publicity and Promotion Chairman, included feature articles and full-page advertisements on the event in *QST*, *CQ*, and other outlets around the world. Lapel pins and T-shirts for various levels of operator achievement provided that extra something to pique the interest of the general ham population.

Danny Eskenazi, the WRTC Committee Chairman, is universally viewed as its ironman and spiritual leader. Danny expertly organized a willing army of volunteers and guided them through uncharted waters, assuming the role of full-time coordinator during the critical months just prior to the event.

Take Me Out to the Ballgame

Gene Walsh, N2AA, the US team coach, shared our July 18th flight from Newark, New Jersey. We speculated on what to expect over the next seven days in Seattle and marveled at how recent political changes in Eastern Europe had created the climate that made the WRTC possible. "Just imagine," Gene said, "an Olympics of Amateur Radio contesting!"

Listening to the unofficial WRTC repeater after arriving, we heard NØAX arranging for UWØCA and UWØCN to attend the Seattle Mariners baseball game that afternoon. Next was a QSO with AA7BO—it was an unfamiliar call sign, but the voice was unmistakably that of Willy, UW9AR.

"Electricity was in the air and did not begin to subside until days after the activities were concluded," says N2AA.

Puget Sound provided a majestic backdrop for the K7SS open house later that day—where I quickly picked out many familiar faces. It was a living *Who's Who* of international contesting (see the sidebar).

About midnight, IK2DVG boiled up a large pot of pasta for a snack, to the delight of everyone, especially I2UIY. The exchange of QSL cards and other mementos was unending.

As evening became morning, a profile of the contestants emerged. Ages ranged from early twenties to sixty-something; all but two were men. Nearly everyone had developed an interest in Amateur Radio by their early or mid-teens. Professions represented were unexpectedly diverse: students, engineers, salesmen, tradesmen, editors, printers, scientists, a toy store proprietor, a company president, even a professional politician.

Although a few radio societies staged qualifying events to choose their team members, most of the entrants were selected through a less formal process, using criteria from contest experience to ability to cover personal expenses.

About half the international participants had never before visited the United States; a few already held US Amateur Radio licenses.

Some entrants, particularly those from Eastern Europe and the USSR, were unfamiliar with the ICOM equipment and spent considerable time "test driving" it. Some teams made a serious effort to observe local propagation patterns.

Despite the jovial atmosphere, there were no loose lips when it came to discussing operating strategies.

Fran, Nick, and I toured the Olympic Mountains, with their spectacular glacier-capped peaks, then went to the first official reception. Excitement and anticipation were evident everywhere, along with strong doses of national pride. A reporter from National Public Radio was doing interviews. Former ARRL Northwestern Division Director Rush Drake, W7RM, greeted everyone on behalf of ARRL President Larry Price, W4RA (the ARRL Board of Directors was meeting in Connecticut that weekend).

Vasili Bondarenko, UV3BW, Chief of the Krenkel Central Radio Club, addressing the crowd through an interpreter, proclaimed the WRTC a "meeting of the stars." The evening was capped with presentation of distinctive WRTC jackets to all competitors, courtesy of the organi-

zing committee.

Coverage of the WRTC by the Seattle media was extensive. *The Seattle Times* and the Seattle *Post Intelligencer* published informative feature articles. TV broadcasters seemed particularly interested in stories involving the Soviets. One piece highlighted the "34-hour birthday" celebrated by UW9AR as he crossed the international dateline enroute to the US.

Another video clip featured NØAX explaining the sport of baseball to UWØCA and UWØCN at the Mariners game at the Kingdome.

Murphy Strikes

The day of the event was clear and hot, the temperature near 90°F. When I arrived at my first stop—the Soviet team of UW9AR and UA9AM—station owner K7LR told me that just prior to the start an S9-plus line noise had erupted. UW9AR was distraught. Desperate efforts to quiet the offending power pole, with the aid of a water hose and a sledgehammer, were unsuccessful. But once Seattle City Light understood the significance of the problem, they responded in force with four bucket trucks and a crew of eight. The noise problem finally was brought under control several hours later.

I managed to visit 11 WRTC stations, exactly half the teams, during the competition. Most of the stations were in urban neighborhoods, on 50- × 100-foot lots, with a lone tower supporting a tribander. In my view, the WRTC Committee had succeeded in providing an equal playing field for all.

The teams' intensity levels varied from no-nonsense, total concentration, to carefree and relaxed. The British team of G3YDV/G4BUO and the K1AR/K1DG "brother-in-law" team seemed particularly laid back. By chance, I ran into a group of roving WRTC judges (K6NA, N6AA and N6ZZ), who were randomly spot checking on-site rules compliance. Another group of officials manned a listening post throughout the event, logging potential operating infractions for later review.

Fears that the WRTC might be a contest without an audience dissipated rapidly once everyone heard the pileups. The WRTC stations averaged about 1100 contacts—in ten hours—running just 100 watts! Worldwide, nearly 4000 stations in more than 150 countries are believed to have participated. Steve, N2IC/Ø, who amassed an incredible 100 contacts with the competitors among his 750 overall QSOs, thought "the activity level was awesome for a contest with no history...the WRTC Committee deserves a lot of credit."

KE7V, the WRTC Soviet Liaison, sensed extraordinary participation by operators who normally don't enter contests. "I would like to think the unique significance of this event enticed many to play, but you can't discount the draw of free T-shirts and lapel pins!"

Following the over-the-air portion of the event, the competitors endured several feverish hours double checking their logs. Physical stamina now became a real factor in the competition.

Early Saturday morning, the judges began a marathon log-checking session, finishing just in time for the Monday evening awards ceremony. Raw scores had suggested there was a real horse race for the first six positions, and the leaders were invited to review portions of tapes from another team of their choice and make log challenges if desired. The judges (K6NA, N6AA, N6ZZ, N7NG, OH2BH, OH2MM, UW3AX, UZ3AU and W6OAT) did yeoman service.

Everybody on the Bus

A host of social activities were scheduled between the log-submission deadline Saturday morning and the awards dinner Monday evening, including a bus trip to the Willamette Valley DX Club convention and picnic in Portland, followed by lunch with Washington State officials, including the Governor, on Monday. During the travel time between cities, many of the foreigners busied themselves taking FCC license examinations, administered by a VE team. Nearly thirty people qualified for new tickets, many advancing from Novice to Extra in one session.

Meanwhile, Fran, Nick and I took side trips to Mount Rainier and Mount St Helens enroute to Portland.

The WVDXC banquet was attended by nearly 300 DXers and contesters from throughout the Northwest. Participation by the WRTC teams as the convention's guests was arranged by Stu, N7ZZ, a WRTC Committee member who also solicited sponsorships for some of the teams. Katashi Nose, KH6IJ, the honorary captain of the US teams, was presented with a special award by WRTC Chairman K7SS for his many years of contesting achievements and continuing inspiration.

Willy, UW9AR, posing between two military policemen at the Portland picnic (held at a US military installation) cracked "Captured by the US Army! What will I tell my mother?" Willy then offered to trade hats with one of the MPs.

On Sunday, the City of Vancouver, Washington, honored the Soviet team at a ceremony on the steps of the Chkalov Monument, which commemorates the Soviet rescue of an American Arctic expedition. This is the only monument in the United States commemorating an accomplishment by Soviet citizens.

At this point, my family and I took leave of the caravan and resumed our touring activities. Fran observed that "the foreign contestants, especially the Soviet team members, seem much more at ease today [than they were] last Thursday. Maybe this notion that Amateur Radio promotes good will and international friendship and understanding isn't so far fetched after all."

On Monday evening, some 250 people showed up at the WRTC awards dinner on Blake Island in Puget Sound. Vasili Bondarenko, UV3BW, leader of the Soviet delegation, said, "the only winner here was friendship. We are sincerely thankful for the great efforts of the organizers in making this difficult project possible. We appreciate the chance to meet all of you face-to-face; there is nothing more important than people to people contact. A new page in radiosport history has been written."

Bondarenko presented a special award from the Soviet people to WRTC Chairman K7SS in recognition of his special individual efforts contributing to the success of the WRTC.

From Moscow to Seattle

My route to the first World Radiosport Team Championship in Seattle took a quarter of a century. In the early 1960s, the Sports Committee of the USSR agreed to decorate the winners of the USSR "HF Championships" with the same gold, silver and bronze medals as they do in athletics. We soon realized that to have real champions we needed to modify our traditional HF contests. The general idea of on-site HF competitions was proposed in 1965, but the first competition of this kind took place only in 1980, sponsored by *Radio* magazine. On-site HF competitions soon became popular in this country. And now, ten years later, we have another first—the WRTC.

Being involved for many years in the preparation and running of competitions of this kind, I can really appreciate the outstanding job done by the WRTC organizers. To the best of my knowledge, all Soviet participants in the WRTC were delighted by the reception (our special "thanks" to the hams and their families who were our hosts) and by the competition itself.

The organizers of the WRTC did their best to equalize everyone's chance to win. I realize the difficulties they faced—to find nearly 30 approximately equal setups in a city like Seattle (located on the hills) was really a job.

I am sure the newly born Championship will have a long and fortunate life. And congratulations to the very first real World Champions of HF communication!—*Boris Stepanov, UW3AX, Deputy Editor,* Radio *magazine*



British teammates G4BUO (l) and G3YDV "rally" round the flag. . . ."

finally arrived for presentation of the Gold, Silver and Bronze Medals. Would the US teams sweep the top three places or had one of the visiting teams managed to beat the *odds and score an upset?*

With appropriate pomp and circumstance, as video cameras whirred and electronic flashes blazed, the gold medals were awarded to the team of K1AR and K1DG, the silver to K7JA and W9RE, and the bronze to KQ2M and KRØY. Bondarenko presented Soviet medals to the competition winners as well. Finishing in fourth through sixth places were the teams from Canada, Germany, and Bulgaria.

Among the special citations, the Murphy Award was presented to the Soviet Team of UW9AR and UA9AM, for their effort under exceptionally difficult conditions.

VE7CC and I2UIY received awards for most accurate CW and phone operator, respectively.

With a spectacular view of the Seattle skyline as a backdrop, the first World RadioSport Team Championship came to an end.

What will happen next in the international arena of radiosporting? For one thing, discussions already are underway to create a World RadioSport Federation to serve as a permanent sanctioning body for international on-site competitions.

For another, the Soviet Radio Sport Federation would like to see the International Olympic Committee include RadioSporting as an Olympic Demonstration Sport. It is too late for the 1992 Games, but the wheels are turning for '96.

And although the future of the Goodwill Games may be in doubt, a second WRTC at the Leningrad Games in 1994 already is penciled in on the calendar as another "impossible dream" that just might come true.



Although less extravagant than his British counterparts, IK2DVG, unofficial WRTC "pasta chef," gets in a little flag waving of his own.

Boris Stepanov, UW3AX, deputy editor of *Radio* magazine and often called the "father of competitive radio" in the Soviet Union, commented to the crowd, "many dreams are coming true with this happening and it is sad to see it come to an end."

ARRL International Affairs Vice President Jay Holladay, W6EJJ, expressed the League's pleasure in having had an opportunity to play a small supporting role in the WRTC project, and to provide financial support through a grant from the W3RLR Fund.

And Finally, the Medals

One by one, country by country, the operators received plaques and other mementos for their participation in the very first WRTC event. Then, the moment

W2GD is an active contester and is director of systems services for the consulting firm of M. F. Smith & Associates, Inc.

Editor's note: A 28-minute broadcast quality video on the WRTC is scheduled for release by year's end. Advance orders for the tape will be accepted. Send $19.95 plus $3 shipping to WRTC Video, 4821 51st SW, Seattle, WA 98116.

The ARRL and *QST* in no way warrant this offer.

Complete scores for all WRTC contestants are slated for publication in the *National Contest Journal.* QST

What is Amateur Radio?

Amateur Radio, also known as "ham radio," is communicating. Hams, who must be licensed by their governments, operate two-way equipment from their homes and cars. They communicate with other hams across town or across the world on special sets of radio frequencies, or bands, that are set aside for Amateur Radio use.

Who are hams?

Just about anyone can be a ham—there are no age limits. Many people with disabilities find a door to the world in Amateur Radio. Some famous people are hams, but most are just people from all walks of life who like making new friends around the world.

How can I become a ham?

Getting a ham radio license is easier than you may think. In the US, the Novice (beginner's) license requires only passing a 30-question written exam on basic electronic theory and FCC rules and regulations, along with copying and sending Morse code at five words per minute.



The American Radio Relay League (ARRL) offers a wide variety of information for persons interested in radio communication. We can also provide you with a list of clubs and instructors in your area. Many local Amateur Radio clubs offer licensing courses several times a year.

For a prospective ham packet, contact the ARRL, Dept Q, 225 Main St, Newington, CT 06111, tel 203-666-1541.

QST Profile:

Jerry Sevick, W2FMI: Coiled to Strike

Inventor, ham radio experimenter and author, W2FMI tackles the magic of radio with the tenacity of a scientist.

By James D. Cain, K1TN
ARRL Associate Editor

When Bell Laboratories moved Jerry Sevick out of the lab and behind a desk, he wrote nine articles on vertical antennas for *QST*. After retiring in 1984, Sevick wrote two books on transmission line transformers. Thank you, Bell Labs!

W2FMI might be a typical ham, happily fooling around in his basement, but the typical ham—if there is such an animal—doesn't have a Harvard PhD in applied physics.

Three vertical antennas poke skyward from Sevick's back yard. They aren't anything like most hams' verticals—where's the rat's nest of wires? Instead, hundreds of radials are neatly fastened to aluminum plates drilled for bolts.

There are no ground rods, either. These are image-plane antennas; they use *no* ground, as such. Each antenna is fed through a transmission line transformer.

"Every ham with a multiband vertical should have, at the very least, a 1.5:1 transformer at the feed point," Sevick says. The visitor writes that down.

Sevick currently is experimenting with three verticals. One vertical system actually has two elements, maybe eight inches apart. A modified commercial trap vertical covers 15 and 20 meters, while its companion element, entirely home-brew, covers 12 and 10 meters.

Quarter-wave wires on 40 and 160 and an inverted L on 80 all are fed from the same feed point as the verticals. What we have here is a 7-band antenna with one feed line. Sevick feeds it through a dual-ratio transmission line transformer.

A second arrangement is for testing mobile antennas, with a very small image plane to simulate the mobile environment. The third array is another multiband setup, entirely home-brew, designed to study parallel transmission line transformers.

"When I bought this house, I was looking for three things," Sevick says. "Good schools, city utilities and a big, flat back yard."

Sevick's basement looks like a radio store specializing in antennas. On a table are a couple of disassembled loading coils from popular mobile antennas.

"Just look at this," Sevick moans. "The coil is much too closely wound, and the assembly uses *metal* end caps. It's just poor engineering."

Sevick's workshop stockpile includes spools of wire, coils, transformers, bits and pieces of stuff and an HF transceiver. "Isn't it great," Sevick says with a smile, "that I can buy all these supplies, play with them, then write them off my taxes because I write about them?"



W2FMI in his basement workshop/shack.

The main W2FMI station is upstairs in a large, pleasant sun-room. A few professional citations and three *QST* cover plaques are modestly displayed. Sevick is especially proud of photos of him with several US senators, taken around the time in 1977 when he arranged one of the first technical exchanges with China.

Reams of graph paper, covered with calculations and notes, fill a desktop. Sevick uses a Hewlett-Packard Q meter, perched on a card table, to measure the inductance and losses of the coils he is studying.

So while W2FMI's basement workshop is chaotic, in a friendly sort of way, his shack/office is the model of organization.

Sevick is reading the first "feedback" forms from buyers of his new book, the second edition of *Transmission Line Transformers*.[1]

"Most people who read the first edition asked for more construction projects hams could use. So I set to work and spent two years building a hundred or so transmission line transformers for the real world."

Doing Pure Science

In the early 1970s, Jerry Sevick was working at Bell Labs in Murray Hill, New Jersey. "I was management and didn't have a lab anymore," he says. "But I had *access*. In those days, doing pure science, with no particular commercial application in mind, was important and encouraged.

"Some of my after-hours work on transformers found its way into Bell Labs' projects," Sevick admits.

"Meanwhile, I had decided not to have a beam antenna at my new house (where he and his wife Connie live today), and thought I'd investigate verticals. I wanted to find out if they really do 'radiate equally poorly in all directions.'"

Sevick wrote his classic *QST* series between 1971 and 1978. "Jerry really didn't discover anything new," says Joe Reisert, W1JR, an antenna engineer. "Jerry's the first one to tell you the information was there, as it had been since the 1930s, hidden away in dusty engineering tracts.

"What W2FMI did was to apply hereto-

[1]Sevick, *Transmission Line Transformers*, second edition (Newington: ARRL, 1990).

fore commercial antenna practices to hamming, and then," Reisert says, "most important of all, he shared what he learned through *QST*."

Saving His Lunch Money

Sevick was first licensed (as W8OWY) as a teenager in 1935. His first station was pretty elaborate for the time: a superhet built from a kit for "under fifty bucks," and a homemade transmitter tuned by observing the glow from the no. 210 tubes in the final.

"I saved the money for that equipment by banking my lunch money," Jerry Sevick says.

Sevick went to Michigan's Wayne State University, where he and Connie met. "My undergraduate major was physical education. I played football and might have gone pro. Instead, I stayed briefly to coach freshman football, before the war hit."

Sevick graduated from the US Army Air Force School as a pilot, then was sent to Harvard and the Massachusetts Institute of Technology for radar training. Although he had no engineering background, Sevick was accepted to the school because he was a licensed Amateur Radio operator. "My ham radio background really did help," he says.

After the war, Sevick returned to Wayne State as an assistant professor of physics and electronics. He also moonlighted as a TV weatherman in Detroit, in the very early days of television. Then the big break occurred—Sevick went to Bell Labs, in Murray Hill, and became involved in high-frequency transistor development.

Those were heady days at Bell Labs. In 1956, Bardeen, Brattain, and Shockley had won the Nobel Prize in physics for the invention of the transistor. Bell Laboratories, holder of more than 20,000 patents (more than one a day since 1925!) was the birthplace not only of the transistor, but also of the laser, the solar cell, LEDs, sound motion pictures, and so on.

In 1969, Sevick became Bell Labs' director of technical relations, "my management period."

Sevick's work on short verticals led him to investigate broadband matching transformers. He had worked with a pioneer in the field, C. L. Ruthroff, at Bell Labs.

"I always knew (transmission line transformers) were capable of broad bandwidth," Sevick said in *Electronics* magazine,[2] "but...I don't think anyone realized just how efficient they were. Transformers wound on only 1½-inch-diameter cores can handle 800 watts without even blushing."

As a ham, Sevick was concerned with the matter of antenna efficiency. His work with verticals had first concentrated on methods of loading them and on optimizing the image plane (a vertical is half of a dipole; the image plane is the other half).

Sevick's devotion to engineering elegance is apparent in his garage, too. Being from Detroit, it figures he'd be a Car Guy, but his taste runs to Teutonic wheels. He currently drives a sleek VW Corrado, which was preceded by four other Volkswagens and a Porsche 914. "These all were finely engineered cars, and inexpensive, too," Sevick says.

He refers to his German cars as "nice instruments."

Because it's possible to put down only a finite number of radials, Sevick's attention naturally turned to transferring power from the station to the radiating element—matching transmission line to antenna. Today, he recommends transmission line transformers not only at the antenna but within the station itself.

"My goal is to come up with a unified theory for these transformers," Sevick says, drawing on the pioneering but often-ignored work of not only Ruthroff, but also that of G. Guanella, who wrote a paper entitled "Novel Matching Systems for High Frequencies," in 1944. Guanella proposed coiling transmission lines to form a choke—the familiar balun (balanced-to-unbalanced transformer). Balanced feed lines were still the standard well into the 1950s.

Ruthroff carried the idea into the world of coax in 1959 when he connected a single transmission line to make a broadband *unun* (unbalanced to unbalanced) transformer.

Guanella, working in the 1940s, had neither ferrite cores nor modern instruments. By the '50s, Ruthroff had ferrite to work with, but only primitive test equipment.

Sevick, of course, had both. He was able to use million-dollar test sets at Bell Labs, capable of working in a range from a few hertz to more than 4 GHz, and of making measurements on the order of a few millidecibels.

This enabled Sevick to test his theories and develop the background for his later work.

"I have some coils measured on the test sets at Bell that, to this day, I still use as benchmarks," he says.

In his 1976 article in *Electronics*, Sevick pointed out that transmission line transformers were in wide use "because of their inherently large bandwidth" (something hams, with their multitude of frequency bands, find extremely important). "Now their applications should be extended...to matching high-power amplifiers to an antenna, as well as matching small-signal amplifiers," Sevick told the *Electronics* crowd (an audience that, by the way, got a dose of Amateur Radio—"It was Jerry Sevick's interest in Amateur Radio that launched him into experiments with transmission line transformers," *Electronics* said).

For the next few years, Sevick published in professional journals, as well as recycling for the pros some of the early *QST* material on short verticals.

"But I much prefer publishing in *QST* and having the IEEE and others pick it up from there," Sevick says.

A Real Pileup Buster

One person who was influenced by Sevick's series was John Kaufman, W1FV, a perennial 80-meter contest winner who uses three phased verticals for the band.

"When I was getting ready to experiment with verticals," Kaufman says, "I read and reread Jerry Sevick's *QST* series on the subject. My first system for 80 meters was a 38-foot top-loaded vertical with 80 radials. It was a real pileup buster, and I was amazed.

"Jerry Sevick didn't discover anything that I know of," Kaufman says, echoing W1JR. "I found the same information in engineering journals from the 1930s. What Sevick did was to describe how hams can make short verticals work. And he got us thinking about efficiency—about keeping losses down."

Reisert adds, "I am a generalist. I have a lot of respect for someone like Jerry Sevick, who can zero in on a particular problem and work it through. His analysis and testing are very thorough. He's focused.

"Most hams don't know this yet—but they will—Sevick in particular brought the use of ferrites down to a level amateurs can relate to and use," Reisert says.

So what's in the future? Sevick is coiled to strike again. Inductors are a part of most hams' antenna installations, and Sevick isn't happy with them in their current state. That's why he's ripping them apart in his basement. It all goes back to efficiency.

"Coils can have a much higher Q than previously thought," Sevick says. "It all depends on how you wind them, and on what, and how each inductance fits its intended application."

As Reisert puts it, Jerry Sevick is focused. Start with short verticals. Optimize the image plane. Find the best place for the loading coil. See how much improvement top hats make.

Draw on decades-old theories to improve power transfer to the antenna.

Then, improve the efficiency of the short antenna's greatest drawback—the loading coil.

Ask Jerry Sevick about commercial applications for his work, and you get a puzzled look. "The antenna manufacturers don't seem interested. And patents are expensive to acquire these days."

What W2FMI's articles and books have done is set forth principles the ham do-it-yourselfer can use to build inexpensive, highly efficient antennas.

Who knows—by the time you get your image plane in place, Jerry Sevick may have discovered the lossless coil!

[2]Sevick, *Electronics*, Nov 25, 1976, pp 123-128.

Sweepstakes for the Beginner

New things are made familiar, and familiar things are made new.—*Samuel Johnson*

By Robert J. Halprin, K1XA
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It's the '90s. With the dynamite combination of you, your radio and your computer, Amateur Radio operating is a whole new ballgame. What better time to try the ARRL November Sweepstakes for the first time or after a long absence?

Sweepstakes is *not* something Ed McMahon is flogging on some tacky TV commercial. It's an Amateur Radio contest. Generally, a contest is an on-the-air activity that involves working as many different stations as possible in a predetermined period of time (usually a designated weekend within formal starting and ending times). 1990 marks the 57th annual ARRL November Sweepstakes. The official rules appear elsewhere in this issue.

Sweepstakes (SS) is actually two separate contests, one on CW, held on the first full weekend of November, and an SSB event that occurs on the third full weekend of November. Each weekend is a separate, self-contained contest; contacts, points, multipliers, etc do not carry over.

You've heard the saying "are we having fun yet?" Well, SS *is* fun, particularly when you consider that you can work hundreds of stations with a barefoot transceiver and a wire antenna, and you can use your home computer to log and keep track of your running score without being buried in IRS-style paperwork.

The object of the competition is for stations in the US and Canada to contact as many other stations in the US and Canada as possible during the contest period—a 30-hour spread that starts Saturday afternoon and ends Sunday evening. Participants must exchange certain pieces of information (more about this "exchange" later).

Because you only have to make domestic (non-DX) QSOs, even a modest station can work hundreds of stations during SS. And you can compete in one of three categories within your personal comfort zone: *Q* if you're a QRPer running five watts output or less, *A* if you're using a typical transceiver at 150 watts output or less and *B* if you're running 150 watts output or more. Achievement certificates are issued to the top scorers in these categories throughout the US and Canada.

For those of you who have never operated SS before, don't worry, no special expertise is required. Nor is there any requirement to preregister, operate a specific amount of time or submit a log (although you may want to, if you feel you have a shot at qualifying for a certificate). Casual participation fuels contesting; contesting is *not* an all-or-nothing proposition.

SS can give a focus, a purpose, to your on-the-air activities that transcends mere rag-chewing or "tuning around" (though both of these activities are perfectly legitimate). The direct benefits to you are many:

- SS is a competitive sport you can "play" right from the comfort of your home.
- SS is an excellent way to gauge and improve your operating efficiency, skill and finesse in making contacts, whatever the size of your station. Most top-scoring contesters started out with modest stations that helped them develop operating skill rather than relying merely on "brute force."
- SS lets you check out new gear and determine the effectiveness of your antenna system. If you are consistently answered on the first or second call and if your message is copied the first time around with no requests for repeats, you can be confident that



your station is getting out.

• If awards are what you're after, you'll be surprised how fast you can collect Worked All States during an SS weekend or add to your Five-Band Worked All States totals.

Any significant participation in SS will probably net you almost all 50 states (in the 1989 CW SS, while operating from an average station, I worked almost all the states within the first four hours of the contest!). Your log will fill up with these needed QSOs much faster than if you were just casually operating.

• Win awards for SS itself. Perhaps you'll be a high scorer in your ARRL Section (see below) and receive an SS certificate from ARRL HQ for your efforts. As an added incentive, there are special pins for those making 100 QSOs or more. See the rules on p 93 of this *QST*.

• If you operate with a friend, you can compete in the multioperator category (multiopping with a friend or two allows everyone to get plenty of sleep, food and operating time).

• Activate one of the rarer sections as a mini DXpedition (last year, Montana, Western Massachusetts, the Virgin Islands and, as usual, Canada's Northwest Territory/Yukon, were in demand). Check last year's scores in May 1990 *QST* to determine the general level of activity in various sections.

Note that SS runs for 30 hours each weekend. You're limited to a maximum of 24 hours, but there is no minimum time requirement. You can operate five minutes or five hours, up to a total of 24. So it's *not* all or nothing; a partial effort is still a lot of fun and can result in a respectable score. You may even qualify for a certificate, depending on the activity in your section. If your time is limited, try operating Sunday afternoon; SS activity tends to diminish then. You'll be "fresh meat," so be prepared for a pileup and an adrenalin rush!

In Sweepstakes, there are no minimum requirements for antennas, power output or amateur experience. Everyone starts off on a level playing field—you take it from there based on your creativity, operating ability and your station.

We're all newcomers when it comes to the things we've never tried before. So don't be bashful about jumping in with both feet. After an hour or two you'll be on your way to becoming an old pro at the Sweepstakes game.

Tactics

Convinced yet? If so, it's time to consider basic tactics and strategy. The first thing to do is read the rules on p 93 of this issue, so you'll have an understanding of the basic framework. From there, certain strategic decisions are required.

What mode? There is one weekend devoted to CW and one to SSB. Pick the mode or modes you feel most comfortable with, although there's been a fall-off in CW SS activity, so consider making some code contacts even if CW is not your mode of choice.

Low-power and/or modest-antenna operation is more effective on CW than on voice modes. SSB tends to be more of a brute-force mode. Consider putting in a few hours on each mode, perhaps.

If you are primarily a phone operator, don't be intimidated by the machine-gun style of some of the CW contestants. Concentrate on the suggested slow-speed CW and Novice frequencies (see the table on p 93) where you'll find the CW speeds to be more reasonable. There are plenty of folks to work there; it will just be a little less hectic.

What band? Unlike most contests, in SS you can work a station only once *per contest*, so plan on doing most of your operating on the band or bands that you are loudest on.

At the risk of oversimplifying, if you're on the East Coast, 40 meters is the workhorse band, particularly on code; 80 is good overnight. If you can get on the higher bands, so much the better, because you can pick up a bunch of the far-off multipliers there.

If you're west of the Mississippi, 20, 15 or 10 will be prime, depending on conditions. On phone, the 10-meter Novice subband is hot—it's where most of the daytime activity is throughout the country.

If you only have wire antennas, you'll probably want to stay on the low bands; but even a small beam will permit you to work the higher frequencies more effectively. Try to hit all the bands you are capable of operating on, but don't put in too much effort on a band where your signal is marginal. Budget your time according to the propagation conditions and the capabilities of your station. Tune around and try to stay where the action is. (Contacts on 30, 17 and 12 meters are not allowed.)

What method? If you're new to SS, or if you're running low power, the so-called "search and pounce" (frequency hopping) method is recommended. If your CW is a little rusty or the phone bands are wall-to-wall with "alligators," searching and pouncing is a good way to get acclimated. The so-called "big guns" tend to congregate at the low ends of the bands, so start at the high end, where activity is less intense. Find a station calling "CQ SS," work him, and move on to find another as quickly as possible until you've worked your way down to the low end.

The idea of searching and pouncing is to start at one end of the band and methodically work your way to the other end, trying to contact all the stations in between (aside from those you may have already worked, if any). Before you know it, you'll have filled a log page. At this point, you may want to reverse the process and work your way back to the high end, or change bands and start the process all over again. (If you are getting out well on a band, however, you may want to stay there as long as you are readily finding new stations to work).

After a while, if all the stations you call are coming back to you without a problem, you may want to call "CQ SS" and try to "run" stations (that is, select a clear frequency and let the other stations come to you). Make sure you do this on a clear spot. The higher end of the band is recommended. As long as stations are coming back to you, keep running

Computerized Logging in Sweepstakes

As comprehensively discussed in K1TN's "The Mind of the Contester" (see July 1990 *QST*), with the prevalence of PCs in ham shacks, real-time computerized contest logging is becoming standard operating procedure. There are numerous programs on the market, but many of us use the K8CC's *NA* program, which is designed to be used like the highly regarded *CT* logging software developed by K1EA.

If you use *NA* or something like it, you'll quickly find that contesting with a computer is a completely different sensory experience than contesting with a conventional pencil-and-paper log. Even if you're lukewarm to contesting, the freedom and exhilaration of having an intelligent PC assistant may make the whole experience something to savor. And, if you like video games, you'll love computer logging.

If you employ a user-friendly program like *NA*, you can use your keyboard to type in each contact, while your monitor shows you a running, real-time logsheet and a running total of your score (it also tells you how many points each new multiplier is worth). Hit Alt-F1 or Alt-F2 to change bands on the screen; check your dupes by invoking the F9 key and keep track of your multipliers worked and needed with the Alt-M and Alt-N functions respectively. On CW, if you hook up the serial port of your computer to the key jack of your radio, *NA* will function as a memory keyer (it's activated by your computer's function keys) and will free you from having to manually send the repetitive contest exchange. Once you've entered the other station's call sign, hit the Insert key to automatically send the other station's call sign *and* the exchange!

The best part is that within minutes of the conclusion of the contest, a few keystrokes will result in a complete finalized printout of your log, including summary and dupe sheets, eliminating burdensome paperwork. As K1TN noted, "a two-day contest is just that; it no longer is two days on the radio followed by a week of paperwork."

You are free to choose any of the logging programs out there. Programs such as *NA* and others like it make the often-awkward piles of log, dupe and multiplier sheets a thing of the past. If you are interested in obtaining *NA* (which also supports Field Day, the ARRL 10-Meter Contest and the IARU HF Championship), it can be obtained from LTA Industries Inc, PO Box 92, Canfield, OH 44406, for $30. *[The ARRL and QST in no way warrant this offer. It is provided for informational purposes only.]—K1XA*

them on that frequency. When things dry up, *resume* searching and pouncing on the same band, or look elsewhere.

What information do I exchange? The Sweepstakes exchange is a little more complicated than the "59 your state" formula, but don't worry; you don't need to be a rocket scientist. Because SS has its roots in Amateur Radio traffic handling, you must transmit and receive certain pieces of information similar to a radiogram message preamble with each station you contact, in an *exact* order, as follows: You send each station a consecutive QSO number (as if you were taking a ticket at the deli counter), a letter that designates your power category (Q, A or B, as discussed above), your complete call sign, the last two digits of the year you were first licensed (called the "check") and your ARRL Section (see below for a discussion of ARRL sections). This exchange is long by contest standards, but it's rooted in tradition and is a refreshing departure from conventional contest exchanges.

For example, in the 1989 phone SS, I worked Bill, N3GTW, in Bethesda, Maryland (which counts as the ARRL Maryland-DC Section). Bill was first licensed in 1988 and runs 100 watts. I happened to be his 55th contact. This is what Bill's transmission sounded like:

"K1XA, please copy my number 55, Alfa, N3GTW, eighty-eight, Maryland."

Bill was my 65th contact. During the phone contest, I was running a kilowatt, and I was first licensed in 1970. As a result, I responded to Bill like this:

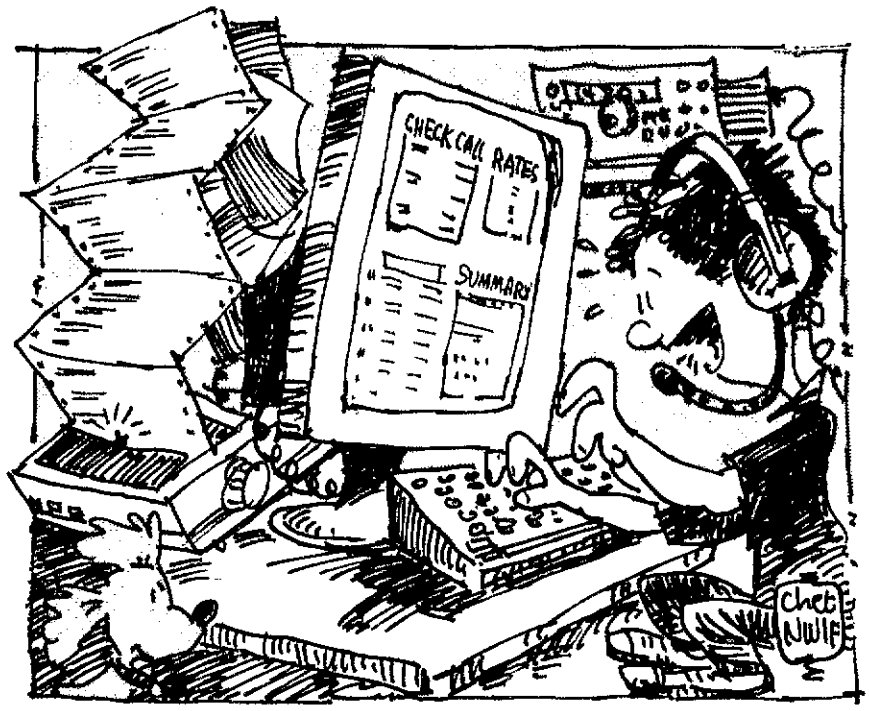
"N3GTW, roger, thank you. Please copy my number 65, Bravo, K1XA, seven-zero, Connecticut."

Bill came back, acknowledged receipt of the information, and off we went to work other stations. Don't leave until you have all the info logged properly, however. If you need a repeat (a "fill"), just ask for it. A contact is not valid until both stations have a complete exchange. Rehearse your exchange before you start calling stations!

If this contact took place on CW, Bill would have sent the following: K1XA NR 55 A N3GTW 88 MDC K. On CW, NR replaces the word "number," the letter A is the "Alfa" power designation and MDC is the abbreviation for the Maryland-DC Section. All of the information is sent in the same order on phone and CW.

Efficiency is crucial in contesting (that is, participants strive to work as many stations as possible during the contest period). Therefore, send your exchange only *once*. If, because of QRM or QRN, the other station needs a repeat, he'll ask you for it. On phone, speak clearly. On CW, send at a speed you can comfortably copy. The other station will adjust his speed (up or down, as required) to match yours, so the information can be exchanged on the first try.

Should I log? Even though no longer required by FCC rules, as a practical matter, yes, so you have a coherent record of each station you've worked, the serial numbers you passed out, how well you're doing on each band and exact QSO details should you later decide to apply for awards or send your log to ARRL HQ. If you submit your log to the League's Contest Branch, you can look forward to having your score registered for posterity in the SS results article in *QST*.



You can maintain your log by using one of many real-time computer programs (see the sidebar), or you can use the manual paper-and-pencil method. If you opt for the latter, obtain the official log sheets, dupe sheets and summary sheets from ARRL HQ. Make sure you log your QSOs in UTC, not local time.

If you're manually logging, the dupe (duplicate) sheet is a critical aid—it's a matrix-type form that's used to keep track of the call signs of the stations you've worked (as you work them), in addition to entering them in your regular log. In SS, because you can only work a station once per contest, additional contacts with the same station on another band (or the same band) don't count. When you're hunting and pouncing or calling CQ, a quick glance at your dupe sheet will reveal whether or not a given station has been worked before ("a dupe").

Paper-and-pencil logging is rapidly disappearing from the scene nowadays, because many of us are using computers to perform this dupe-checking function. But use whatever method you feel comfortable with. Technology aside, calling someone you've already worked wastes time and tends to create heartburn for the other station, so it's best to keep an accurate dupe sheet. Also, submitting your log to ARRL HQ without the duplicate contacts removed can earmark your entry for possible disqualification.

How do I calculate my score? There is no need to add up your score if you're not submitting your entry to ARRL HQ. Assuming you decide to send your log to the Contest Branch, however, here's how to figure out your final score. First, mark and deduct all the duplicate contacts, if any, from your log (which your dupe sheet or computer-logging program should have done for you). Contacts where the two-way exchange of information was not completed don't count either. Once you've eliminated any duplicate or "busted" QSOs, the bottom-line result is your net QSOs.

In SS, each QSO is worth two points. So if you make 100 valid contacts, you have 200 QSO points. To determine your final score, multiply your QSO points times your total multipliers, as indicated on the official SS summary sheet.

What's a multiplier? It's a specific geographical area, which in Sweepstakes is ARRL and CRRL Sections—political boundaries for organizational purposes. As mentioned above, you are required to transmit your section as a component of a valid exchange. See page 8 of this issue for the entire roster of ARRL sections and the elected ARRL Section Managers for each. In SS, there are now 77 total multipliers—69 ARRL sections and eight Canadian multipliers; working all of them is a called a "clean sweep." In 1983, to commemorate the 50th anniversary of SS, the League awarded small whisk brooms to each entrant who made a clean sweep on either mode. (I still have my broom, somewhere...)

Determining what section you live in can be anything from downright simple to almost cosmic. If you live anywhere in Ohio, for example, you're in the Ohio section, and that's all you need to know. If you live in Texas, however, you'll note that the League has carved out three distinct sections in the Lone Star State; if you live in California, there are nine of these entities!

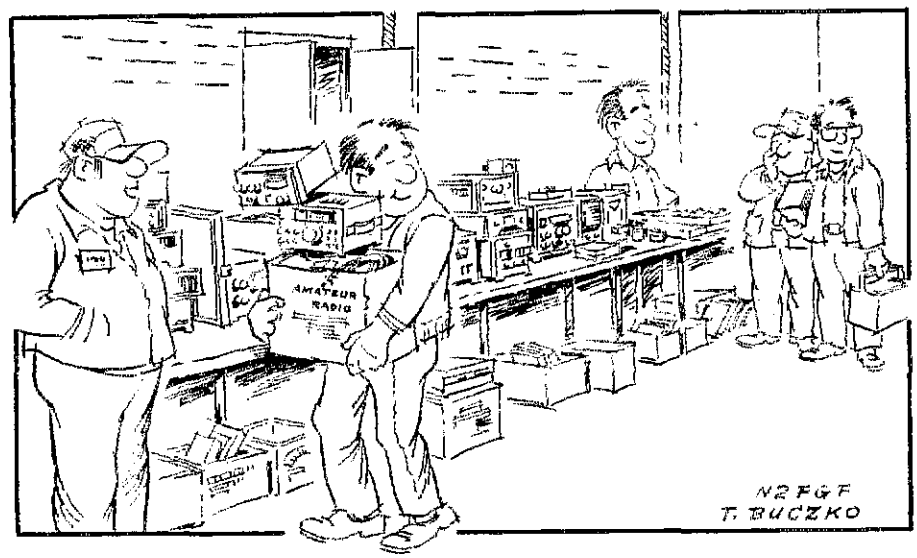
In most cases, even in such multiple-section states, knowing your section is self-explanatory. But if you're not sure what section you're in, ask a local contester or a local League official, or contact the Contest Branch at ARRL HQ. You can also find this informa-

(continued on page 56)

The Retread

Once Amateur Radio gets in your blood, its spark never dies. . . sometimes it just hibernates for a while.

By Bruce Vaughan, NR5Q
PO Box 203
Springdale, AR 72765



Al reached in his coat pocket and removed the paperback book Badland Justice by Lawrence LaRue. This must be LaRue's last book, he thought, as he regarded the cover. He looked forward to reading it after dinner.

Although he had enjoyed teaching physics to high school students, Al decided last year to retire early. Deeply tanned from years in the southern New Mexico sun, he looked and felt younger than his 58 years.

Al soon found he had more free time than he wanted. Afternoons, he would walk down to the Plaza, stopping to visit with merchants along the way. Somehow, he had the impression that he looked forward to these visits more than the shopkeepers did. Now, though he would never admit it, Al was getting bored.

Marie had prepared Al's favorite dish for dinner: chili rellenos. "Al, John called while you were at the bookstore," Marie said. "He wants to come by tonight talk to you about something."

After dinner, Al turned on the stereo and picked up his paperback. Leaning back in the recliner, he wished his son would put off tonight's visit. Just then, he heard the back door slam and he knew John had arrived. He sighed, thinking, "I'll never teach that boy not to slam doors."

"Hi, Dad," said John. "I want to talk to you about something. Remember when I was a kid and you had a ham station in the basement? Well, I have a friend at work who's a ham, and Bill tells me they're having a big ham equipment flea market at the Armory over on San Rafael Street this weekend. Why don't we drive over Saturday morning?"

"No, I don't think so, son. Ham radio has changed a lot in the last 25 years. I'd be in a totally different world. Besides, I let my ticket lapse 26 years ago," Al replied. "My hamming days are over. I'll leave things like ham radio for the younger people."

"Yeah, I know, Dad. I've often wondered why you quit when you seemed to enjoy ham radio so much," said John.

"Well, John, I got busy with teaching and this family and fixing up the house. I just ran out of time," Al replied. "There was also the problem of money. I was using my World War Two-vintage equipment while everyone was going to sideband and VFO control. It seemed time to retire the rockbound AM rig and move up, but I just didn't have the money to do it. So that was that. Now do you understand?"

"I suppose so," answered John. "But go with me Saturday for old time's sake; you might see some old friends there. I hear they have a large turnout and everyone has a good time."

"Oh, I dunno, son..."

"You and I haven't done anything together for months. How about it?"

"Well, when you put it that way, John, how can I say no? Pick me up about seven and we'll stop for breakfast on the way. How's that sound?" Al asked.

"Great, Dad! See you Saturday morning." With that, John rushed into the kitchen, gave his mother a hug and left, slamming the door on his way out.

On Saturday, Al was up and dressed by 6 AM. He wore his walking shoes and comfortable clothes, remembering the hamfests he'd attended years ago. He was just finishing his first cup of coffee when he heard John's pickup pull into the drive. Knowing John would slam the door, waking Marie, he quickly left the house.

"Good morning, son, glad to see you could get out of bed on time," greeted Al.

"Hi, Dad," replied John. "The doors open at eight and if there are any red-hot bargains, you have to be there early to get them. Let's grab a fast breakfast and hurry on over."

John and Al entered the busy restaurant, picking a booth near a window. Most of the male patrons sported baseball caps with their call signs proudly displayed on the front and many people wore engraved badges. Al was surprised to see quite a few folks his age or older. Maybe ham radio was for old-timers as well as young people. Looking out the window, Al noticed a lot of vehicles with call sign license plates and all manner of fancy antennas. John, passing on what Bill had told him, explained about VHF FM and repeaters.

"Good morning, boys. I'm Judy. I'll bet you're a couple of ham radio operators. They've been coming in here since before six this morning. I guess you're having a convention over at the Armory. What'll you have?" While talking, Judy was pouring two steaming cups of coffee. "So where are your caps with your numbers on them?" she asked.

Al answered, "We're not exactly ham operators, Judy. John, here, is my son and wants to become a ham. I was a ham years ago." He handed her the menu. "We'll each have a short stack with bacon and two eggs on the side, over easy."

"Look, Dad," said John. "Isn't that guy looking our way someone you used to know?"

Glancing up, Al studied the face. "Well, I'll be dipped...that's old Mike Sears, W5HTD," said Al. "I'm going over to say hello."

"Hello, Mike," said Al, "I haven't seen you in years. How's everything going?"

"Why, look who's here. Glad to see you,

Al," said Mike. "I haven't heard you on the air for the longest time. What bands are you working?"

"Well, it's like this, Mike," answered Al. "I sort of got busy with the family and my job and, well you know how it is. I just let my ticket go. I'm thinking about maybe getting back into ham radio, but I don't know. It's such a hassle getting your license and all."

"Not anymore," replied Mike. "I'm a Volunteer Examiner. I'll be serving with two other VEs at the exams next month. You can take the exam right here in town. It's not like the old days, Al, when we had to wait months and then drive to Albuquerque to take it."

John was half through with his breakfast when Al returned to the table. He could tell his Dad was excited. "John, did you know you can take the ham exam right here in town?" asked Al.

"Sure, Dad. I know. Bill's a VE. There are a lot of them in this area," replied John.

"Hmmm...sounds kinda convenient. You know, I just might take my exam again sometime...I wouldn't want an elaborate station, just something simple," mused Al.

After breakfast, John and Al drove to the Armory. A young fellow with a hand-held transceiver was directing traffic. "I wonder if those little 'walkie talkies' are any good?" asked Al.

"Bill says you can often work up to a hundred miles, going through the repeater," answered John. "All the folks seem to have them."

"I'll pay for the tickets," said Al, as they walked toward the registration desk.

Placing the small card in her typewriter, the young woman at the table smiled. "That will be five dollars each, sir. Please give me your name and call sign."

"My name's Al Welch," replied Al, "and well, you see...my old call was W5HTX...but I let it lapse...I'm thinking of..."

"No call. Okay, sir, please pin this to your shirt and write your name and address on the ticket stub for our door prize drawings." The YL already was filling out John's card before she stopped talking.

"John," said Al, "I suspect I'll be doing a lot of visiting and looking. I wouldn't want to slow you down, so why don't we split up and meet at the lunch counter at noon."

"Okay, Dad, I'm going to look for a good used 2-meter rig for the pickup," replied John.

The Armory was large and Al was surprised to see that it was jam-packed with people and new and used equipment. The first table he stopped at had a lot of equipment on it that he was familiar with. There was a SX-100, HQ-129, Globe Scout, DX-60 and even an old Meissner Signal Shifter. Al remembered how he had wanted a Signal Shifter. Among all this equipment was a bunch of 813 tubes, variable capacitors, a Vibroplex bug and all the other "by-products" of years of hamming.

The seller completed a deal on an old J-38 key and turned to Al. "What could I sell you today?" he asked, "Well, I'll be darned! If it's not Al Welch."

Al recognized Jim immediately. They had once driven to Albuquerque, looking for parts for an amplifier Jim was building.

"Jim, it's sure good to see you," said Al. "Do you remember when we went to the city looking for parts for your kW?"

"I sure do, Al. Tell me what you've been doing in ham radio," replied Jim, "Are you working a lot of DX during this terrific cycle?"

"Not exactly, Jim," said Al. "You see, I went and let my ticket lapse. I'm considering taking the exam next month. I think I'll pick up some books and review my theory. You know, when I was hamming, I always wanted a Meissner Signal Shifter like this one. How much do you want for it?"

"Al, y'know, they really aren't practical now—about all they're good for is the cabinet and parts. I'm tired of moving this one around. Is it worth twenty bucks to you?" asked Jim.

"Sure thing," said Al. "Okay if I pay you for it and leave it under your table? I may also buy another item or so while I'm here."

"No problem, Al," replied Jim, placing the old Signal Shifter under the table. "I'll be here all day."

The fellows at Pueblo Electronics had several brand-new HF transceivers set up, ready to operate. There were models and nameplates Al had never heard of: an ICOM IC-781, a Yaesu FT-1000 and a Kenwood TS-950SD. Al stopped, took one look at them and decided he was foolish to even think of getting back into radio. There were so many knobs and buttons that were meaningless to him. "Could I help you, sir?" asked the young fellow behind the counter.

Al was embarrassed—how could he tell this youngster that he didn't know enough about these rigs to even ask a question? "Well, you see, I'm an old-timer who's been inactive for years and I really don't understand this new gear at all," said Al. "I was thinking of taking my exam next month, but I think it sorta looks like radio has changed too much."

"Let me walk you through the operation of one of these little jewels, then you may change your mind," said the young man. Pointing at the front panel of one rig, he slowly explained each control to Al, then said, "Why don't you work with it a few minutes while I show a hand-held rig to that fellow over there?"

Al pushed the "14 MHz" button. The digital readout was new to him, but he slowly tuned down to the low end of 20. Some of the CW he was hearing must have been close to 25 WPM. Al, without thinking, was getting solid copy in his head. Then, all of a sudden it hit him—he had not forgotten. He then tried the audio filters and was just getting into the operation of the memory when the salesman returned.

"What do you think of it?" he asked.

"I really like that digital readout," replied Al and the filters work great. "How much does it sell for?"

The salesman quoted a price and Al caught his breath. "That much!" said Al. "Boy, that's a lot of money for such a small package."

"In a way, but think about it a minute," replied the salesman. "You're getting a high-powered multimode rig with two VFOs, computer-controlled digital features and a receiver that could only be dreamed of just a few years ago. Looking at it that way, it's really a bargain."

Al paused, then said, "If you have time, show me some of the other new things that have been happening to ham radio."

One hour later, Al took out his checkbook and wrote a check to the young man. "Would you please put that in back for me? I'll get my son to help me pick it up."

Al looked at his watch. Time sure does fly; it was already 11 AM. Oh, well, it was an hour before he had to meet John. He started moving through the maze of tables, equipment and hams. Just then he spotted the Hallicrafters SX-115 and HT-32. Walking over to the table, he couldn't believe the price. How could anyone let these two beautiful pieces of gear go for only $200? One thing was for sure, he couldn't pass up a bargain like this. What fun it would be to put these two units on the air and work CW again!

Al stuck out his hand. "I'm Al Welch," he said. "I was noticing the SX-115 and the HT-32. What can you tell me about them?"

"Glad to know you, Al, I'm George Hilton. The two units were in use at my shack for years. They're working great, but they just became obsolete. No one runs separates anymore. Tell you what, if you have any use for 'em I'll sell you both for $150. You do have a license, don't you?"

"No, at present I'm not licensed," replied Al. "I'll be taking my exam next month. I was a ham for a lot of years and only took a break to get my second wind. Here's the money for the Hallicrafters equipment. I'll have my son pick 'em up right after lunch."

John, waiting at the lunch counter, said, "Hi, Dad, did you find anything to interest you this morning? I was afraid you'd got bored and gone to the truck to wait for me."

"Hardly," replied Al, "let's get a cold drink and a couple of sandwiches, then go out in the shade and eat. I have a few things I need to discuss with you."

John listened to his Dad talk for several minutes and then said, "Just exactly how much stuff did you buy in there?"

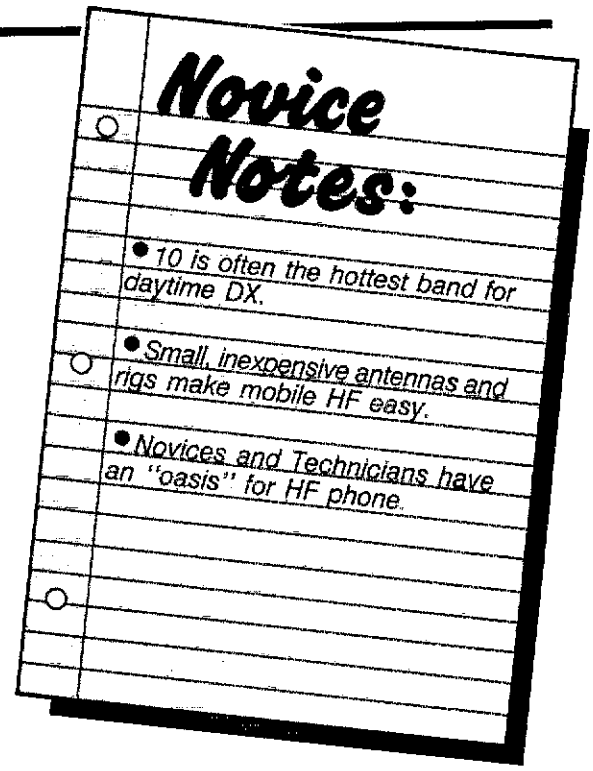
"Well, it's like this, son," began Al, "I have a lot of time now, and...well, everyone needs a hobby, so you see...that is, I always wanted a Signal Shifter...."

(continued on page 63)

Why So Many Hams Carry A Torch for 10

Capricious and seductive, the highest-frequency HF band offers a world of exciting activity for any interest or budget.

By James D. Cain, K1TN
ARRL Associate Editor



The 10-meter band is like someone you once knew. When it's good it's terrific, when it's bad it's awful and you never know from one day to the next what its mood will be. That may explain why so many hams carry a torch for 10.

On what other band can you work someone a thousand miles away with rock-crushing signals and have a station 12,000 miles away break in?[1]

Where else can you talk around the world on an antenna just eight feet tall with a transceiver from Radio Shack? And name another band with repeaters that regularly reach to other continents.

You can take a 10-meter rig and dipole to school in a lunchbox, make some voice contacts, then tell your classmates they can do the same just by getting a beginner's license.

Visit an old-time ham and chances are he may pull out a scrapbook of QSL cards from 250 or more countries, all worked on 10. He may brag just a little about doing that "from the mobile," or with an antenna in his attic. And when he says that in the "good old days" the band was open 24 hours a day to everywhere—well, old timers are allowed to stretch the truth a little.

Actually, those good old days are now and they were never better.

Room for Everybody

Every Amateur Radio operator has access to at least some of 10 meters and has a choice of CW, data modes and SSB. Everybody is welcome because the band is big. Its 1.7 MHz of spectrum nearly equals the sum of the other eight HF bands. During organized operating events, battalions of stations blanket 28.3 to 29 MHz and beyond—a range double that of the popular 20-meter band.

In a fascinating turn of events the past few years, many contest winners have made nearly half their contacts on 10; other bands seemed deserted because most competitors were on 10—"everybody's favorite band."

For DX, 10 meters is a joy. Operators on the other end easily hear you answer them, because—due to the "skip"—the DX station is many times stronger than his pileup.

And the DX operator hears better because the selective skip keeps the pileup manageable. Last February, I operated the ARRL CW DX Contest from the Bahamas, working the US and Canada. Looking at my 10-meter log, I can plot the skip sliding across North America, first long, then short, moving east instead of west, then stretching out again.

The band is especially attractive to newcomers. Low power and basic antennas perform better on 10 than anywhere else. Avoid the frustration of static on 80, shortwave broadcast stations on 40 and "big-gun" high-power stations on 15 and 20 by using 28 MHz.

Two Worlds

Although 10 meters favors the daylight hours, you can make contacts 24 hours a day. Activity abounds and 10 meters has become a meeting ground of old-timers and beginners. Amateur Radio contests, some more than 50 years old, have been changed dramatically by this surge of new operators on 10 in the last few years.

If you are an experienced Technician class operator (some of whom have been licensed more than 30 years), coming down to 10 from higher (VHF) frequencies can be like meeting a distant cousin for the first time. Ten meters will remind you of the 6-meter (50-MHz) band.

If you are a Novice "moving up" to 10 from lower-frequency bands, your appetite for VHF, Amateur Radio's great frontier, may be whetted.

Modern technology has made the band more accessible. No longer do HF rigs strain to reach 28 MHz (as 5-tube receivers did 30 years ago). Rigs today are as clean and stable at 28 as at 1.8 MHz (and at lower prices than in "the good old days").

Ten meters has a greater variety of communication modes available to Novices and Technicians than any other band. While virtually everyone has a rig for CW and SSB, Novices and Technicians may also operate data modes such as RTTY, AMTOR and packet radio in the 28.1-28.15 MHz range.[2]

These new modes are great for impressing nonhams and the computer-radio link will light up many youngsters' eyes. You can use the money you might otherwise spend for a linear amplifier to get on these data modes.

A Day in the Life

It's midnight. You retire to the shack to do some computer work. While you are at it, put your transceiver on 10 meters and set the scan function to patrol your favorite segment, or the whole band.

If you have a directional antenna, point it toward the area most likely to support sporadic-E propagation (maybe toward a major weather front). Or aim at a metropolitan area for groundwave possi-

[1]Notes appear on page 56.

bilities. Chances are good your scanner will turn up a signal.

If you are adventurous, send some CQs (the band is dead if nobody transmits). Use popular frequencies: 28.115 MHz on CW, 28.400 or 28.450 on Novice SSB.

Ten meters, more than any other band, follows this pattern: If you can hear a station, it is likely you will be heard in return. Sometimes the weakest ones will hear you better than the loudest. You can flex your low-power muscles, knowing your chances of getting through are good.

Now that you have dredged up a local station by calling a few CQs and made a single-hop sporadic-E contact out 800 or 1000 miles, try calling a weak groundwave station; if he doesn't come back, he may be running a lot more power than you.

Listen for beacons (28.19-28.3 MHz)[2] and for repeaters above 29.5 MHz. Repeaters and beacons are harbingers of band openings. Novices and Technicians aren't licensed to transmit through 10-meter repeaters (unless they're linked to VHF), but there's no law against listening!

These exercises completed, go take a nap and get up about an hour before dawn. Dial up WWV (the National Institute of Standards and Technology station in Colorado, on 5, 10, 15 and 20 MHz). At 18 minutes past the hour, WWV will give you a propagation report. The important numbers are the "A" and "K" indices and the solar flux. A high solar flux (150 or more) and low A and K indices (zero or single digits) indicate the chance of good conditions.

If WWV says a geomagnetic storm is in progress, that explains why your receiver sounds dead. During periods of high sunspot activity (like now), these solar disturbances are fairly common.

Go back to your computer and run a gray-line terminator program. This is not an Arnold Schwartzenegger game. Gray-line software, available from several sources, displays a world map with current areas of daylight and darkness. When you are on the light-dark edge, a station on the other side of the globe at his dark-light edge is said to be on the "terminator."

The best opportunity to make contact is when you and the other station are both on the gray line. Turn your antenna toward the terminator at the other end and listen, or call a few CQs. If nothing happens, scan the band for local big guns. If they are working somebody you can't hear, be patient. The band will open for you before long.

If the sun is up and the band is still completely dead, drop down to 15 meters (21 MHz) for a listen. If you hear stations—and the solar flux is high—10 will open. But it could take as long as an hour.

If nothing is coming through on 15, pull the switch and go to work.

Here Comes the Sun

Some years ago, a friend took a two-hour rest period each night of the ARRL International DX Contest[3] after running out of stations on the low bands (40 meters and below) and before the high bands (20 meters and higher) opened. Dialing in 14.005 MHz—a hot spot—he propped up his headphones on the desk and slept in the operating chair, waiting for signals to wake him up.

Today these techniques aren't called for. Your scanning transceiver just found its first 10-meter station and it's still pitch dark. This is going to be a good day!

The first signals you hear will be east of you (already in full daylight) from high-power stations. If you're hearing Europe, the Eastern USSR will probably be coming through first; the Ukraine has been in the sun for hours now. Your first calls may go unheeded, but keep trying (this is the dreaded "one-way skip").

If a W4 in Florida beats you to a contact across the Atlantic, don't worry. He's been in the sun longer than you have. If a Caribbean station gets through first, not only has his sun been up longer, but his exotic call sign makes him very attractive!

In a little while, Central Americans will pop up, then South Americans (except the Brazilians, who always come through, for reasons beyond the scope of logical thinking). If you are on the east coast of North America, enjoy this while you can, before Europeans and Africans start working the Midwest, then the Rockies and finally W6 and W7.

Tune fast. Check CW and SSB. Call some CQs.

When the band really heats up, go down to 15 meters. If 15 doesn't sound so hot, you really are in business, because the MUF (maximum usable frequency) has already hurdled 21 MHz. If you are a Technician, you may be on your way to 6 meters by now, as that band stands a good chance of opening.

On 10, check the long path to Asia (for signals coming 180° away from the "direct path"—if your great circle chart says Japan is at 350°, the long path is 170°).

Equipment and Antennas

If you already have an HF rig, it undoubtedly includes 10 meters and probably works fine there. "Probably" because older equipment, especially with vacuum tubes, may dodder a little on its highest-frequency band. The newer solid-state synthesized rigs are better in this respect, as they have fewer moving parts and no vacuum tubes to weaken or die.

Thinking about buying your first HF rig or a replacement? One alternative is older, inexpensive second-hand rigs, transceivers or separate receivers and transmitters. The advantage of such equipment is cost. For example, a 20-year-old Drake "B" line can be had for as little as $300, less than a third of its price when it was new.

The disadvantage of old equipment is the same as old *anything—caveat emptor*. Consultation with a more experienced amateur, perhaps the person who gave you your license exam, can prevent indigestion. It's common for an older set to work well on the lower frequencies but not on 10 meters (nor maybe 15).

Older radios will benefit from a set of new tubes and a tune-up. They are easy to work on, with room inside to maneuver.

Transceivers from the 1970s, like the Kenwood TS-520, also can be had for a virtual song. Most of these '70s rigs, like the 1960s models, use tubes and will run at least 100 watts—plenty of power, especially on 10 meters.

A new item is the dedicated 10-meter transceiver, inspired by the tremendous market demand brought on partly by Novice Enhancement and the exceptional propagation we've enjoyed lately. One example is the Radio Shack HTX-100, which Lew McCoy, W1ICP, says is a "very good one."[†] This set works SSB and CW over the entire band, runs 25 watts output and costs just $259 (plus the cost of a small DC power supply).

If you are convinced you want to operate just one band, transceivers like this are a good choice, especially because they're ideal for mobile use. They are exceedingly simple to operate and by virtue of their simplicity, have fewer things to go wrong. Single-band rigs for 10 are offered by several manufacturers and their ads can be found in *QST* and elsewhere.

On the other hand, although there are many converted Citizens Band rigs in use on 10, they have serious drawbacks: crystal control, SSB only (no CW) and only 5 watts of transmitter power input. If you can get one cheap (or free), however, and it works, you can be on the air for next to nothing. This approach has a certain charm that appeals to many hams. A number of articles have described the conversion of CB rigs to 10 meters.

The used-CB market is a great source of antennas and rotators. Ten-meter beams are relatively small and lightweight, easily turned with a TV-type rotator and can be roof-mounted on a tripod.

The spread of cable television has created a glut of used but usable masts, rotators and feed lines. Visit a neighbor and offer to take down her old TV antenna.

Just as with rigs, a single-band antenna limits your ability to use other bands, but a CB antenna, easily modified by lengthening the elements a bit, can provide the thrill of a directional antenna at minimal cost.—*K1TN*

†L. McCoy, "CQ Reviews," CQ, Jun 1989, pp 46-47.



The long path will be strongest just after your dawn and as the sun is setting over Japan. This is one of your best times to work long-haul contacts with a minimum of competition. One JA at breakfast is worth ten at dinner.

Your first few long-path contacts may send you out to buy a world globe for the shack.

Throughout the day, keep your gray-line program running and watch as areas of the world run out of sunlight.

You will start to take a back seat as stations to your west benefit from more sun. W6s will start working Europe and the Caribbean, but they're just getting their rightful turn. The light-dark line creeps across the Pacific and it's time to listen for Hawaii, other islands, Japan and the Far East (this time on the short path).

At midday, when both coasts of North America are in full sun, it's also time to work across the country and complete your Worked All States.

Go up to the FM range (above 29.5 MHz) and listen to three or four repeaters interfering with each other on the same frequency as somebody with a handheld transceiver keys up machines thousands of miles apart. These repeaters are another good reason to upgrade to General class.

Incidentally, 10 meters is so big that the band can be open at 28.1 MHz but not at 29.5 MHz. You are most likely to observe this phenomenon just as the band opens in the morning and shuts down in the evening.

Before you know it, the day is gone and so is 10-meter DX. So it's back to calling CQ or dinner (you do remember dinner?).

Don't Be Single-Minded

A ham I know used a Collins S-Line (a 1950s vacuum-tube rig). It barely worked anyplace but the 20-meter band, because that's where its mechanical bandswitch had camped for years. In fact, it was reluctant to work on any frequency except 14.025 MHz. Don't let this happen to you.

Every band has its place—80 and 40 meters are where thousands of Amateurs first operated and learned about static. On 40 meters we discovered that Radio Moscow doesn't follow the gray-line rule. 15-meter CW was where most of us worked our first DX and our first television set.

Even VHF FM has its purpose: For bragging to the locals about the DX worked on 10 meters or how we finally overcame the 13-WPM "barrier."

But these still are fun bands. 160 meters (1.8 MHz, just above the AM broadcast band) harkens back to the first days of radio, when everyone but hams thought the usable spectrum stopped at 200 meters ("short waves are useless—let the hams have them"); 80 is the best "local" HF band, yet a few insomniacs have worked 300 countries on it.

40 meters is where, when The Solar Storm of the Century occurs, you still can work somebody; 20 is the band open to the most areas of the world, the most hours per day, year in and year out; and 15 meters is a junior 10 meters (and a junior 20).

If you have a General class or higher license, don't forget our bands at 10, 18 and 24 MHz. These relatively new bands have plenty of open space for two reasons. When 10 MHz opened almost a decade ago, few people had rigs that worked there; it took manufacturers a while to catch up.

And when we got 18 and 24 MHz not long ago, the solar cycle maximum made the surrounding "traditional" bands so good that many hams have been slow to try 17 and 12 meters.

But when the sunspots begin to fade, there will be days when 10 is dead but 12 is open, 15 is marginal but 17 is good and so forth. In early 1990, many hams around the US reported that the 17-meter signal from W1AW eclipsed those on 15 and 20 meters.

Back in the old days, if Novices had had 10 meters and 220-MHz FM (not to mention a 200-watt power limit and VFOs), some of us probably would have flunked out of junior high school. Beginners today have incredible freedom to operate, so enjoy it. Especially the sunspots and 10 meters. Three or four years from now, you will tell the Novice class you are teaching about the "good old days" on 10 when you worked the world. Running two microwatts to a vegetable peeler, of course.

Notes

[1]D. Newkirk, "Are You Ready for 10-meter E Skip?" *QST*, Apr 1988, pp 57-58.
[2]D. Newkirk, "What's Going on in the New Novice Bands," *QST*, May 1988, pp 44-47.
[3]R. Halprin, "Contests and You—Perfect Together," *QST*, Jan 1989, pp 48-52.

Sweepstakes for the Beginner

(contined from page 51)

tion on p 17-155 of *The ARRL Operating Manual* (3rd ed, 3rd printing).

Determine what section you're in before the contest starts. Don't engage in "investigative journalism" on the air in the midst of the contest!

The rule of thumb in logging a lot of multipliers is to work everything you hear while you're on and don't sweat the multipliers (but keep track of the ones you've worked). Emphasis should rest on generating contacts. If you're reasonably active, you'll probably come across most of the multipliers in your hunting and pouncing. Don't spend 15 minutes calling a Connecticut station just because it happens to be a new multiplier. Chances are great that you'll find another easier-to-work Connecticut station later in the contest. In contrast, VE8/VY1 has been difficult in the last couple of years, so if you hear this rare Canadian multiplier, do your best to work it right then and there, even if it takes a while.

For more information on contest basics, see my articles "Contests and You: Perfect Together," January 1989 *QST*, pp 48-52, and "Awards Chasing," April 1989 *QST*, pp 49-52, which are both reprinted in the League's anthology publication *Novice Notes: The Book*.

Go for it!

Amateur Radio contesting is diverse and fascinating—and can definitely be habit forming! Because of its domestic flavor, SS is uniquely suited to amateurs who primarily run 100 watts to a dipole or low tribander. Have you ever wondered what your station can really do or how sharp your operating skills are? SS is the time and place to find out, and have fun in the process. So fire up your rig, your computer and your imagination, and...CQ SS!

Hitting the Limit

Gentlemen's agreements have served amateurs well for 70 years, but it's time for formal management of our frequency portfolio.

By John F. Lindholm, W1XX
Manager, Membership Communications Services

FOR SALE: Two-meter repeater frequency pair in Manhattan. Assigned to the Intergalactic Trade Center. $2 million or best offer.

Of course, this "Ham-Ad" is fictitious. But the tremendous commercial pressure on the radio spectrum, especially in the major metropolitan areas, is all too real. A recent *New York Times* article reported "fierce elbowing for space in the radio spectrum," with everything from pizza delivery businesses to high-definition television vying for access to the same spectrum. Government officials speak of holding auctions, and other ways of conveying property rights to the radio spectrum to generate federal revenue and to encourage efficiency in its utilization.

Increasingly, the access to spectrum that we enjoy as radio amateurs is viewed in terms of what it would fetch on the open market. Spectrum that was of little commercial interest as recently as a decade ago is the new battleground for exploitation. UHF and microwave bands that we have shared successfully with the military are being eyed for other uses, possibly incompatible with ours. Against such reasoning, we must show that our use of the amateur bands is in the public interest, efficient, and well-managed.

In simpler times, this was easy enough to do. There was CW and there was phone, and the FCC told us where phone could and could not be used. There was also interference; lots of it. Amateurs coped with it as best they could, recognizing that everyone had the same right to operate and no one had the right to tell someone they couldn't. We developed a knack for peaceful coexistence, using congestion as a spur for improving our equipment and for migrating to higher frequencies to escape the crowd. Aided by war surplus and experimenters' zest for new horizons, we pushed higher in frequency ahead of commercial services.

In the "good old days" the small group interested in a new mode or a new pursuit would seek out the quietest place they could find to operate, and the rest of us—probably with the thought that it was better to contain the racket in a corral than to have the newfangled noisemakers roam the range—would make a little room for them without much complaint. In this way and without formality, narrow slivers of bands became recognized for particular uses by so-called "gentlemen's agreements"; but if asked to produce documentation of the existence of any such agreement, no one would have been able to do so. This informal approach worked surprisingly well for a surprisingly long time.

Today, things are different. At an accelerating pace, technology brings us new modes to use in competition with traditional modes and in bands that are already full of activity. Domestically, only the FCC has the authority to make binding rules on our use of the amateur bands; but in today's deregulatory atmosphere the Commission has neither the interest nor the resources to do so, and even if it did we'd probably not like the result. Recent problems with Amateur Radio spectrum management have led ARRL Executive Vice President David Sumner, K1ZZ, to comment, "We have hit the limit of our ability to deal with internal band planning either through the FCC or by informal gentlemen's agreement."

Through studies by its Membership Services Committee (MSC), which is charged with band planning matters in the ARRL By-Laws, the League's Board of Directors has been addressing this issue for some time. The MSC believes it is close to a solution. In response to its report to the Board at the July meeting, the committee was instructed by the Board to seek further member input "with a final report and recommendation to be brought back to the Board at its 1991 Annual Meeting" next January.

Who Will Lead?

Over the years the League has addressed spectrum management in a somewhat fragmented way. On VHF, the League supports a volunteer advisory committee for repeaters and another essentially for "weak-signal" modes. There are three more for DXing, contests, public service and a digital committee.

An entirely separate organization—the Radio Amateur Satellite Corporation (AMSAT)—deals with both technical and operational aspects of amateur satellites.

But what ties all these diverse interests into a single, cohesive response to spectrum demands? Today, nothing does short of the Board itself.

The MSC has proposed an Amateur Radio Consultative Committee (CCARS), made up entirely of amateurs.

CCARS working groups—one for HF and one for 30 MHz and above—would:

- Review current practice, ARRL band plans, and spectrum usage recommendations;
- Consider the interests of all user groups;
- Take into account technical matters relating to spectrum usage;
- Always look to the future.

As the organization of the International Amateur Radio Union Region 2 (which includes the US) has become more tightly knit in recent years, so has its ability to band plan. CCARS would complement these efforts.

CCARS working groups would operate on a three-year cycle to coincide with the triennial conferences of the IARU. Regular progress reports would appear in *QST*, with user input sought at every juncture. Final reports of the working groups would be published every three years.

Each working group would consist of some half-dozen highly qualified, neutral amateurs. Current ARRL advisory committees would be connected, as part of the process. The ARRL would fund committee activity, including at least one in-person meeting per term. Final reports would be presented to the ARRL Board for consideration.

Speak Up

Can Amateur Radio, an international free society of the airwaves, govern itself more effectively to maximize spectrum usage for us all? Can we do so in a manner that gains universal acceptance—and approval? Your thoughts are solicited on both the concept and the proposed mechanics of the CCARS. Write to ARRL Spectrum Management, in care of ARRL HQ.

Happenings

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Editor

Comment Deadline Looms for New Methods to Test Disabled

At an open meeting August 1, the FCC announced proposed amended rules to accommodate those persons who, because of severe handicaps, have extraordinary difficulty in passing the higher-speed Morse code telegraphy examinations for amateur operator licenses. The Commission issued the Notice of Proposed Rule Making (NPRM) in PR Docket 90-356 on Morse code testing of persons with disabilities, setting a comment deadline of September 24 and a reply comment deadline of October 9.

Although the subject had been broached earlier (see Happenings, Sep *QST*, p 60), specific written information was not available until after the ARRL Board of Directors held its second 1990 meeting in late July.

For some time, Volunteer Examiners (VEs) have exercised discretion in accommodating persons with disabilities, giving them several options in the testing of Morse proficiency. Present FCC Rules say, in Part 97.509 (h), "The administering VEs must accommodate an examinee whose physical disabilities require a special examination procedure. The administering VEs may require a physician's certification indicating the nature of the disability before determining which, if any, special procedures must be used."

The FCC went a step further in a letter to Volunteer Examiner Coordinators (VECs) on July 18, asking VECs to "expand the special procedures the VEs make to accommodate handicapped individuals."

In the letter, the FCC said "The Commission's policy is to exempt from the 13- and 20-WPM examinations persons holding a current, or within the renewal grace period, Novice, Technician, General or Advanced class operator license who, because of their severe handicaps, cannot pass these examinations, even when the above special accommodation procedures are used."

In what the Commission referred to as "interim procedures," VEs were given specific instructions for obtaining a physician's certificate concerning the examinee's disability and guidelines for applying to the FCC for a total waiver of the 13- and 20-WPM Morse code examinations for those individuals.

The FCC said at that time that an NPRM was being drafted.

The FCC's procedures for accommodating disabled applicants include substituting a sending test for a receiving test or pausing the CW tape to allow the examinee to speak or otherwise communicate the message to the VE.

The Morse requirement in its most basic form has not been eliminated—waivers are available only to applicants with severe disabilities already holding at least a Novice class license. This meets international requirements for operation below 30 MHz.

The Commission asks for comments on this proposal. It is anticipated that VEs in particular will have something to say about the proposal. ARRL sent a copy of the FCC proposal to each of its active VE teams.

Unfortunately, the FCC's comment period is quite short and affords little opportunity to get the word out. The comment deadline is September 24, just about the time you receive this issue of *QST*. The deadline for reply comments is October 9. The FCC has stated that "Extensions [to the comment period] are not contemplated." At press time, the League response to the NPRM was being formulated.

To file formally in this proceeding, participants must file an original and four copies of all comments and reply comments. If commentors want each Commissioner to have a personal copy of the comments, an original and nine copies must be filed. Comments and reply comments should show the docket number on the first page and they should be sent to the Secretary, FCC, Washington, DC 20554.

BLIND HAM HONORED AT WHITE HOUSE

Scott Charles LaBarre, KTØU, a 21-year-old Amateur Extra Class ham who has been totally blind since age 9 has received the Recordings for the Blind 1990 Scholastic Achievement Award. LaBarre, of Woodbury, Minnesota, a recent graduate of St John's University in Collegeville, Minnesota, received a check for $3000 from the General Electric Company for "extraordinary scholarship, intellect, enterprise and service to others."

LaBarre, who plans to enter law school this fall, earned his Novice license at age 13 and his Amateur Extra Class ticket by 14, through the Courage Handi-Ham System. For more information on Handi-Hams, write to Courage Handi-Ham System, 3915 Golden Valley Rd, Golden Valley, MN 55422, tel 612-588-0811.

HQ STAFFERS REASSIGNED

To make the greatest possible commitment to preparations for the World Administrative Radio Conference in 1992 (WARC-92), three ARRL HQ staff members assumed new duties on July 23.

Paul Rinaldo, W4RI, has been named Manager, Technical Development. Rinaldo is responsible for WARC-92 preparations, which are closely tied to frequency allocations. He remains as Editor, *QST* and *QEX*.

Mark Wilson, AA2Z, has been named Publications Manager, with overall responsibility for planning, editing and production of League publications. He continues as Manager of the Production Department and Managing Editor, *QST*.

John Nelson, W1GNC, moves to the business staff as Manager, Planning and Financial Analysis.

NETS GET MORE TIME TO RESOLVE DISPUTES

The Federal Communications Commission has granted several nets operating on the 20-meter band more time to resolve their ongoing disputes.

The FCC entered the 20-meter dispute late last year when it sent letters to 19 net and bulletin station managers (including W1AW, which is not involved). A second FCC letter to nine of the managers asked them to come up with a plan to resolve the disputes, many of which have been occurring for some time (see Feb *QST*, p 53; March, p 61; and May, p 53).

The Chief of the FCC's Special Services Branch Robert H. McNamara, wrote on August 9:

"The Commission has received five individual plans addressing the underlying causes of unproductive on-the-air disputes that were taking place on the 20-meter amateur service band. It is obvious that the amateur community desires that the disputes be resolved amicably and that potentially restrictive rule making be avoided. It appears, moreover, that there has been progress in resolving the disputes.

"The plans recommend that the amateur community be allowed to continue addressing this problem internally. Interest in this approach as a model for future dispute resolution in the amateur community has also been expressed by other observers.

"Because rule making could limit the flexibility that amateur operators now enjoy, it is important that you succeed in this activity. I believe that the requested extension of time is warranted. Correspondence from other amateur service licensees indicates that they, too, are interested in assisting with the development of the amateur community's plan. Therefore, I am extending until February 1, 1991, the date for you and other interested amateur service licensees to develop the joint plan."

THREATS BRING AMATEUR'S ARREST

According to an FCC News release dated August 14, FBI agents, assisted by FCC investigators, arrested Anthony V. Marcantonio, KA2ZGE, of Queens, New York, on August 2 and seized 20 pieces of radio transmitting equipment. The FCC had previously responded to complaints that Marcantonio was "interfering with Amateur Radio communications by transmitting unidentified, disruptive signals on the 2-meter Amateur Radio band," according to the FCC.

"On July 27, FCC investigators, using direction-finding equipment, traced the signal to the Marcantonio home," the FCC said. "The investigators discussed the situation with a family member who then shut the transmitter off. The transmissions resumed that evening and continued into the next day." It was then, according to the FCC, that Marcantonio made death threats over the radio against an FCC investigator.

Marcantonio was charged with making threats by radio, a felony carrying a penalty of up to five years in prison, a $250,000 fine, or both. Following a hearing, a Federal judge set Marcantonio's bond at $50,000.

420-MHz RESTRICTIONS EMPHASIZED

Amateurs in New Mexico and western Texas using the 420-450 MHz band have been asked by the Department of Defense (DoD) to step up efforts to avoid interference to the White Sands Missile Range. Amateurs in the area are already restricted to 50 W PEP, on a secondary, noninterference basis within the White Sands Restricted Area.

DoD Area Frequency Coordinator (AFC) Stanley F. Greene, in an August 6 letter to selected amateurs, said that "additional coordination appears necessary to overcome conflicts in this band. In the 420-430 portion of this band, increased amateur repeater control activity and the possibility of mobile operations are a concern as sources of interference to White Sands Missile Range operations. Amateur mobile and repeater operations in the 430-450 portion, are a continuing concern to Fort Bliss range operations.

"The US Air Force...recently asked the FCC to add an additional rule for the White Sands Restricted Area. This would require amateur operators to coordinate any operations in the 420-430 MHz band with the White Sands DoD AFC before operating there. We understand that this request has been approved by the FCC in principle and will be incorporated in the future."

The letter asks that "mobile or repeater operations in the 420-430 MHz band not

FAR Scholarship Winners

On August 9, the Foundation for Amateur Radio (FAR) announced the 1990 winners of the 33 scholarships it administers. They are:

- John W. Gore Memorial Scholarship ($1000) to Stuart Rosner, WU4L, of Vienna, Virginia.
- Richard G. Chichester Memorial Scholarship ($900) to Michael King, KA8NAJ, of Canton, Ohio.
- Edwin S. Van Deusen Memorial Scholarship ($750) to Martin Gruen, KA2VLD, of Runnemede, New Jersey.
- QCWA Memorial Scholarships ($750 each) to William T. Baggett, AA5DF, of New Braunfels, Texas; Thomas W. Brown, KA2UGQ, of Berkeley Heights, New Jersey; Victoria L. Gruen, KA2VHR, of Runnemede, New Jersey; and Paul W. Hoffman, NK3M, of Sinking Spring, Pennsylvania.
- QCWA Leo Meyerson Family Living Scholarship ($750) to Robert M. Popella, KA3HIE, of Tidioute, Pennsylvania.
- QCWA Robert S. Cresap Memorial Scholarship ($750) to Jason G. Lovett, N1EJD, of Kennebunk, Maine.
- QCWA Cresson F. Donbar Scholarship ($750) to Heather L. Ludtke, KDØRU, of Glenwood Springs, Colorado.
- Radio Club of America Scholarships ($500) to Douglas Claprood, KA2KWB, of Mt Morris, New York; Timothy Potocki, N3CZV, of Bradfordwoods, Pennsylvania; and Jonathan Vidal, NY3Z, of Erie, Pennsylvania.
- Edmund B. Redington Memorial Scholarship ($500) to Richard T. De La Hunt, KAØLEE, of Park Rapids, Minnesota.
- Young Ladies' Radio League Scholarship ($1200) to Melissa Benish, N3FAC, of Pittston, Pennsylvania.
- Amateur Radio News Service Scholarships ($600 each) to Jennifer Doerrie, KA5WMJ, of Booker, Texas; and Paul C. Yoder, KA3MUD, of Bridgeport, Pennsylvania.
- Columbia Amateur Radio Association Scholarship ($1000) to Kurt W. Ruppecht, N3EOI, of Salisbury, Maryland.
- Baltimore Amateur Radio Club Scholarships ($1000 each) to Barry Bell, KA3PRE, of Reisterstown, Maryland; Andrew S. Faiola, N3GLA, of Silver Spring, Maryland; and David S. Katz, N3DKV, of Bowie, Maryland.
- Dade Radio Club Tropical Hamboree Scholarships ($1000 each) to Aaron A. Algiere, KC4NGA, of Gainesville, Florida and Nathaniel Tarbox, KC4AOI, of Jacksonville Beach, Florida.
- Rose Ellen Bills Memorial Scholarship ($2000) to Douglas M. Benish, N3CXB, of Pittston, Pennsylvania.
- Victor C. Clark Memorial Scholarship ($1000), sponsored by the Vienna Wireless Society, to William T. Free, KC3YO, of Fairfax, Virginia.
- Frederick Amateur Radio Club Scholarship ($1000) to Amos D. Faux-Burhans, KS3O, of Thurmont, Maryland.
- 10-10 International Net Scholarships ($750 each) to Mark Horwath, KA1SPU, of Derry, New Hampshire; and Nathan S. Willingham, KAØUFO, of Bevier, Missouri.
- WARAC Memorial Scholarships ($500 each), sponsored by the West Allis (Wisconsin) Radio Amateur Club, to Douglas Kleemann, KA9LWN, of Shawano, Wisconsin; Chad Kurszewski, WE9V, of Greenfield, Wisconsin; and Martin Van Der Burgt, KA9MSR, of Kaukauna, Wisconsin.
- Kevin Barry Perdue Memorial Scholarship ($1000), sponsored by Kay (KC3LM) and Carter (KD3AO) Craigie, to Matthew M. Harbur, KB2GHW, of Woodstock, New York.
- Karl R. Medrow Memorial Scholarship ($750), sponsored by the Goddard Amateur Radio Club, to Lesley D. Walker, N4FTJ, of Cullman, Alabama.

These scholarships were open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. The Foundation is a nonprofit organization representing 50 clubs in Maryland, the District of Columbia and Northern Virginia. It is devoted exclusively to the scientific, literary and educational pursuits that advance the purpose of Amateur Radio.

More information can be obtained from FAR Scholarships, 6903 Rhode Island Ave, College Park, MD 20740.

SECTION MANAGER ELECTION RESULTS

Ballots have been counted in the Section Manager election for Puerto Rico. The following votes were received:

Luis Lopez, WP4EPC, 112
Alberto Valldejuli, WP4CSG, 66
Lopez was declared elected.

Nine other Section Manager races were uncontested. Their terms of office began October 1, 1990. The following were declared elected:

ARRL Section	*SM*
Virgin Islands	Ronald Hall, KP2N
Minnesota	George Frederickson, KCØT
Oklahoma	Joseph Lynch, N6CL
North Dakota	Roger Kurtti, WCØM
Idaho	Don Clower, KA7T
Connecticut	Caesar Rondina, N1DCS
Western NY	William Thompson, W2MTA
Ohio	David Kersten, N8AUH

be performed in the White Sands Restricted Area, unless first coordinated with this office. The intent of the restrictions and coordination requests placed on amateurs *in this area is to prevent interference on* some frequencies, while allowing your general use of the band to continue. Your cooperation in this effort to prevent radio interference to area DoD missions is appreciated."

EQUIPMENT INSURANCE RATES RISE

The ARRL's "All-Risk" Ham Radio Equipment Insurance Plan will undergo a modest rate increase as of October 1, 1990. For every $100 of equipment replacement cost, the rate will increase to $1.50, up from $1.25. This is the first rate increase in three years. *The plan's administrator, the* Albert H. Wohlers Company (tel 800-323-2106; in Illinois, 708-803-3100) will notify League members at their next premium renewal. The ARRL plan remains less expensive than similar policies, which can cost as much as $8 per $100 of replacement cost.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Arizona, Arkansas, Iowa, Kentucky, Montana, Mississippi, North Texas, Orange and Wyoming sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on p 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 form FSD-129 is available on request from ARRL Headquarters, but is not required. The following is suggested:

(Place and date)

Field Services Manager
ARRL
225 Main St
Newington, CT 06111

We, the undersigned Full Members of the...ARRL Section of the...Division, hereby nominate...as candidate for Section Manager for this Section for the next two-year term of office.

(Signature...Call sign...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 ARRL Headquarters on or before 4 PM Eastern Standard Time, December 7, 1990. Whenever more than one Member is nominated in a single Section, ballots will be mailed from Headquarters to Full Members of record as of the nomination closing date (December 7) on or before January 2, 1991. Returns will be counted February 19, 1991. SMs elected as a result of the above procedure will take office April 1, 1991.

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, 1991.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in January 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 ARRL Field Services Manager.

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

Richard K. Palm, K1CE
ARRL Field Services Manager

Amateur 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	AAØBQ	KFØLY	NØMHU	KBØHKI
1	WJ1F	KC1WI	N1HYJ	KA1WGV
2	AA2AT	KE2VI	N2LCV	KB2KZH
3	WD3B	KD3TI	N3IKM	KA3WSQ
4	AB4YA	KN4NK	N4ZZD	KC4SGJ
5	AA5UA	KI5IB	N5RDS	KB5NME
6	AA6XF	KK6OB	N6ZZZ	KC6MWQ
7	AA7FO	KG7HJ	N7PIK	KB7LMF
8	AA8BX	KF8IO	N8MUC	KB8KOJ
9	WU9G	KE9YP	N9KAC	KB9FJD
Guam	KH2N	AH2CH	KH2EO	WH2AMQ
Hawaii	**	AH6KN	NH6XH	WH6CIM
Alaska	**	AL7MG	NL7UQ	WL7BZG
USVI	NP2F	KP2BU	NP2DX	WP2AHD
Puerto Rico	**	KP4QY	WP4YN	WP4JGT

**All 2 × 1 call signs have been assigned in these districts.

Note: N-prefixed Group C calls for the fourth and sixth districts have been exhausted. The FCC will now assign Technician and General class operators Group D (2 × 3) call signs in these call areas.

Strays



THE GOVERNMENT COUNTS ON THIS HAM

☐ Lillie Marshall, W5RQK, of Las Cruces, New Mexico, a ham since the 1940s, was recently honored by the US Bureau of the Census for her 50 years of service as an enumerator. The 71-year-old wife of Tom, N6LT, is looking forward to helping take the government's head count again in the year 2000.

NOW, WHERE DID SHE GET THAT IDEA?

My three under-six-year-old grandchildren were visiting me for the 4th of July, telling jokes to "Paw Paw" in his "dit-dah room." After what seemed like a thousand "why did the chicken cross the road" jokes, I asked them to change the subject to something else. My four-year-old grandson Randy immediately asked, "Why did the ham cross the road?" My 5½-year-old granddaughter Amanda responded, "To buy another radio!"—*Lane Arbuthnot, KC6AST, Ramona, California*

How's DX?

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

THE BALTICS

Yuri Baltin, chief operator of YL1XX (see photo), the Riga Polytechnic Institute DX Club, reminds us that the Baltic Republics regained their original prefixes on January 1, 1990. (LY, YL and ES were issued by the ITU in 1929 for independent Lithuania, Latvia and Estonia, respectively.) The YL prefixes are as follows: YL1WA-YL1ZZ clubs; YL2AA-YL2VZ, YL3AA-YL3VZ personal stations (class I and class II); YL2GAA-YL2GVZ, YL3GAA-YL3GVZ, personal stations (class III and class IV, Novices); YL4 and YL5, personal stations (reserved for future use); YL6...YLØ, special calls. Yuri notes that there are still about 50% of the old UQ1, UQ2 and RQ2 calls around. Hams can change to the newer prefixes at any time (usually when the old QSL cards are used up!). YL1XX QSLs go to Yuri Baltin, Box 100, Riga-7, Latvia, 226007, USSR (omit call letters or any mention of Amateur Radio on the envelope and make sure that IRCs, etc, are well-disguised).



Chief operator Yuri works on equipment at club station YL1XX (see text). Their 40-meter two-element quad is up about 35 meters.

ERMAK

ERMAK is the West Siberian ARC, founded last year after two exciting EK9JG DXpeditions (the River Ob and via train to rare Oblast 163 above the Arctic Circle). Their summer plans took them to Zapadnyy Kamennyy Island, part of the Plavnikovyye Group, rare for IOTA, where they had hoped to use 4K4A and 4K4RAS, part of a training program of the Tyumen Regional Group of the Soviet Amateur Radio Emergency Service. The club invites membership and can be reached via Box 1, Surgut 14, 626400, USSR.

YOU CAN DO IT!

Steve Szabo, WB4OMM, of Port Orange, Florida, found that achieving Novice-band DXCC is possible. He was first licensed as WN2TAW in 1971, later receiving WB4OMM after moving to Florida. He got the DX bug in mid-1987 and also holds RCC, WAC, WAS and WPX. All of his awards were earned in less than two years, with a dipole at 30 feet, an 100 watts or less on the Novice bands. Steve reiterates, "You can do it!"

CIRCUIT

☐ **US1A:** The Harvard Wireless Club's Leningrad operation in May summed up 21k contacts, despite poor propagation. From October 18-29, a contingent from the Leningrad Institute of Aircraft Instrumentation Club pays a return visit to the Boston area with such notable operators as UA1ALZ, UV1AA and UW1AE hoping to operate W1AF. US1A cards go via the 1990 CBA for W1AF.

☐ **8Q7DX:** Art Doppler, HB9DCO, of Bottmingen, Switzerland, will be QRV on 160-10 meters CW (split up 5) and SSB from Mirihi/Ari Atoll, October 15-November 5. QSL via his home call.

☐ **VP2EBN:** KA3DBN will be Anguilla-active on 80-6 meters October 1-8, SSB, CW and RTTY. Cards for this operation, IOTA NA22, VP2EE and VP2EHF, go to his CBA with an SASE please.

☐ **Micronesia:** A DXpedition by the Eastern Canadian DX Association on 160-6 SSB with VE3SMA and VE3RMM operating will be QRV October 5-November 4, hitting DU, KC6, Belau; V63, Yap; KH2, Guam; V63, Pohnpei and V73, the Marshalls. John, VE3JDO, of Stittsville, Ontario, will manage the pasteboards.

☐ **NCDXC:** The Northern California DX Club Inc, has a beautiful certificate, free of charge, for licensed hams outside the US who have cards for contacts with 220 different California stations, as follows: 200 different stations in W6 and with 20 different members of the NCDXC, all made after October 1946. The application may be certified by recognized clubs/societies. A free list of NCDXC members is available from the club; NCDXC, Box 608, Menlo Park, CA 94026.

☐ **XT2BW:** Peter Wright, WA2FUT, of Williamstown, New York, is under contract to do forestry work for the US through a Swedish firm and will be in XT (Burkina Faso) until July 1991. His manager, Bob Nadolny, WB2YQH, of West Seneca, New York, will be happy to arrange schedules, etc.

☐ **VQ9TD:** Walt Schulz Jr, K3OQF, of Philadelphia, Pennsylvania, has been QRV on Diego Garcia. Cards go via the K3OQF CBA. Walt runs 100 watts to a Hy-Gain TH7 up about 100 feet.

☐ **Kudos:** John Torrance, N3GZV, of West Mifflin, Pennsylvania, applauds Ed Lips, W3BWU, of Pittsburgh, Pennsylvania, who gives a new look to Amateur Radio with his manifold achievements operating within his Technician-class limits: Satellite DXCC no. 4, 10-Meter DXCC, CW DXCC, Mixed-Mode DXCC, 50+ countries on 50 MHz, and more.

☐ **Routings:** CN8GM had lots of problems with PO Box 5335 and now wants you to QSL via Mike Anson, Box 14141, Casablanca, Morocco. Bob Kaplan, WA4WTG, began handling cards for 9M8MG and 9M8PV as of April 1. He also confirms for FY7AE, K7NJ/4X, TJ1BF, ZF2IB/4X, ZF2GE, ZP5KS, 4Z4DX, ZC4DX, 4ZØDX, 4Z4HF, 4Z4LF, 4X4NJ, 4X4UF, 4X2BYB, 4X6BYB, 4X4FF/5N4, 5Z4RH, 6Y5MC, 8P6AH, 8P6IB and 8PØA. Bob no longer handles cards for V2AK, V21AK, 6Y5RL or 8P6BN. His address is 718 SE 3rd Ln, Dania, FL 33004. HC1IT and HD1T QSLs via Kassell Miller, W2KF. ZF2PB/ZF8 QSLs via CBA for Roy Richards, N7ARO. The V3 Bureau is apparently nonfunctional. Phil Rice, WB9JKI (V31EF), has approximately 16 pounds of unclaimed cards and will be happy to reroute to the proper V3-license holders upon receipt of SASEs. Write to him at 425 N Montana, Morton, IL 61550.

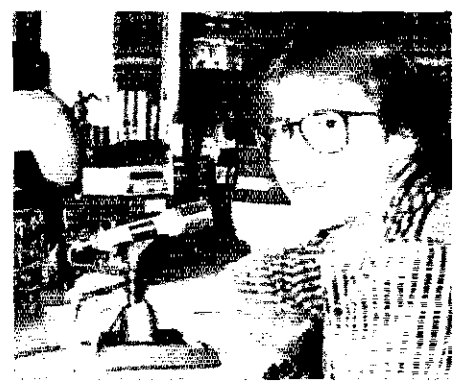
☐ **Turkey:** If you worked TA3B/C/D/F from 1986-1989 and haven't received a card, note that there is an internal postal problem. The group suggests you resend as registered mail or via Thomas Vortkamp, DL5YCQ.

☐ **Volunteers:** Everett LaPorte, KC1OC, volunteers to handle cards. Contact him at 42 Mathews Ave, Waterville, ME 04901.

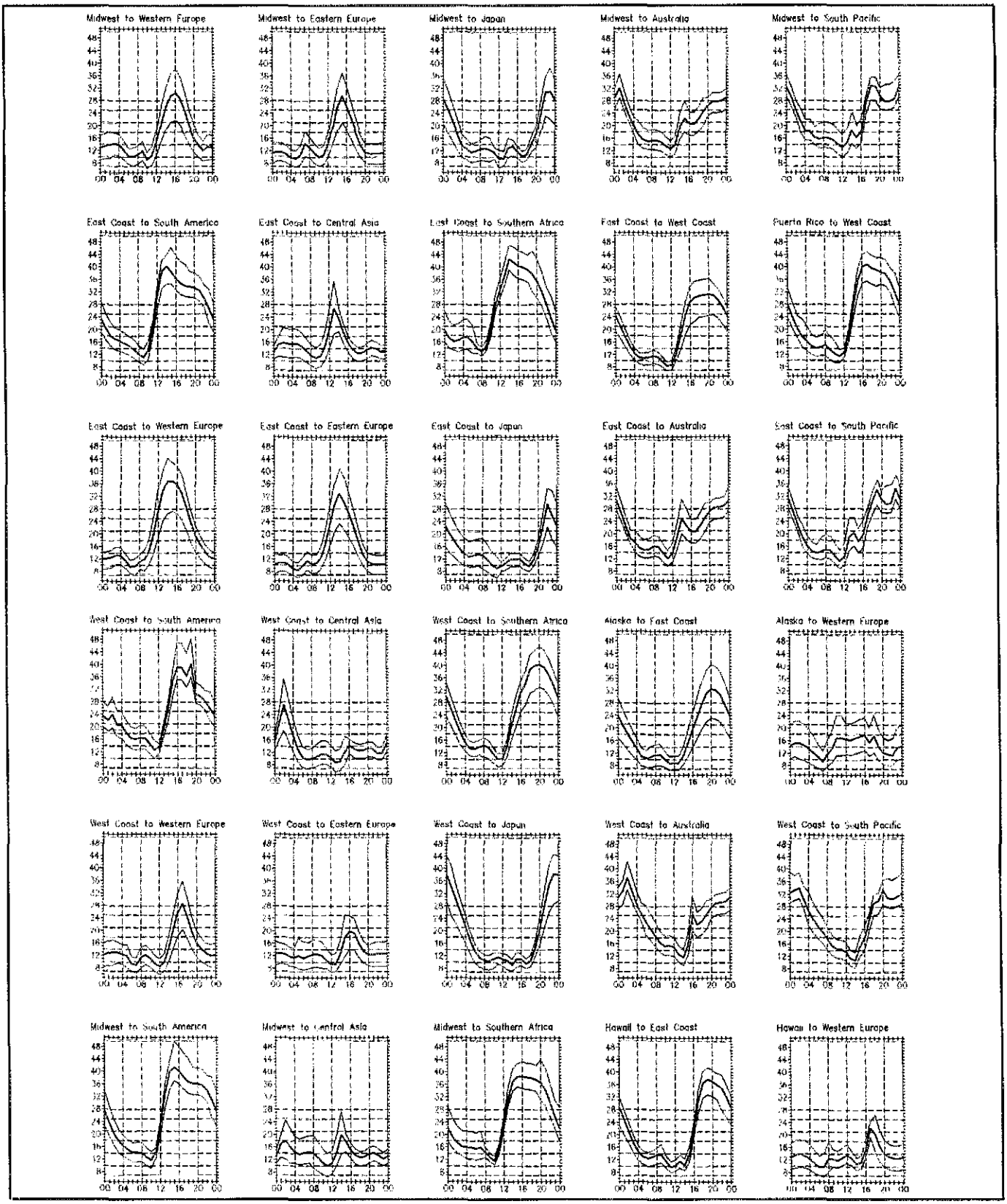
☐ **Commandments:** Bill Gary, K8CSG, of Houston, Texas, dashed off ten of 'em as a result of the 3Y5X, A51JS, S21U and other expeditions. For example: "Calleth not on the frequency of the DX station when he is operating split, for the wrath of thy friends (?) shall be swift and sure and thine ears be withered."



Betty Christian, VR6YL (l), met Sue Miller, KA9UCK, of Niles, Illinois, at the Seventh Day Adventist Church Convention last July in Indianapolis, Indiana. Betty, OM Tom, VR6TC, and their two daughters, Sheri and Darlene, have been traveling the US and meeting their ham friends. *(photo courtesy of NZ9E)*



Bob Johnson, WB9YXY, of Endeavor, Wisconsin, made the DXCC Honor Roll in January 1986 at age 23 (first licensed at age 14) and lacks just a few. Bob uses a Kenwood TS-940S, Dentron MLA-2500, Hy-Gain TH6DXX at 70 feet and a Cushcraft 2-element 40-meter beam at 60 feet. His *three words for success are Listen, listen,* listen (followed by a comment that it helps to live on a hill!).



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 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 (E/GC2), Boulder, Colorado. Curves are generated using IONCAP. These predictions, for October 16 to November 15, 1990, assume a smoothed sunspot number of 134, which corresponds to a smoothed 2800-MHz solar flux of 177.

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. An SASE will bring you the rules and application forms for participation in the DX Century Club program. Send $1 to request the ARRL DXCC Countries List.

DXCC Notes

1990 DXCC HONOR ROLL LISTING

Because of the unusually high volume of applications during the past few months and in the month of March, the Honor Roll month, the Honor Roll listing will be published in the November issue of *QST*. Those amateurs who submitted Honor Roll applications during the past year and during the month of March 1990 will have their updated Honor Roll totals included in the Honor Roll Listing. Your patience is appreciated.

DXCC AUTOMATION UPDATE

An important benefit of DXCC automation is that QSL cards will have be submitted only once for the multitude of awards now available from DXCC. Once a card has been processed and logged with call sign, date, band and mode, that credit will be available in future years for an applicant's band and mode endorsements.

That's the good news; the flip side is that the DXCC backlog is expected to worsen somewhat as the process of "backfilling" continues. Backfilling is the process of entering past, manually processed records into the system to bring applicants' records up to date. Several ARRL HQ staffers are working overtime on the initial phases of automating the DXCC Branch, which is now processing submissions made in March 1990. Mail received after June 1, which will be processed in September, will be the first to be done entirely by computer. At that time, the process of backfilling will accelerate, temporarily adding to the backlog.

NEW USER FEES TO SUPPORT DXCC

The ARRL DX Century Club has a new fee schedule, as of October 1, 1990. DXCC, while affecting a relatively small percentage of its members, is a substantial financial burden on the League. User fees, approved by the League's Board of Directors, will go toward better service (quicker turnaround time).

The fee structure explained below is intended to encourage participants to send less-frequent submissions to DXCC:

1) After October 1, every first-time applicant for DXCC will be charged $10 plus the usual charge for return postage. DXCC members as of October 1, 1990, are exempt from this registration fee.

2) ARRL and CRRL members will be allowed one free submission per calendar year; this annual submission may include any number of QSLs, any number of DXCC awards and any combination of new and endorsement applications. It does not include a person's all-time first submission.

3) Non-League members outside the US and Canada will be charged $10 for their first DXCC submission of any kind each year.

4) US and Canada DXCC participants who submit more than once a year will be charged $10 for each submission after the first one. Foreign nonmembers will be charged $20 for their additional submissions.

The Retread

(continued from page 53)

"Quit stalling, Dad, and tell me just how much stuff we have to load," interrupted John.

"Let's see, there's the Signal Shifter, an HT-32, an SX-115 and, oh yes, the Kenwood '950."

"Dad, you didn't," said John.

"Afraid I did," answered Al. "Then there's the keyer, the Transmatch and a paddle."

"Naturally," said John, "now, is that all?"

"Yes, that's about it, except some books. The fellows from Pueblo Electronics are going to deliver the 50-foot tower, rotator, antenna and hardware to get the beam in the air. I told 'em next week would be okay, seeing as how we can probably put it up next weekend."

"Mother is going to kill you, Dad. You've had it," said John. "Just exactly how much money did you spend today?"

"With, or without the 2-meter gear," asked Al.

"Oh, my gosh...not more stuff," choked John. "Just give me a total figure. I'd like to know before Mom silences both of us for good."

"I've got it right here in the checkbook, John," replied Al. "The total comes to four dollars and fifty cents per week."

"How on earth do you figure that?" asked John.

"It's like this..." replied his Dad. "I haven't bought any ham gear for 27 years, right? There are 52 weeks in a year and 52 times 27 equals 1404. That makes 1404 weeks since I've spent any money on ham radio. So, I figure it comes to $4.54 per week. A reasonable figure, I think. It's really quite simple."

"How much Dad?" demanded John.

"Look at it this way...I really didn't spend anything. I *invested* $4.54 a week in my future happiness and well-being. Six thousand three hundred seventy-four dollars well-invested, son."

"Let's load it all up Dad, and go home and face the music," sighed John.

Al wasn't worried. He'd just made the best investment of his life. All he had to do was get Marie to see it his way....

Strays

GET IN TOUCH

William A. Dubois, WIANM, age 88, is in a nursing home and not doing well. He'd enjoy hearing from some of the many ham friends he's made over the years. Bill has been a member of the ARRL since 1920 and has saved every issue of *QST* for 70 years. He was a contact with the Byrd expedition to the Antarctic, built a great deal of home-brew equipment and introduced a number of youngsters to the hobby. Write to Bill c/o Hallmark Nursing Center, 49 Melvin Ave, Troy, NY 12180.—*Robert B. Genthner, WA2MXO, Ballston Spa, New York*

TOP BAND DOWN UNDER

Members of several ZL and VK stations including ZL2BEI from the New Zealand Association of Radio Transmitters (NZART), plan propagation experiments and operation on 160 meters. Listen at 1840 and 1940 kHz from 0800-1600Z Oct 19-20 and Oct 20-21. We look forward to operating in the *CQ* World-Wide contest.—*David Walker, ZL3DK, Hastings, New Zealand*

ELK CALL

☐ Members of the BPOE operate an Elks Amateur Radio net and run a station at Carmichael Lodge No. 2103, 5631 Cypress Ave, Carmichael, CA 95608. Check into the net daily at 10 AM PST on 14.328 MHz.

I would like to get in touch with...

☐ anyone who can help me to obtain a Varian pen motor. Kenneth P. Lange, K6DSB, 17105 Harvard Blvd, Gardena, CA 90247.

☐ anyone who has successfully applied Amateur Radio, cellular telephone or satellite-relay equipment for reliable phone patch communications from kayaks or small boats in remote waters such as Baja California or Tierra del Fuego. Keith R. Higgins, WA6IYL, PO Box 306, Lakewood, CA 90714.

☐ anyone who has ideas for souvenirs to give to youngsters during Operation North Pole (visiting children in hospitals at Christmas). "I Talked with Santa at the North Pole via Amateur Radio" buttons, perhaps? Tex Jarvis, KE8AK, 6634 Morningstar Way, Kalamazoo, MI 49009.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Editor

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

DON'T STEP ON THE PROS' TOES

☐ I found the June 1990 *QST* article "The Avianca Crash: Disaster and Discord" interesting and enlightening. I hope to use some of the lessons learned from the article as a training aid for our local ARES unit. However, a few lessons brought out by the article are how *not* to act in such a situation.

Although my experience in Amateur Radio is limited, I've been involved in public safety for more than eight years. I wonder why the Amateur Radio operators involved at the Avianca scene were surprised that they weren't invited to the post-incident critique.

According to the article, one radio amateur not only "tailed an emergency vehicle," an illegal and dangerous activity, but he also broke another law by failing to obey an officer. Although the officer probably should not have issued the vacate order, the amateur was wrong not to obey it. When that person got to the scene, he "walked to the embankment where the aircraft had come to rest." Now, along with the numerous injuries for the emergency personnel to contend with, an untrained citizen was wandering around a hazardous location.

The article mentions that an amateur "argued with the MEDCOM dispatcher." It will be impossible to become effectively integrated into public safety if radio amateurs argue with emergency personnel. Public safety personnel don't change their procedures simply because someone not trained in that area feels they are wrong. Imagine how a ham would react if a public safety officer told him he wasn't operating his rig properly!

Hindsight is 20/20. In professional emergency services, we constantly critique the performance of ourselves and others to learn from our mistakes. This allows us to benefit from hindsight and amateurs should do the same. I commend the amateurs involved in the Avianca crash for their willingness to jump in and offer their services. Lessons should be learned from that situation to build a good working relationship with local emergency services. This is important for effective assistance and personal safety.—*Edward W. Ferguson, N4YTR, Firefighter, Peachtree City, Georgia*

SATISFIED MEMBERS

☐ I was impressed by two heartwarming stories in July *QST*. "In the Blink of an Eye" by Ronald J. Curt, N6VQQ, and "Morse Code From the Heart" by Donna Burch, W8QOY, highlight the fact that Morse code can be a worthwhile form of communication, even in the most unique situations.—*Kevin A. Halevan, WQ2T, Champlain, New York*

☐ The story entitled "The Best Field Day Ever" (June *QST* p 54) by Patrick Tice, was one of the best stories I've read in *QST* since John Troster's regular appearances. It represents a good narrative style and a real appreciation for the eccentricities of us hams! I hope Tice has more like that in him. These short-format stories boost the readability of *QST*, but don't shortchange the good technical stuff. With the demise of *Ham Radio* magazine, the League will have to pick up the slack.—*Mark Nelson, AJ2X, Natick, Massachusetts*

BACK TO THE FUTURE

☐ In the early part of this century, people liked progress and assumed "the more technology, the better." Hams were fascinated by new developments—after all, new developments gave us international DX, single sideband and more. But there were those who objected: the "Spark Forever" crowd.

Now, people view new technology as a threat because they aren't "into it." The definition of "radio" has gotten broader and more diversified with the creation of new technologies such as packet radio and other computer modes. The ARRL is the voice of Amateur Radio; it is not the American Wireless Telegraphy League. It must speak for the entire fraternity.

When I got into ham radio, the old-timers I met exhibited a fascination with all that was new and regarded the classic gear they gave me as junk. They loved the new stuff. They would be the first to try new equipment. Is that true today? Is it true of you? When was the last time you tried a new mode? Could it be that we are hanging onto the past?

C'mon friends, let's try something new—maybe even I will!—*David L. Wiesen, K2VX, Newark, New Jersey*

DON'T GO DOWN WITHOUT A FIGHT

☐ I've been reading the comments over the possible loss of the 220-222 MHz band. After reading a nationally distributed packet bulletin in which the author urged hams to "boycott UPS " and to "write to *Mobile Radio Technology* magazine" because they wrote an article praising UPS for rescuing amplitude-compandored single sideband, I was finally prodded into writing. UPS didn't "steal" 220 and the FCC didn't "take it out from under us." I've seen emotional comments, but it's time to be objective.

I strongly urge the ARRL to stop spending members' money to continue this lost cause. Let's be realistic; we've lost... let's lick our wounds and get on with things.—*Mark Forbes, KC9C, Rocklin, California*

☐ Let's face it—the ARRL has got to continue to save the low end of 220 MHz. Don't give up!—*M. R. Carso, Xenia, Ohio*

[The ARRL has appealed the FCC's decision in Federal Court, calling the reallocation decision "arbitrary, capricious, an abuse of discretion and not in accordance with the law."—*Ed.*]

DIRTY DEEDS

☐ Most of us don't think twice about putting up antennas, believing we have a right to do so. After moving to the Phoenix area, I was shocked at the proliferation of deed restrictions. I've been looking for a new house after having my antenna turned down by my homeowners association. After a year of trying, I found it impossible to find a single house without antenna restrictions written into the deed. This is a major problem for the amateur community. If we do not pay heed, we will soon be relegated to the far reaches of our towns and cities. If one wishes to buy a home less than 10 years old, it's almost impossible to avoid deed restrictions.

Recognizing the legal implications of signing a deed with these restrictions, we should try a new tactic. We might be successful if we approach the issue from a Constitutional point of view. These restrictions actually take away our right of free speech and our right to receive radio signals as we wish.

I hope the ARRL pursues a course that will result in the removal of these threats to our rights. I hope we wake up before it's too late or we'll all be DXing from our attics! —*Michael W. Sweeley, K6MHO, Chandler, Arizona*

[PRB-1, the Federal preemption of local zoning ordinances, specifically excludes deed restrictions. The ARRL recognizes that covenants and deed restrictions are one of the biggest problems facing amateurs today and is seeking ways around them.—*Ed.*]

CODE STILL WORKS

☐ I believe a disservice has been done to the amateur community in the misrepresentation of the resolution of the International Maritime Organization (IMO) concerning the switch from Morse telegraphy to automated systems. It's being done for one reason: to reduce manpower on merchant vessels, not because CW is "obsolete." Because automated systems like HF radio teleprinter and satellite systems don't require specially trained operators, the present Radio Electronics Officer is not needed.

During the 1980 distress of the *MV Prinsendam* in the Gulf of Alaska, the COMSAT system failed and distress communications were handled on battery powered Morse sets. These transmissions not only alerted rescue vessels, but were received throughout the Pacific Ocean while the 2182-kHz voice distress system—used as a primary alert on non-Morse-equipped vessels—alerted only one vessel. Approximately 350 people were rescued after abandoning ship. With the automated system alone, it isn't known what would have happened.—*David J. Ring Jr, Radio Electronics Officer*, S King *Houston, Texas*

Public Service

Conducted By Luck Hurder, KY1T
Deputy Manager, Field Services Department, ARRL

Tornado Alley

By Marty Hensley, KA9PCT

Indiana is in what the locals call "Tornado Alley." With an estimated 50 touchdowns on the evening of Saturday, June 2, 1990, our nickname will undoubtedly stick.

Having been requested to activate the Tri-State ARES/RACES Emergency Net by the National Weather Service (NWS), we had some warning that deadly storms were coming, but we had no idea how severe our weather would be.

Local weather patterns normally move through Illinois and then into Indiana or Kentucky. Our local club, the Tri-State Amateur Radio Society, has a net control operator who works with a station at the NWS. This gives us access to radar and we can request spotters in the affected areas. This system has worked well for years. As repeater linking has developed, so has our weather net. The net was simulcast over the 147.150- and 145.150-MHz repeaters in Evansville. Also active was the Pike County Emergency Net on 145.450 MHz in Petersburg and 147.000 MHz in Winslow.

Lisa Clements, KA9VLV, was NCS and Charlie Apfelstadt, N9GWS, was stationed at the NWS Office in Evansville. The net activated at 6:15 PM and the NWS issued the first warning at 6:35 PM.

A severe storm was reported heading towards Wabash and Lawrence Counties in Illinois. There was an unconfirmed report of a tornado touchdown and we later learned that a factory and several homes had been destroyed in Albion, Illinois. Our first tornado sighting was by Bob Effland, AI9H, near Mt Carmel. The NWS issued its first tornado warning at 7:02 PM following Bob's report. He followed the storm as it destroyed homes in Mt Carmel and cut a path between two local broadcast towers. Another warning was issued at 7:15 PM.

The general path of this storm was towards Gibson and Knox Counties in Indiana and prompted the next NWS tornado warnings. Our spotter in Gibson County, Joe Deal, KB9CZB, saw the tornado north of Princeton, Indiana, and followed it through Hazelton and Decker. Warnings for this area were sent by the NWS at 7:40 PM and 8 PM.

We began trading information with another weather net active in Pike County. Warnings were issued at 8:15 PM and 8:26 PM for this area. The 8:15 warning was for the first Petersburg tornado. Reports on the first tornadoes were originated by Mike Voyles, WA9FGT, and others. The second tornado was sighted and reports were supplied to the NWS.

The warnings were rebroadcast by Petersburg radio station WFPC via the Emergency Broadcast System, originated by the NWS in Evansville at 8:26 PM, four minutes before the tornado hit.

Petersburg residents got the warning at 8:26 PM and the WA9FGT 145.450-MHz repeater left the air at 8:30 PM. Because this system has backup power and is normally unaffected by storms, this was a bad sign. Relays from the 147.00-MHz machine indicated a tornado had smashed Petersburg. Nobody knew immediately how severe the damage was.

No roads were open to Petersburg. Indiana Route 57 had trees across it and Indiana Route 356 was also closed, cutting Petersburg off from the rest of the world. A request was made for chainsaws and bulldozers to clear the way.

A large crew of hams that had been activated for the weather net headed for Petersburg with the Red Cross disaster van. Upon arrival, the destruction was evident.

WFPC was off the air; its tower had blown down. The studios were okay, but without power, as was all of Petersburg.

In trying to set up an emergency link to Evansville for the Red Cross, we found that the 145.450-repeater's tower had been torn from its base and thrown to the ground. Other towers lay in A-shaped heaps throughout the town.

The logical choice for a shelter, the Petersburg Elementary School, had been leveled except for one wall.

The Petersburg Police had communications, thanks to a generator acquired from the National Guard. The Pike County Sheriff's department lost the rear of its building. A temporary hospital and ambulance staging area was set up at the local VFW. Doctors, nurses, paramedics and volunteers from surrounding counties were stationed there.

A wedding reception at the Moose Lodge was cut short by the tornado and the bride, a nurse, spent her time helping the injured. For a time, many were trapped in the basement.

The greatest loss of life was at a nursing home where several patients were found dead. Petersburg Mayor Jack Kinman was trapped in his basement and had to move debris to get out. He emerged to find that two of his neighbors had been killed. Their house, as his, had been leveled.

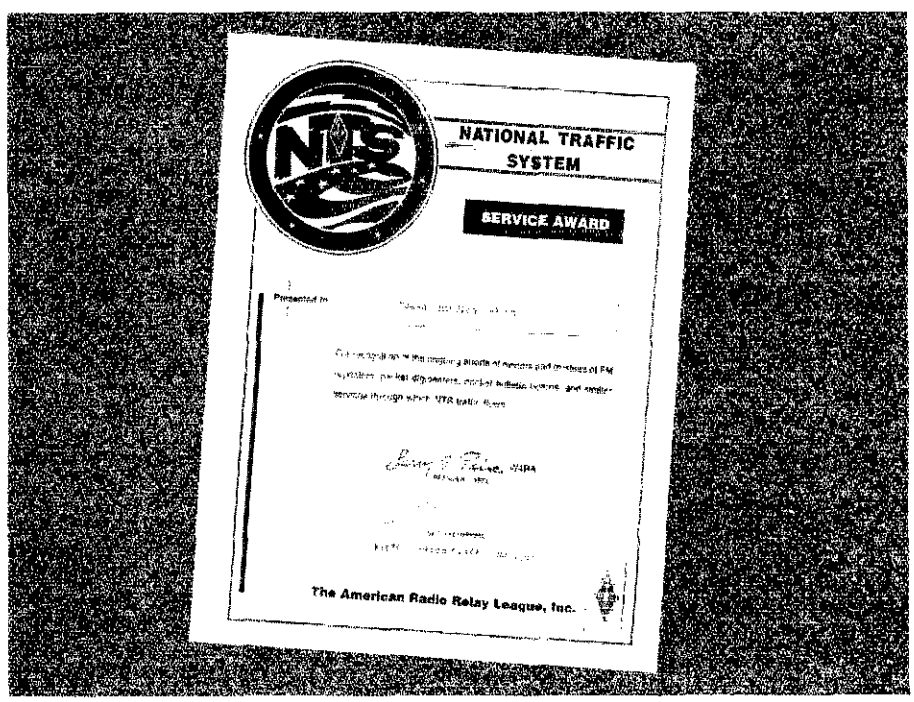
By 4:00 the next morning, the following observations were made:

1) All of Petersburg was without power and many power poles for the main feeds to the town were down.

2) The city was without water, even though a temporary pipeline had been installed after a flood the previous week; the tornado had wrecked it.

3) At least 18 businesses were destroyed and 20 others were severely damaged.

4) More than 150 homes were destroyed



The National Traffic System Service Award has been expressly designed to recognize the efforts of owners and trustees of FM repeaters, packet digipeaters, digital bulletin boards and similar services through which NTS traffic flows.

These handsome awards are available to ARRL Section Managers and Section Traffic Managers for presentation to the trustee and/or support staff of the system to be recognized. Contact Luck Hurder, KY1T, Deputy Manager, Field Services Department, at ARRL HQ for further details on the NTS Service Award.

and another 150-200 were severely damaged.

5) The only roads open were Indiana Routes 57 and 356; most other roads were blocked with trees, houses and mobile homes.

6) At least three people were dead and others were missing.

In talking with those who were in the storm, comments such as, "I thought it was all over," and "It was the loudest thing I had ever heard" were common. Eyewitnesses reported the tornado to be a half-mile wide as it ripped through Petersburg. The storm system continued north and savaged the communities of Montgomery, Bedford and Reddington. The death toll rose to 10; six of those killed were in Petersburg. There is no doubt that the bravery of the amateurs in the Petersburg area resulted in lives saved.

Field Organization Reports July 1990

ARRL Section Emergency Coordinator Reports

There are 33,169 ARES members accounted for in SEC records. The following sections reported this month: AL, AZ, GA, IA, KS, KY, LAX, MI, MN, ME, MO, NFL, NLI, NV, OH, OK, ORG, PAC, RI, SD, SDG, SFL, UT, VA, WMA, WNY, WPA, WWA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern				
TCC Central	85	91.40	340	339
TCC Pacific	105	84.68	328	613
Summary	190	88.04	668	952
Cycle Three				
TCC Eastern				
Cycle Four				
TCC Eastern				
TCC Central	58	85.2	93	300
TCC Pacific	110	88.71	457	902

TCC Roster

TCC Central Area, Cycle 2: NØFBW, Director. WA4JCH W5CTZ AE5I NS5M W5QFU KC5TL NS5M K5UPN VE5KZ WØFE

TCC Pacific Area, Cycle 2. ND5T, Director. W5JOV ND5T WB6DOB WF6O K6UYK KF7AG W7AMM KA7YYR VE7EII W7IGC KF7R W7TGU KA7YYR WAØYNP.

TCC Pacific Area, Cycle 4. KØDJ, Director. N2IC KA5NNG ND5T K6LL W6EOT W6VZT WF6O W7EP W7GHT W7LG W7VSE KA7CPT KN7B NN7H NR7E KØDJ KØTER KCØD KJØG

National Traffic System

1RN Packet Nodes QTC 1047

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	586	18.90	.625	93.0	
CAN	31	576	18.58	.510	100.0	
PAN*	57	428	7.50	.593	96.5	
Region Nets						
1RN	62	318	5.13	.378	89.0	100.0
2RN	58	173	2.98	.277	94.1	96.8
3RN	29	115	3.96	.344	92.7	96.8
4RN	62	253	4.08	.220	75.5	96.8
5RN	62	566	9.13	.332	83.0	
6RN	60	94	1.56	.221	96.5	
7RN						100.0
8RN	62	192	3.09	.244	93.0	90.3
9RN						100.0
TEN						100.0
TWN	62	117	2.85	.269	77.7	94.7
ECN						77.4
Cycle Three						
Area Net						
EAN	31	181	5.84	.532	80.6	
Region Net						
1RN						96.7
2RN	31	84	2.71	.242	97.4	74.2
3RN						90.3
4RN						67.7
8RN						96.7
ECN						74.2
Cycle Four						
Area Nets						
EAN	31	750	24.19	.966	95.8	
CAN	31	604	19.51	.905	100.0	
PAN	30	516	17.20	.913	97.7	
Region Nets						
1RN						93.5
2RN	46	121	2.63	.321	67.7	96.7
3RN						100.0
4RN	60	321	5.35	.298	96.3	100.0
5RN	62	420	6.77	.430	84.0	100.0
6RN	62	271	4.37	.436	96.7	100.0
7RN	62	227	3.66	.559	87.0	100.0
8RN	60	229	3.82	.259	90.0	
9RN	62	229	3.69	.360	89 0	100.0
TEN	62	355	5.73	.542	59.1	100.0
TWN						93.3
ECN						90.3
ARN	31	66	2.13	.048	90.3	

*PAN operates both cycles one and two.

ARRL Section Traffic Managers reporting: AK, AL, AR, CT, DE, EMA, ENY, EPA, EWA, GA, IL, IN, KS, LA, MDC, ME, MI, MN, NC, NFL, NH, NNJ, NTX, NV, OH, OK, OR, ORG, SCV, SD, SDG, SFL, SNJ, TN, UT, VA, VT, WMA, WNY, WTX, WV, WWA.

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. This certificate is a one-time award, ie, it is not issued more than once.

416
W8AKF

192
KF6BL

178
K5CXP

160
N3EMD
WTØG

147
KJ3E

146
N2JAW

144
WA2SPL
N5PGZ

140
KF8AU

134
N4GHI

130
KB2EPU

125
WB4DVZ

123
W7LRB

121
W1WCG

118
KAØKPY

117
WA9VND
W2MTA

115
KA1EXJ

113
W4ANK
KA1GWE

112
W2QNL
W1PEX
N1FLO

111
KK4M

108
KC4BUX
WB8SYA

107
WA4PFK
KA2GJV
W7VSE

106
WB2VUK

105
WA4JDH
W4PIM
WB2UVB
N4EXQ
K5UPN

104
N5MEA

103
W7TVA
KI6ZH
AC5Z

102
N2XJ
W4QAT
NJ3V
N2EIA
N1CPX

101
KD8HB
K4IWW
KI4YV
WE2G

100
WB8DPZ
WA1TBY
KC4GCK

99
KT1Q

98
W3YVQ
K4MTX
WT8J
WB4WII

97
WS7U
KA7AID

96
W4CKS
WF6O
WD5GKH

95
WDØGUF
KB5BNU

94
WB4FDT
W5YQZ
N4JTG
WD4LOO

93
W2DMM
WA3YLO
W1ALE
W7GHT
W4JLS

92
WA4EIC
KB9LT

91
WB4MMD
K2YAI

90
W2MTO
KA1S
KA1GEP

89
W9DM
KB1AF
NY8W
AA4ZV

88
KC3Y

87
N5LJF
WB2OEV

ND2S
N4WFW

86
K2VX
KF7GB
WA2ERT
WA1JVV
WB8R

85
K1EIC
NØFOO
W7LNE

84
W5CTZ
WB7WVD
KB2HYT/T
KT9I
NØCYR

83
NR9K

82
AA4AT

81
W1KX
KA1IFC
N4VVX

80
W1KK

79
KØMZV
WB8FSV
N7BGW
N4SSX
KB7LX
WB1BTJ

78
N5KQZ
WAØTFC
KØERM
N3DRM

76
KA4MTX

75
W2RRX
KA4FZI

74
KA2QOO
W6VOM
KDØNH
WB4ZTR
N7LVK

73
K2PBP/T
KJ9J
N5BFV
KAØPDM
N8FPN

72
WB5YDD
WA4GYR
KJ4EK
KAØUEQ

70
KA2KJF
KA2INE
W4DWN
KØPIZ
NW3K

69
KT6A

68
W5FZH
K3RXK
NM3K
K7OVK

67
W4IBU
N5NAV
NDØN
WA2FJJ
NR3Q
K3GHH
K1ABO
W5TZC
KA7WFW

66
WB4AVZ
KAØVQN
KDØYL

65
KB4CYC/T
AB4EZ
WX4J
KC4FL
KAØARP
N8JRV
WA1FNM

64
WB2FTX
KM4JD
W9UMH
WA2UKX
K8JDI
N8FWA
KB4CAU
KDØYL
KC5NG

63
N2DXP/T
WA4RUE
KD8KU
AA7CU
WA8DHB

62
WA2PAC
KA4HHE
N4JAQ
N8INP
KC4OJM

61
WA4RNP
WØOUD
KØQBE
WBØWNJ
N6CRV
WI8K
WF2M

60
N7KLO
AA4XF
WA3UNX
W2FR
K5WOD
WB8KWC
WD8KBW
K4BGZ
KA8CPS

59
N2JRS/T

58
KA2CQX/T

56
KA2ZNZ/T

55
KA6TND/T
K1GGS

52
N2EVG/T

50
KB2CEV/T

48
N7MME/T
W1YOL/T

47
KA1HPO/T
KA1VAX
KA8YWV/T
N2JBA/T

45
KB1LDD/T
KC4MWT/T

43
KA6HJK/T

41
KB7GYS/T

The following stations qualified for PSHR during the month of June but were not listed in last month's column: WB8DPZ 88, AA7CU 71, W4ANK 102.

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
W8AKF	421	2830	3014	392	6657
W1PEX	1	497	1093	28	1619
WBØYNS	*0*	*644*	*644*	*0*	*1288*
NØFBW	0	580	580	93	1253
WBØWNJ	265	85	650	2	1002
W3IWI	1	450	442	0	893
N2GTE	11	427	423	2	863
K6UYK	271	315	270	5	861
KA1IFC	0	362	426	22	810
K1UGM	0	393	393	0	786
WA2SPL	6	400	316	43	765
W1FYR	53	277	308	4	640
W1UD	62	231	297	12	602
KF5BL	50	237	245	61	593
NM1K	113	251	206	21	591
KF8AU	6	263	303	11	583
WA4JDH	0	277	293	4	574
KJ3E	3	232	239	86	560
KA1VED	185	201	221	8	555
N4GHI	6	290	209	33	538
K4DOR	14	245	255	4	518
WA6ZUD	1	258	258	1	518

BPL for 100 or more originations plus deliveries: K1UGM 692, K1TQY 155, WØFIR 115, N5PGZ 100.

The following station qualified for BPL during the month of May, but was not listed in August's column: K6UYK 581.

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	26	284	381
Bears of Manchester	31	342	392
Central Gulf Coast Hurricane Net	31	123	2831
Clearing House Net	31	183	245
Empire Slow Speed Net	30	117	336
Great Lakes Emergency & Traffic Net	31	58	956
Golden Bear Amateur Radio Net	31	246	1272
Hit and Bounce Net	31	258	617
IMRA	26	640	1450
Mission Trail Net	31	213	897
NYSPTEN	31	53	427
Southwest Traffic Net	31	202	1848
West Coast Slow-Speed Net	30	37	322
20-Meter ISSB Net	26	812	248
75-Meter Interstate SB Net	31	148	956
7290 Net	48	318	2926

Packet Perspective

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2702
CompuServe ID no. 70645,247

Packet Radio Basics—*Part 2*

This is the second installment of Packet Radio Basics, the column within a column that answers questions packet radio beginners often ask. If you have any questions or topics you would like addressed, please let me know.—WA1LOU

The Great Software Hunt

In "Packet Radio Basics—Part 1" (Aug *QST*, p 73), I described one of the primary building blocks of a packet radio station, the data terminal equipment (DTE), often just called a terminal. As I mentioned, you can use a personal computer to emulate a terminal with the proper application software. Now we pick up from that point and go in search of software.

If your computer is a current standard model, such as an IBM® PC or PS/2, Apple Macintosh, Commodore, Amiga, Atari ST, or compatible machine manufactured and marketed today, your search shouldn't be difficult. Useful software for telephone-line data communications is easy to find and can meet your packet needs. Data communications software specifically written for packet applications is available for most popular personal computers.

Orphan Relief

In compu-speak, "orphan" is a common term for a computer no longer sold or supported by its manufacturer. If your orphan has been around for a while (remember when 64 kbytes of RAM was a lot?), you may face a challenge finding software to interface with a TNC—or with a telephone modem, for that matter. The older the computer, the less likely it is that packet software exists for it. In your orphan's heyday, packet radio was less popular than it is today, so it's somewhat unlikely that packet programs were written for it. Landline data communications software may have been available for your computer at one time, but if your orphan is more than about five years old, software for it might be hard to find.

I was informed that one of the packet radio programs (*Pacterm*, for the TRS-80 Models III/IV/4P) I listed in the "Terminal Emulator Sampler" sidebar that accompanied "Packet Radio Basics—Part 1" was discontinued by its manufacturer. That program was the only packet terminal program ever written (to my knowledge) for a computer that hasn't been produced for four or five years. But don't despair! Software sources exist even for the oldest orphaned computers. You just have to know where to look.

Amateur Radio Dealers

If you are hunting for a packet program, contact the businesses that advertise in *QST*. You may find one that has a copy of a program you can use that's just gathering dust on a shelf. The dealer may be glad to get rid of it by selling it to you at a bargain price.

Ham radio and computer flea markets can be great sources for long-lost software. At the Dayton HamVention®, software packages that had originally sold for $500 went for $25 and less.

Orphaned-Computer Periodicals

Although your computer may be an orphan, there might be enough interest in it that periodicals are still published to support it. Although you may not find a source for packet radio software, you could find landline communications software that can be used for packet.

If you own a Timex or Sinclair computer, for instance, there's a periodical published for ham radio users of those computers. *QZX, The Journal Covering Amateur Radio & Sinclair Computers*[1] has published some packet applications. Another source for orphaned-computer support is *Computer Shopper*,[2] which contains monthly columns and advertisements for a variety of orphans. Besides its ads containing a treasure trove of orphaned-computer software (and hardware), *Computer Shopper* lists computer user groups, special-interest groups (SIGs) and landline bulletin boards (BBSs).

Users' Groups

User groups and SIGs form when people band together for mutual support in using a certain computer, family of computers, computer language or computer application.[3] Many groups support long-orphaned Altairs, Apple IIIs, KIMs and so on; chances are there is a user group for your orphan as well. Once you find one and join it, you may be successful in finding a program to get your orphan on packet radio. Some user groups run landline BBSs to make it easier to exchange messages and software.

Landline Bulletin Boards

A landline BBS is run by a club, individual, company or user group for the purpose of disseminating information and public-domain software. Most are free, although some charge a modest one-time membership fee. When you locate a BBS, use your modem to dial it up, follow the log-on instructions, search for the software you need and download it to your computer ("download" means to receive files or programs from another computer). The catch-22 is that you need a landline terminal program to dial up and download a landline terminal program from a BBS. The solution is to borrow some time on a friend's computer.

You'll also find interesting discussions on the hundreds of BBSs that make up a network called FidoNet. This international system links BBSs that carry wide-area conferences called Echoes, devoted to dozens of topics including ham radio and packet. Fellow users may be able to direct you to the resources you need.

The Meter is Running

Commercial online computer services are similar to landline BBSs except that they typically charge you for the amount of time you use—that can add up fast. They provide you with a far greater range of services, however, than a BBS does. The problem is that you run into the same catch-22 as with landline BBSs. Assuming someone lets you use their computer to dial up a service like GEnie, Delphi, PC-Link or CompuServe, however, you'll find SIGs online that can provide you with downloadable software or information to help you find what you need. On CompuServe, there's a ham radio SIG called *HamNet* with downloadable software for packet radio applications. Many of today's best-known packet radio developers are denizens of HamNet, so it's a good place to find the latest packet news.

Texas Packet Radio Society Address Correction

One more thing concerning the sidebar that accompanied "Packet Radio Basics—Part 1." The address I gave for the Texas Packet Radio Society (TPRS) was an old address. The current address is PO Box 50238, Denton, TX 76206-0238. (TPRS sells a nice packet terminal program for the Commodore 64/128 at a reasonable price.)

Notes

[1]*QZX* is available by subscription from Alex Burr, K5XY, 2025 O'Donnell Dr, Las Cruces, NM 88001.

[2]*Computer Shopper*, Coastal Associates Publishing, L. P., 1 Park Ave, New York, NY 10016, tel 800-274-6384.

[3]Fog is an international nonprofit computer users group that provides a variety of useful information. For information, send a large SASE to PO Box 3474, Daly City, CA 94015-0474.

The World Above 50 MHz

Conducted by Bill Tynan, W3XO*

Can We Talk?

To borrow a phrase from a well-known TV talk show, it has become clear to many that the various interest groups that make up the Amateur Radio community are in need of more and better dialogue. This is true of the HF bands as well as the world above 50 MHz. It is the latter part of the spectrum that I will address in the following paragraphs—leaving others to deal with HF matters.

In the VHF/UHF/microwave realm, there are various facets, or interest groups. The "weak-signal operators," as most readers of this column would term themselves, is but one of these. Because of the dynamic nature of technology, the number of such groups and their needs for frequencies are ever changing as amateurs continually try new modes and techniques and eventually discard old ones. For example, 10 years ago, packet radio did not exist. Today, it is a very popular part of Amateur Radio, and its needs for space must be considered. New technological developments, as well as administrative actions, may be expected to further change the picture in the future. For example, ATV may become more popular as a result of the greater availability of commercial equipment. The advent of digital video compression techniques may further increase the viability and appeal of the mode. On the administrative side, the FCC's proposed codeless license can be expected to have a significant impact on the bands above 50 MHz. Whether or not the commission sees fit to grant Communicator class licensees access to 6 and/or 2 meters, as a number of those commenting on Docket 90-55 are urging, the arrival on the VHF/UHF bands of a new group of hams will, most certainly, produce new pressures for expanded operating room for various modes—especially wideband modes such as FM voice and digital data transmissions. If Communicators are given access to 6 and/or 2 meters, the pressure will be even greater, especially in the case of 2 meters, where intermode friction is already being felt in many areas.

"Weak-signal VHFers," currently represented by VUAC; repeater users, owners and coordinators, represented by VRAC; as well as other interest groups, such as digital and ATV, must find a way to get together and work out amicable ways to accommodate each other's needs. This must be done before problems develop, not after. Such a forum has now been proposed by the League's Membership Services Committee, a committee of the ARRL Board of Directors. Its plan for accomplishing the much-needed dialogue for bands above and below 30 MHz is covered in an article on page 57 of this issue. Please read it and make your views known.

ON THE BANDS

Those looking for clues to impending openings need only find out when W3XO/5 is going to be somewhere else. The Dayton HamVention® weekend provided but one example of this almost foolproof indicator of band conditions. The best tropo opening across the Gulf of Mexico so far this year erupted on Sunday, April 29. Another occurred the weekend of the Central States VHF Conference. W5OZI says that, on Sunday, July 29, 6 meters opened to the Caribbean. Beginning about 1800Z, Pat hooked up with VP2MO, VP2VI, KP4EOR, V29OA and heard 6Y5IC working 4s. If that wasn't enough for one day, a 2-meter tropo session to Florida set in at about 2200Z. Beginning about 2215Z, W5OZI worked K5WTA/4, EM90; W4TKE, WA4CHA and W4GJO, EL88; W4MYF, EM80; WB4IYG, EL98; KA4AQS, EM90; and WA4AHZ, EL87. Most stations were S7 to S8, except for W4MYF who was S2 and WB4IYG who was 40 dB over S9. To top off the day, Pat worked CO2KK on 6 meters at 0014Z July 30 with S9 signals. Too late to be of use for DX predicting, W3XO plans call for being in Houston for the STS-35 Shuttle Mission the week of September 3. Of more use to those reading these lines, I will be in Houston again between October 19 and 22, this time for the AMSAT annual meeting. The VHF bands are bound to explode with DX during both of these periods!

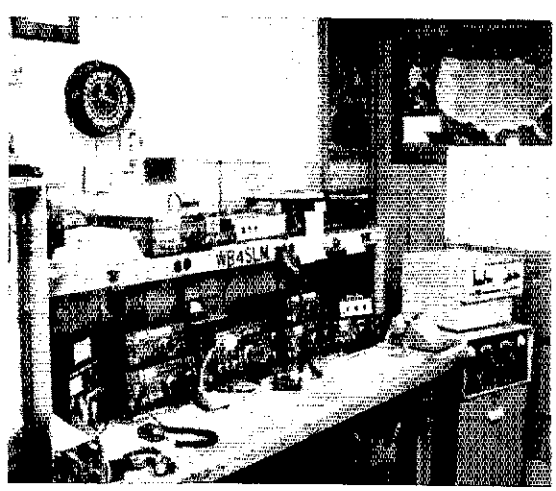
WA1OUB summarizes the summer trans-Atlantic sporadic-E openings which he has managed to catch. Bob says that he missed two "biggies." On June 3, after hearing 48.240-MHz video buzz for a half hour, he worked CT1DTQ and CT4KQ with good signals at 2030Z. CT4KQ was worked again June 9 at 2030Z during the VHF contest. At 1109Z June 29, WA1OUB worked CT1QP, followed 35 minutes later by ZB2EO and ZB2HN. Beginning just after 1800Z that day, he hooked up with one EI, two French stations, one PA, one GJ, four Gs plus two ONs and four Italians. The last two countries were new ones. On June 30, between 1100 and 1140Z, Bob worked ZB0W and ZB0T. He worked CU1EZ July 7 at 1220Z and again on the 8th at 1311Z, the 11th at 2226Z and the 22nd at 2309Z. He also worked CU2/G3RFS at 2030Z July 11 and CU2/G3KDX at 1540Z July 16. LX1SI was worked for another new country at 1330Z July 18. Although he classifies this summer's E_S to Europe as "poor compared to previous years," WA1OUB's accomplishments sure make my mouth water.

The Azores provided most of the DX excitement for scattered parts of the country. One who reports working CU1EZ is KD9OT. David, who runs 20 W, did it at 0007Z July 19. Even a few West Coast stations got in on the act. On July 11, at 2140Z, N6CA and K6PVS were both fortunate to work CU2/G3RFS—a pretty rare catch for Californians any time, but especially so in mid-summer.

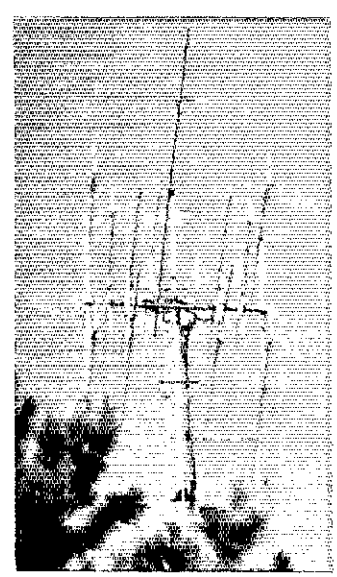
WA5QCP writes from El Paso that the first few days of July were better for him than all of June. Richard says that the 7th was the best day, with double-hop openings to W1, W2, W3 and W4.

ZL1MQ reports that New Zealand's winter E_S season has been quite poor this year. Cliff does note a few openings to VK2 and VK4, which mainly benefited West Coast stations like ZL2TPY and ZL3TY. ZL2TPY worked VK2 stations on five days during the last half of June, and VK7 on two days. ZL3TPY turned in similar results.

June 15 was a notable day, producing a contact with VK9NS for ZL2AQR, a link-up between



The well equipped shack of WB4SLM, Centerville, Georgia.



The reason for WB4SLM's dominant signal on the VHF bands.

*Mail reports to Bill Tynan, W3XO, at HCR 5 Box 574-334, Tierra Linda Ranch, Kerrville, TX 78028, or phone 512-257-1296 to make a voice recording regarding late-breaking information or to send a fax.

KG6DX and VK4 as well as the first-ever contact between KH6 and VK7. It is reported that JAs worked into VK6 that day as well.

JA1VOK's August column in the Japanese magazine *Five Nine* offers a hint as to how conditions appear from the JA perspective. Hat lists some of the more unusual 6-meter DX heard in his islands during July. These include BZ4AA on the 6th, 9th and 10th; VS6SIX, BZ4CBC and BY4AA on the 7th and the VK6RTT beacon on the 8th. The same column also mentions that VU2AID is expected to be activated again from Madras.

G4UPS wishes me to inform World Above 50 MHz readers of the UK 6-Metre Group's upcoming contest. It will be held concurrent with the SMIRK fall contest, November 17 and 18. Anyone wanting a sample log sheet and entry forms may send an SASE to the address at the top of this column. Ted goes on to say that over the past three months, the UK 6-Metre Group has grown by 150 percent. For information on joining, write to Ted Collins, G4UPS, 27 Parklands Hemyock, Devon EX15 3RY England. The newsletter that accompanied G4UPS's letter reports on the IK2GSO DXpedition to La Madalena Island (IMØ). Enrico worked 303 Gs, including GU and GJ; 80 PAs; 62 DLs; 51 OZs; 33 SMs; 24 Fs; 23 Is; 8 9Hs; 8 LAs; 7 ONs; 6 SVs; 5 OEs, 3 CTs; 2 ZBs 1 ZS; 1 ZC; 1 OH; 1 EI plus EA on crossband. It sounds as if Europe is jumping with 6-meter activity and propagation.

K6QXY reports the existence of transequatorial propagation (TEP) to the South Pacific on a number of evenings beginning on about July 18. Times center around 0745Z. On several of these occasions, he has been able to work FO5DR and, in a few cases, ZK1CG. Signals on this end have run S1 to S6. Bob also passes along the information that he and N6AMG have supplied equipment for a beacon at FO5DR. The anticipated frequency is 50.048 MHz. They are also considering supplying Rene with a 2-meter beacon, in hopes of determining whether or not the TEP exists on that band over this particular path.

K6QXY also passes along information on the trans-Pacific tropo duct. Since June 7, Bob has heard the KH6HME 2-meter beacon on about 10 days and the 23-cm beacon on two occasions. The 70-cm beacon has been off, but is now reportedly operating again. The major objective this summer among N6CA and others to the south is to span the Pacific on one or more microwave bands. N6CA has provided KH6HME with equipment for all bands through 10 GHz. Despite this year's openings being below par so far, N6CA is very hopeful of success. On one occasion, he was able to hear signals from the 3456-MHz beacon on Mauna Loa from a portable location in the San Diego area.

K2UYH reports on East Coast microwave activity. Al says that, he, K2RIW and W2TTM are all active on 10-GHz SSB and CW. His rig is an SSB unit that feeds a 2-foot dish mounted in the center of his 70-cm tropo array. K2RIW has a similar setup with his 2-foot dish at the 70-foot level on his 160-foot tower. On the evening of June 17, the two established contact over a nonline-of-sight 78-mile path. Al says that signals began at RST 529 on CW, but built up until four hours later, when they reached S9 on SSB. Incidentally, K2UYH finds that his Ham-M rotator is adequate to point the dish with sufficient accuracy. W2TTM, who has a 2-foot dish on a 35-foot tower, works K2RIW regularly over a 50-mile path. According to the latest *San Bernardino Microwave Society Newsletter*, K2RIW has been visiting the area and has become a member of the group. Dick reports that a number of East Coast hams are considering 10-GHz DXpeditions to places like Nova Scotia and the Outer Banks of North Carolina. The same newsletter notes that WA6EXV is working on a GaAsFET amplifier for the M/A-Com 10 GHz transverter. Chuck hopes for a 1-dB noise figure and about 21 dB gain. For information on the SBMS, drop an SASE to Bill Burns, WA6QYR, 247 Rebel Rd, Ridgecrest, CA 93555.

WA4PGM, Farmville, Virginia, FM07, says that afternoon and evening of July 28 produced a good 2-meter aurora. Kyle reports working K7OWJ/8, EN62; WB9UWA, EN50; K5CM, EM25; W1GDP, FN55; AC8W and AA9D, EN52; W1AIM, FN34; and a number of others between 2100Z and 0540Z on the 29th. Another notable 2-meter opening, this one E_S, took place July 8 beginning around 2000Z. Among the stations WA1VRH (FN31, Connecticut) and W5VY (EL09, San Antonio) reported working were each other. The contact occurred at 2039Z and covered a distance of about 1680 miles.

For those looking for Delaware on 2 meters, KA3KHZ may be your man. Doug runs 200 W to a Cushcraft 215 at 35 feet and will accept meteor scatter skeds. Those interested may drop him a note at 17 N Avon Dr, Claymont, DE 19703.

Those who can get to the Philadelphia area this fall are reminded of the Pack Rats' VHF Conference and huge HAMARAMA hamfest the weekend of October 6 and 7. This is always a fun-filled affair. For information contact John Sortor, KB3XG, or Dave Zimmerman, W3ZD.

CALL FOR PAPERS

The Colorado Front Range Microwave Society will sponsor the Microwave Update Conference beginning January 30, 1991. All technical sessions will take place at the Ramada Conference Center at 1475 S Colorado Boulevard in Denver, Colorado.

All radio amateurs are invited to submit talks and papers for presentation at the technical sessions. Presentations may range from 15 to 45 minutes in length and should stress practical technology applications at frequencies above 900 MHz. Of particular interest are presentations on practical designs for receivers, transmitters and beacons; antennas; software tools; microwave propagation; and microwave operating experiences.

As in previous years, a proceedings booklet will be published. Final papers should be ready by November 15, 1990, to make the publication deadline. For more information, contact Don Lund (WAØIQN), PO Box 1664, Boulder, CO 80306 by October 15.

FM/RPT

Conducted By Brian Battles, WA1YUA
QST Copy Editor

Fight RptFI (Repeater-Frequency Interference)—*Part 2*

Last month, FM/RPT presented a proposal by David Williams, N3FNW, of Glenside, Pennsylvania, that asks repeater operators to consider universal use of continuous tone-coded squelch system (CTCSS) access to reduce problems with unintentional interference between machines. Here are some other members' thoughts on the matter.

To keep distant stations from inadvertently accessing local repeaters, you could modify the repeater's receiver so it has two audio outputs, one squelched and one unsquelched. The squelch circuit would have to generate a contact closure. The unsquelched audio output goes to the CTCSS decoder. The contact closure from the CTCSS board is paralleled with the closure from the squelch circuit to use as a carrier-operated relay (COR) to control the transmitter. The squelched output and the output from the CTCSS board are mixed and sent to the transmitter.

This is the basic idea, but there are many ways of varying the setup with the same results. It gives you full CTCSS sensitivity and is adjustable (depending on the setting of the squelch).—*Gary Reardon, N1EDZ, Ware, Massachusetts*

Hook up a CTCSS decoder to the repeater and set the carrier-operated squelch (COS) as tight as you want. Tie the CTCSS decoder squelch where it overrides the normal squelch function (ie, unsquelches the receiver totally). If you have CTCSS, you will carry the repeater as far as the decoder hears you, but without it, you only get as far as the normal squelch allows. The only problem is, if the skip gets bad enough to start keying up the system on COS, the CTCSS squelch won't make much difference (especially during a good band opening).

CTCSS is *not* a cure-all. If you have receiver problems (such as intermodulation), fix them first. CTCSS doesn't make them go away, it merely covers them up. Your repeater range isn't any better than before—and may be less—because of the CTCSS decoder getting falsed off by heterodynes between the incoming signal and the intermod or other interference.—*Chris Boone, WB5ITT, Groves, Texas, ex-Director, Texas VHF FM Society*

Your suggestions are invited, too. Send a letter or use your computer to send a message via the ARRL HQ BBS (203-665-0090, 2400-8-N-1), the FidoNet Ham Radio Echo, or to ARRL HQ via MCI Mail (215-5052)—WA1YUA

New Op-Ed Column in *QST*

For some time, QST *has been faced with the dilemma of how to provide a regular outlet for League members to express their views and opinions on timely matters—especially if their position can't be condensed to fit the relatively limited space of the Correspondence column.*

Aside from that column, and from the occasional guest piece elsewhere, there are scant opportunities for members to make a case in QST *for a position that either is not yet League policy, or may be contrary to present policy.*

League policy is fluid, not static; it is the product of the developing thoughts of a host of individuals, expressed ultimately through an action of the ARRL Board. You, as a member, have ways of influencing that policy—including, as of now, the opportunity to communicate a case for change directly to fellow members.

You may be familiar with the "op-ed" concept from the newspapers. Many papers make space available, usually opposite the editorial page (hence the name), for readers' dissertations. These pieces generally are more carefully reasoned and frequently are longer than the typical "letter to the editor." QST*'s Op-Ed page follows this tradition.*

Having created this new outlet in QST*, we must ensure that valuable* QST *page space is not devoted to narrow, special interests; to causes that are contrary to public policy, or to the best interests of Amateur Radio; or to the dissemination of untruths.*

With sufficient input from League members, QST*'s Op-Ed page should prove to be an interesting and stimulating forum. We welcome your contributions.*—David Sumner, K1ZZ

QST Op-Ed Policy

1) Contributions may be up to two-thirds of a *QST* page in length (approximately 900 words).

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111.

THE CASE FOR TOLERANCE

By George W. McCarthy, W6SUN
PO Box 42
Pilot Hill, CA 95664

A few months ago, I tuned across the 12-meter band one evening about 8:30 and found no signals, which was not too surprising for a summer evening. Hopeful that I might raise a VK or ZL, I turned my four-element quad to the southwest and called CQ on SSB. In response, I heard a weak signal from a WDØ calling me, so I turned the beam around and brought the signal up to a readable level. It was a Colorado station signing as "QRP, solar powered." This was intriguing, since it was pitch black outside in northern California.

Replying to my question, the operator clarified his statement to mean that he was battery operated, having charged the batteries from solar panels—still a neat deal. As part of my introduction, I mentioned that I was running a kilowatt into a four-element quad. I do run high power into apparently dead bands, when I'm working a mobile, or when conditions warrant its use.

I was then subjected to a ten-minute unsolicited lecture on my failings as an Amateur Radio operator. "In the 12 years that I have been licensed," my contact condescendingly informed me, "I have made it a practice to use the least amount of power possible." His lecture was conducted in a patronizing manner, typical of an elitist lecturing a member of the great unwashed. He concluded, "If you only knew a little bit about propagation you might understand the utter waste you are guilty of. I'll turn it back to you, so you can ionize the layers with your big amplifier."

You can probably guess that I was a bit steamed. Like most people, I don't relish being talked down to, much less patronized and insulted in the process. But I don't like on-the-air hassles either, so I resisted the temptation to inform my contact that I have been licensed for fifty years and do have a nodding acquaintance with what Messrs Kennelly and Heaviside discovered. I signed off quickly, only to hear a K5 calling. It turned out that he was also a QRP station and wanted to talk to the guy in Colorado. I listened with some amusement while it took four "overs" for them to get each other's call signs straight. Then I sat back, cooled off, and began to think about what I had just felt, why I had felt that way and what was happening to ham radio as I have known it.

This is a great hobby, as we all know. One of the things that makes it attractive is its diversity. It started out so simply in the old days. Then came the technical innovations, many of them developed by hams, that have broadened its scope to include many different techniques, many different interests and consequent specializations. But all must share a limited spectrum that will never be big enough to permit everyone to do his or her thing in pristine isolation. Ten years ago, I wrote a humorous article for *QST* about DXing on 20 meters† in response to observations about the battle of the "big guns" seeking pure ego gratification. I got a lot of mail from that, much from hams who were seriously disturbed by the "hogging" of DX stations by certain well-known DXers.

By today's standards, that was minor-

†"The CMP Plan for 20-Meter DXing," Apr 1980 *QST*.

league stuff. Tuning across almost any of the bands will reveal a level of contention and squabbling that borders on anarchy. What is the problem? It seems that the major factor is pure intolerance. Ham radio is our world and the frequencies are our environment. Because the resource is so limited, Amateur Radio requires tolerance, cooperation and an inherent appreciation that our own particular forte has no particular precedence over someone else's.

That type of appreciation is hard to come by, in noticeable short supply, and the lack of it the basic cause of most of the problems I read in the Correspondence section of *QST*. Unfortunately, the exercise of someone's speciality involves the use of a frequency which, from a human relations standpoint, involves the territorial imperative, ie, this is *my* (*our*) frequency to be used only for my (our) purpose.

Almost every "net" or repeater I have heard appeared to have evolved to serve a good and sometimes noble purpose. Certainly they have the advantage of accommodating the needs of many hams on only one frequency, so they are inherently conserving our space (environment) whether we agree with their purpose or procedures.

Although all amateurs are subject to the rules and regulations of their licensing country, the hobby provides one of the widest opportunities for personal expression of any medium on this earth. In its fulfillment I have witnessed public service of the highest order, emergency traffic handled with skill and devotion, international friendship and understanding enhanced beyond the boundaries of nationalities or political convictions and help and understanding offered without stint to the beginner, young and old alike.

But the other side of this coin is the dark side of Amateur Radio. Too easily can convictions turn into prejudices, opinions harden into attitudes and censorship turn into intolerance. Yes, there is a lot out there that none of us likes. Some nets are aggressive and unrelenting in defense of their chosen frequency, some stations discuss subjects possibly inappropriate to ham radio, some DXers are rude and offensive, some newcomers use CB language (horrors!) and some stations put out a lousy signal. Granted, our tradition holds that ham radio is generally a "self-policing" institution. That's the ideal. When there were far fewer of us it was much easier to "catch on" to the protocol and we soon learned what was acceptable behavior. The rare operator who persisted in violating the accepted code of behavior was soon isolated and literally became a pariah with whom no one would talk.

Today, the influx of new operators is greater than the capacity of the existing training resources. The FCC exams completely fail to instruct new hams how to operate once they are licensed. They can only learn by making on-the-air mistakes which will (hopefully) be corrected by tolerant and understanding hams with more experience. But it is this very principle of helping that has been corrupted into the "policing mentality" that is the root cause of most of the contention we hear on the air today. The very essence of good manners is never to do or say anything that will cause embarrassment to another person. There are an infinite number of acceptable and caring ways to help others. The accusing, hassling, contentious, patronizing or disputatious operator may feel he or she is justified in belittling the operator who has made an error *viz*: "You're on the wrong VFO, jerk," or "This is a net frequency, stupid," or "This frequency is in use already, why didn't you QRZ first, CBer?" or "What are you trying to do, cheat Ma Bell with your phone patches?"

Let the first ham who has never made a "cockpit error" please come forth—I want to see the halo. There will always be QRM. There will always be inexperienced or inconsiderate operators. There will always be raunchy signals. There will always be pileups on DX stations. There will always be someone louder than you. Let's hope there will always be ham radio. And, finally, let's hope that each of us can try to develop tolerance for each other, for our differences in operating, in our perceptions, our convictions and our diverse personalities. If getting lectured by an overly pretentious QRPer caused me to look deeply at my own feelings, maybe it was worth the experience. QST

Strays

FAMILY FIELD DAY

Few clubs are so exclusive that you can only join by being born into them. Some families picnic together...some travel together... some even operate Amateur Radio together... but how many families combine all three? The Millers, spanning three generations with seven licensed amateurs, set up their own Field Day operation at the farm belonging to Grandfather, W7CB, and Grandmother, KB6AWM, in a rural spot in central California, near Templeton. The FD call sign was drawn from a hat, with N6YJY used for 1990. Members christened the group Millers Maverick Contest Club and had shirts and hats made, emblazoned with the name.

The family formed two-hour operating shifts of two hams each, with an extra person taking turns managing the generator, antennas, etc. Special tasks were delegated to each group. One was to receive the official ARRL Field Day message and send a Field Day message via NTS to their SM. A special party handled packet and solar-powered QSOs. Another team's job was to coordinate public relations efforts and be sure the station contacted at least 10 Novice/Technician stations. In all, 700 bonus points were earned. Unlicensed family members supplied food and other necessities.

Millers Mavericks harvested 250 CW QSOs, 500 phone QSOs and 5 packet contacts. Plans are already afoot for next year!







Coming Conventions

PACIFIC DIVISION CONVENTION

October 12-14, 1990, San Jose, California

The Pacific Division Convention is sponsored by the Santa Clara County ARA and will be held at the Le Baron Hotel, 1350 N First St. Open Friday for registration at 12 PM, sessions 6 PM, Saturday registration 7 AM, sessions 9 AM, Sunday 9 AM-1 PM. Features include tech sessions, exhibits, ARRL forum, banquet 8 PM ($22). Admission is $12 in advance, $15 at the door. Talk-in on 146.385/985, 442.425/447.425. Emmett Freitas, AE6Z, 481 Fenley Ave, San Jose, CA 95117, 408-243-8349 days.

NEW ENGLAND DIVISION CONVENTION

October 13-14, 1990, Boxboro, Massachusetts

The New England Division Convention, sponsored by FEMARA, will be held at the Sheraton Boxboro Hotel, Rte 495 at Rte 111. Doors open 8 AM. Features include flea market, commercial exhibits, VE exams both days, Wouff Hong ceremony at midnight Saturday, YL programs both days, seminars both days, 2-meter fox hunts for hand-helds, banquet, dance and show $23. Featured speakers ARRL President Dr Larry E. Price, W4RA, and AMSAT President Doug Loughmiller, KO5I. Advance registration $7, door $8. Arthur Tomkinson, W1THT, 9 Oliver Terrace, Revere, MA 02151; send an SASE. Make checks payable to FEMARA.

SOUTH CAROLINA STATE CONVENTION

October 27, 1990, Sumter

The South Carolina State Convention is sponsored by the Sumter ARA and will be held at the Sumter County Exhibition Center, 700 W Liberty St. Open 8 AM-4 PM. Features include VE exams, ARRL forum, MARS forum, ATV forum, commercial dealers, flea market, refreshments. Admission is $4 in advance, $5 at the door. Talk-in on 147.615/015. Tables are $4 in advance, $5 at the door. For tickets, send SASE to SARA, PO Box 193, Sumter, SC 29151, for other info, contact Mike, KC4HUT, 803-481-4611 or Woody, N4SID, 803-481-9205.

1990

November 9-11
South Texas Section, Houston

ARRL NATIONAL CONVENTIONS

August 23-25, 1991—Saginaw, MI
August 20-23, 1992—Los Angeles

TENNESSEE STATE CONVENTION

October 27-28, 1990, Chattanooga

The Tennessee State Convention and Twelfth Annual Chattanooga Amateur Radio Convention is sponsored by the Chattanooga ARC and will be held at the South Hall of the Chattanooga-Hamilton County Convention and Trade Center. Open Saturday from 9 AM-5 PM and Sunday 9 AM-3 PM. Features include VE sessions both days (9:30 AM—no walk-ins), exhibitors, flea market, forums, refreshments. Admission is $5 at the door; no advance sales. Tables are $10/day, $15 weekend. Talk-in on 146.79/19. Exhibitors: Barbara Gregory, WA4RMC, 615-629-7911 weekdays, 615-892-8889 eves; flea market: Frank Gray, KC4TV, 615-624-4839 early eves; Exam reg: Mail FCC Form 610, photocopy of license and check for $4.95 (payable to ARRL/VEC) to Bill Wiggins, N4BMR, PO Box 222, Signal Mountain, TN 37377 by Oct 24.

1993 National Convention: Call for Applications

The ARRL is now accepting applications for the 1993 National Convention. Contact ARRL Headquarters for application forms and information.

The Board of Directors may consider applications for the 1993 Convention as early as the 1991 Annual Meeting, so applicants should forward completed forms to HQ by December 31, 1990.—*Bernice Dunn, KA1KXQ, ARRL Convention Manager*

Attention Hamfest and Convention Sponsors

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and additionally, by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541, ext 283.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

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.

†ARRL Hamfest

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequencies, *Adm* = Admission fee.)

California (Redwood City)—Oct 13, 8:30 AM. *Spr:* Palo Alto ARA. Ampex Cafeteria, Hwy 101 to Woodside Rd to Bay Rd. Ham gear, electronic parts, test equipment, refreshments. *TI:* 147.45. *Tables:* $7 ea. Chuck Johnson, N6VFH, 3309 Mt Logan Dr, San Jose, CA 95127.

Colorado (Denver)—Oct 21; set up 7 AM, public 8 AM-2 PM. *Spr:* Rocky Mountain Radio League. Jeffco Fairgrounds, 15200 W 6th Ave, Golden. Swap, exhibits, new equipment, refreshments, handicapped accessible. *TI:* 146.34/94. *Adm:* $2. *Tables:* $7. Dan Duryee, KBØJ, 303-458-5444 (days), Fred Brachle, NØFIK, 8230 Reed Ct, Arvada, CO 80003, 303-425-5791 (eves).

†**Connecticut (Cromwell)—Oct 28,** 9 AM-2 PM. *Spr:* Middlesex ARS/CARES & Cromwell Middle School ARC. I-91 to Rt 372 E to Rt 3 N to Geer St to Mann Memorial Dr. Flea mkt, CW copying championships, packet workshop, NTS seminar with KY1F, DXing & contesting conferences, VE exams (walk-ins okay), dealers. *TI:* 147.69/09, 444.625/449.625, 146.52. *Adm:* no adv, door $4. *Tables:* $10 each. MARS/CARES Pres Jack Chapman, WA1K, 51 Ballfall Rd, Middletown, CT 06457, 203-347-8745 or Carl Brinck, KA1DXP, 20 Hicksville Rd, Cromwell, CT 06416, 203-635-5020.

Connecticut (Uncasville)—Oct 27; set up 9 AM, public 10 AM. *Spr:* Tri-City ARC. Uncasville VFW, off Rte 32 behind Wonder Bread bakery. Auction, refreshments, wheelchair accessible. *TI:* 146.13/73. *Adm:* free. Tom Scott, WA2RYV, 203-464-6555.

Florida (Bunnell)—Oct 6; setup 7 AM, public 9 AM-5 PM. *Spr:* Daytona Beach ARA, Flagler/Palm Coast ARC, St Augustine ARS. Flagler County Fairgrounds on County Rd 13 off US1. Tailgating $2, refreshments. *TI:* 146.52. *Adm:* $1. *Tables:* $3. Bob Piselli, WA1ZRU, PO Box 350390, Palm Coast, FL 32135, 904-445-5545.

Florida (Sarasota)—Oct 20, 9 AM-3 PM. *Spr:* Sarasota ARA. Ed Smith Stadium Complex, north parking lot, 2700 12th St. Tailgating, free parking, refreshments. *TI:* 146.31/91, 147.90/30. *Adm:* no adv, door $3, vendors $5. Eddie Martin, 813-954-1870, or write CFT, PO Box 3182, Sarasota, FL 24230 before Oct 10, SASE.

†**Florida (West Palm Beach)—Oct 13-14;** Sat 9 AM-5 PM, Sun 9 AM-3 PM. *Spr:* Palm Beach Repeater Assn. Take W Palm Beach exit off FL Tpke or Southern Blvd exit off I-95 & follow fairground signs. Refreshments, RV facilities, VE exams, flea mkt, forums, demos, free parking, on-site security. *TI:* 147.765/165, 146.52. *Adm:* adv $4, door $5. PBRA Hamfest, PO Box 461, Lake Worth, FL 33460.

Georgia (Lawrenceville)—Nov 3-4. *Spr:* Alford Memorial RC, Gwinnett County Fairgrounds. Exhibitor area, flea mkt, tailgating, Handi-Hams, special-event station, equipment testing facilities, RV sites. Alford Memorial RC, Hamfest Info, PO Box 3100, Lithonia, GA 30058.

†**Illinois (Centralia)—Oct 21;** set up 7 AM, public 8 AM-3 PM. *Spr:* Centralia Wireless Assn. Kaskaskia College Gymnasium, 3 mi NW of Centralia. Flea mkt space incl 1 table $5, exhibit displays, free parking, refreshments. *TI:* 147.27/87, 443.2/448.2. *Adm:* $2 each, or 3 for $5. Mail ticket orders with an SASE to Centralia Wireless Assn, Hamfest Tickets, PO Box 1166, Centralia, IL 62801.

Illinois (Grayslake)—Oct 28, 7 AM-4 PM. *Spr:* Civil Air Patrol. Lake County Fairgrounds. *Adm:* $4. *Tables:* $6. SASE to CAP, 637 Emerald St, Mundelein, IL 60060.

†**Louisiana (West Monroe)—Nov 10,** 9 AM-3 PM. *Spr:* Twin City Hams. W Monroe Convention Center, 2305 N 7th St. Refreshments, forums, RV sites, swap tables, dealers, VE exams, free parking, handicapped facilities. *TI:* 146.25/85. *Adm:* $1. Benson Scott, AE5V, 745 40 Oaks Farm Rd, West Monroe, LA 71291-9432, 318-323-3478 days, 318-396-2424 eves.

†**Maryland (Friendship)—Oct 14,** 8 AM-3:30 PM. *Spr:* Columbia ARA. Rt 70 W from Baltimore to Rt 32 S, take right off Rt 32 onto Rt 144 & proceed 2.5 mi to Howard County Fairgrounds. Refreshments, VE exams, tailgating, free parking. *TI:* 147.735/135, 146.52, 222.34/223.94. *Adm:* $5. CARA Hamfest Hotline, 301-997-5052.

†**Maryland (Westminster)—Nov 4,** 8 AM. *Spr:* Carroll County ARC & Penn-Mar RC. Follow signs

to Carroll County AG Center, Smith Ave. VE exams, handicapped parking, refreshments. *TI:* 144.81/145.41, 147.93/33, 444.875/449.875. *Adm:* no adv, door $4. PO Box 299, Westminster, MD 21157, 301-239-3878.

Massachusetts (Framingham)—Oct 28; set up 8 AM, public 9 AM to early-bird buyers & 10 AM to all buyers. *Spr:* Framingham ARA. Framingham N High School, A St, 1.3 mi N of junction of Rts 9 & 126. VE exams. *TI:* 147.75/15. *Adm:* $5 to early-bird buyers & $2 to all buyers. *Tables:* $12 incl 1 free adm. To reserve tables, contact Jon Weiner, K1VVC, 52 Overlook Dr, Framingham, MA 01701, 508-877-7166, for exams send completed Form 610, copy of FCC license & check for $4.95 payable to ARRL/VEC to FARA, PO Box 3005, Framingham, MA 01701, 508-877-0563 eves.

Michigan (Kalamazoo)—Oct 21; set up 6 AM, public 8 AM. *Spr:* Southwestern Michigan Amateur Radio Team & Kalamazoo ARC. Kalamazoo Central High School, US 131 to M-43 E to Drake Rd, then N to the school. VE exams (9 AM), free parking. *TI:* 147.040, 444.875/449.875. *Adm:* adv $2, door $3. *Tables:* $1/ft, $4 min. Send requests & payment with SASE by Oct 5 to Gary Hazelton, KB8PL, 67332 32nd St, Lawton, MI 49065 (checks payable to Kalamazoo Hamfest).

Michigan (Shelby Township)—Oct 14, 8 AM-2 PM. *Spr:* Utica-Shelby Emergency Communications Assn ARC. Eisenhower High School, 6500 25 Mile Rd. Refreshments, trunk sales $5. *TI:* 147.78/18. *Adm:* adv $2, door $4. *Tables:* $10. For tickets & tables, send payment & SASE to Arpad Miklos, WY8M, 3180 Chard, Warren, MI 48092, 313-751-3804.

†**Michigan (Southfield)—Nov 4,** 8 AM. *Spr:* Oak Park ARC. Southfield Pavilion Center, Evergreen Rd, between 10 & 11 Mile Rds. Free parking, NTS forum, ARRL forum, dealers, new & used ham gear, VE exams (11 AM). *TI:* 146.52, 146.64/04, 224.36/222.76. *Adm:* no adv, door $4, under 12 free with an adult. *Tables:* $12 ea, must be paid in adv. Exam info: Don Olszewski, WA8IZV, 294-4766; general info: Alan Quirie, KA8ZRR, 313-549-6812 days.

†**Minnesota (Brooklyn Park)—Oct 27,** 7:30 AM-3 PM. *Spr:* Twin City FM Club, Hennepin Tech College/Brooklyn Park Campus, 9000 Brooklyn Blvd, just N of I-694 & Hwy 169 (previously County Rd 18). Refreshments, flea mkt, free parking, VE exams, forums, seminars, top amateur & computer retailers, speakers Wayne Green, W2NSD & astronaut Dr Ron Parise, WA4SIR. *TI:* 146.16/76. *Adm:* adv $4.50, door $6. Write to Minnesota Hamfest & Computer Expo, PO Box 5598, Hopkins, MN 55343 612-474-1529.

†**Mississippi (Biloxi)—Oct 6-7;** Sat 8 AM-5 PM, Sun 8 AM-2 PM. *Spr:* Mississippi Coast ARA. Point Cadet Plaza on US 90 at Biloxi—Ocean Springs Bridge. Forums, VE exams, refreshments. *TI:* 146.13/73. *Adm:* free. Charlie Kunz, AA5QJ, 601-377-6495 days, 601-875-9516 eves.

†**Missouri (Grandview)—Oct 27,** 8 AM-3 PM. *Spr:* Southside ARC. MO Hwy 71 to Grandview, exit at Main St, W ¼ mi to Grandview Jr High School at 10th & Main. VE exams (9:30 AM prereg only, no walk-ins), flea mkt, forums, refreshments. *TI:* 147.72/12. *Adm:* free. *Tables:* $12 each, incl ticket paid in adv. Edward Conrad, NØCKT, 608 Cedar, Belton, MO 64012-2652, 816-331-4085.

†**New Jersey (Paramus)—Oct 7,** 8 AM-2 PM. *Spr:* Bergen ARA. Bergen Community College, 400 Paramus Rd. Refreshments, VE exams (7 AM-10 AM), free parking. *TI:* 146.19/79. *Adm:* buyers free, sellers $7 per space. Jim Joyce, K2ZO, 286 Ridgewood Blvd, N Westwood, NJ 07675, 201-664-6725. VE exams: Pete Adely, K2MHP, 13-30 Edward St, Fairlawn, NJ 07410, 201-796-6622.

†**New Jersey (Stirling)—Oct 21,** 8 AM-2 PM. *Spr:* Tri-County Radio Assn. Valley Rd to Passaic Township Community Center. Refreshments, tailgating (reservations reqd), wheelchair accessible. *TI:* 147.255/855, 146.52. *Adm:* $3, under 12 with parent free. *Tables:* $8, with elect $10. Dick Franklin, W2EUF, 23 Shawnee Rd, Cranford, NJ 07016, 201-276-6522.

†**New York (Syracuse)—Oct 13;** set up 7 AM, public 9 AM-5 PM. *Spr:* Radio Amateurs of Greater Syracuse, NY State Fairgrounds, just 3 mi E of Thruway exit 39 off Rte 690. Flea mkt, technical talks, contests, commercial vendors, tailgating $3 per space plus adm. *TI:* 146.31/91, 147.90/30. *Adm:* 16 & under free. *Tables:* $7 plus adm. Viv Douglas, WA2PUU, 315-469-0590.

New York (Yonkers)—Oct 7; set up 8 AM, public 9 AM-3 PM. *Spr:* Yonkers ARC. Yonkers Municipal Parking Garage, corner Nepperhan/Main St. Refreshments, new & used equipment, auction 2 PM. *TI:* 146.265/865, 440.150/445.150. *Adm:* no adv, door buyers $5, sellers $10 per space. John Costa, WB2AUL, 914-963-1021 eves.

†**North Carolina (Smithfield)—Oct 20;** set up 6:45 AM, public 8:30 AM-3:30 PM. *Spr:* Triangle E ARA. Smithfield Moose Lodge at exit 97 (I-95) & US 70-A, Selma, NC. Refreshments, flea mkt (space $3), forums, VE exams. *TI:* 146.28/88. *Adm:* adv $4, door $5, under 12 free. *Tables:* $6. For exam info, send $4.95 & completed FCC Form 610 to Vince Yakamavich, AA4MY, 220 Carriage Tr, Raleigh, NC 27614, 919-847-8512 eves 7-9. General info: Harry Greenberg, W2AC, 919-553-4309 days; Kirk Ellis, KK4YP, 919-965-9577 eves; Peter Hulth, N4SXG, 919-934-8927.

†**North Dakota (Grand Forks)—Oct 13,** 9 AM-5 PM. *Spr:* Forx ARC. City Auditorium. *TI:* 146.34/94. Warren Tobin, WFØV, 515 Sixth Ave SE, E Grand Forks, MN 56721.

Nova Scotia (Greenwood)—Oct 20, 9 AM-3 PM. *Spr:* Greenwood ARC. Gilwell Hall. *TI:* 146.52, 146.07/67. *Adm:* $2. Lance Peterson, VE1VCL, PO Box 63, Greenwood, NS, Canada, B0P 1N0.

†**Pennsylvania (Bensalem)—Oct 21,** 8 AM-2 PM. *Spr:* Penn Wireless Assn. Yezzi Field, Hulmeville Rd, PA Rte 513 (near US Rte 13). Refreshments, VE exams, auction. *TI:* 146.52, 146.325/925. *Adm:* door $3, carload $7. Steve Ewall, WB3IRC, PO Box 734, Langhorne, PA 19047, 215-752-1202 or Ed Tryon, KA3CVP, 215-750-0124.

Pennsylvania (Carlisle)—Oct 21; set-up 6 AM, public 7 AM-2 PM. *Spr:* Cumberland Co ARS. Carlisle Fairgrounds, from exit 17 off I-81 or exit 16 off PA Tpke (I-76), follow US Rte 11 S (Hanover St) to Clay St, turn right & go ¼ mi to fairgrounds gate, look for signs. *TI:* 144.67/145.27, 146.52. *Adm:* $3. *Tables:* inside $7. SASE to C-CARS, PO Box 448, New Kingstown, PA 17072.

†**Pennsylvania (Sellersville)—Oct 28;** sellers 6 AM, public 8 AM. *Spr:* RF Hill ARC. PA Nat'l Guard Armory, PA Rte 152. Flea mkt, refreshments. *TI:* 144.71/145.31, 146.28/88, 146.52, 223.50. *Adm:* no adv, door $4. Bob Buonfiglio, KA3POV, 361 School House Rd, Souderton, PA 18964, 215-723-1016 eves.

Quebec (Montreal)—Oct 27; set up 8 AM, open 9-3. *Spr:* Cote St Luc ARA. St Richards Church, 7070 Guleph Rd, Cote St Luc. Flea mkt. *Adm:* $2 door, no adv. Tables $10. *TI:* 147.27/147.87. Joe Ship, VE2JS, 5637 Melling Ave, Cote St Luc, Quebec, H4W 2C1, tel 514-482-6500.

Tennessee (Gray)— Oct 20; 8-5. *Spr:* Kingsport, Bristol & Johnson City Tri-Cities Hamfest. *Adm:* $5. *TI:* 146.97. Alva Messimer, K4ZHK, 512 W Poplar St, Johnson City, TN 37604, tel 615-926-5755 (days), 615-928-4407 (eves).

†**Tennessee (Memphis)—Oct 13-14;** Sat 9 AM-5 PM, Sun 9 AM-2 PM. *Spr:* Mid S ARA. Youth Bldg, Mid S Fairgrounds. ARRL forum, Army MARS, DX, antennas. *TI:* 146.28/88. *Adm:* no adv, door $5, $2 for family member. Harry Simpson, W4MI, 901-357-8148; Nita Wofford, N4DON, 901-363-4971, or Don Chandler, KA4EBU, 901-795-6987 days, 901-755-6629 eves.

†**Texas (El Paso)—October 19-21;** Fri Hospitality night at K5WPH or Hotel Plaza Jaurez, 8 PM; Sat 8-5; Sun 8-2. El Paso/Jaurez Internat'l Ham Fiesta. *Sprs:* K5WPH/BARA/W5ES/QCWA. I-10 to Trowbridge exit, turn S, then right on Delta, left at Ascarate Park. Seminars, VE sess, contests, Mexican lunch, special-event station. *Adm:* $5 adv, $6 door. Chris Hines, N5LZB, Ham Fiesta Chmn, 6426 Belton, El Paso, TX 79912, tel 915-532-1483 (days), 915-584-3824 (eves).

Wisconsin (Kaukauna)—Nov 4. *Spr:* Fox Cities ARC. Starlite Club at Rt 1. VE exams (checkin at 8:15 AM). Don Baker, 621 W 7th St, Kaukauna, WI 54130, 414-766-3886.

Wisconsin (Waukesha)—Oct 14; set up 6 AM, public 8 AM-1 PM. *Spr:* Kettle Moraine RAC. Waukesha County Exposition Center, Hwys J & FT. VE exams. *Adm:* adv $4, door $5. *Tables:* reserved $5 each, adm ticket required in addition to table reservation (reservations accepted until Oct 6). Send check & SASE to KMRA Swapfest, PO Box 276, Waukesha, WI 53187-0276.

Strays

VETERAN POST

☐ American Legion Amateur Radio Post 380 in Sunnyvale, California, is believed to be the only American Legion Post in the world consisting of veterans who are Amateur Radio operators. Members meet on the air every Thursday evening at 7:30 Pacific Time on the K6FB repeater (145.45 MHz) in California's Silicon Valley.

AMATEUR MEMORIAL

A granite monument to radio amateurs who died while performing civilian public service communications will be dedicated at the ARRL National Convention in Saginaw, Michigan, on August 25, 1991.

If you know of any amateurs who should be honored at this ceremony, please contact Joe Turner, K8CQF, Monument Committee, 1991 National Convention, 423 N Granger St, Saginaw, MI 48602. Information should include the fallen ham's name, call sign, date of death, a description of the circumstances surrounding the death and any supporting documentation, media reports, personal testimonials or other relevant materials. Nominations may only be made for US hams not killed in military action and may date back to the beginning of ham radio.

Donations to help defray the cost of constructing the monument may be sent to the address above. At this writing, donations are not tax-deductible.—*Joe Turner, K8CQF, ARRL Michigan Section Emergency Coordinator*

I would like to get in touch with...

☐ anyone who has configured an AEA PK-232 data controller with a Radio Shack Model 4 computer to make the Model 4 beep when connected in packet mode or called by a PacketCluster node. Bill Nelson, N2GGQ, 52 Dykes Park Rd, Nanuet, NY 10954.

☐ anyone who has a schematic for a Heathkit battery eliminator Model BE-5. I'd also like to hear from anyone who knows of a program or system to create a personal BBS using a PK-64. Heard S. Lowry, K4VFA, 915 Madison St, Manchester, TN 37355.

☐ anyone who has used a HAL ST-6000 and a Commodore® C-128 personal computer to operate HF RTTY. I need information on interfacing, software, etc. Bob Goldberg, WB6OFO/8, 715 N Washington St, PO Box 231, Hubbardston, MI 48845.

☐ anyone who has an old Thordarson catalog. I have several large transformers I need to identify. John R. Leary, W9WHM, 438 E Hamilton St, Fortville, IN 46040.

☐ anyone who has a schematic or hook-up information for a Western Electric 106B loudspeaker set equipped with a KS-16728L1 amplifier. Mel Frerking, KB4MQ, 2566 Bailey Dr, Norcross, GA 30071.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

President: Richard L. Baldwin, W1RU
Vice President: Michael J. Owen, VK3KI
Secretary: Larry E. Price, W4RA

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Tokyo 170-91
Japan

The International Amateur Radio Union—since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

Responsibility

The column this month is written not so much for the 160,000 members of the ARRL who receive their monthly copy of *QST*, but for the officers of International Amateur Radio Union (IARU) societies who also receive a copy of *QST*, thanks to the ARRL.

In June, the International Telecommunication Union (ITU) published an agenda for the World Administrative Radio Conference (WARC) to be held in Spain in February 1992. The substance of that agenda was summarized in the *QST* editorial in August (It Seems to Us..., p 9).

In July, the Administrative Council of the IARU met in Boston to review that agenda and to produce documentation that would aid our member-societies in preparing for WARC-92. Two important documents were mailed to our member-societies. One details the long-range needs of the amateur and amateur-satellite services and the other details a position in response to the WARC-92 agenda.

Most of the long-range needs of the amateur services cannot be addressed at WARC-92 because of the limited scope of its agenda. Nevertheless, we believe it's important for our member-societies to call these long-range needs to the attention of their administrations, not only for information, but more importantly, for future planning.

The other paper deals with each area of the WARC-92 agenda and details the IARU position with respect to each item, positions based on in-depth discussions that have taken place at IARU regional conferences over the past several years. This paper is of immediate importance to each member society of the IARU.

The IARU has a tremendous amount of potential strength and effectiveness if everyone fulfills his responsibilities. On one level, we have the IARU Administrative Council, which is responsible for the overall policy and management of the IARU. At another level, we have the regional organizations which coordinate activties in support of the IARU and Amateur Radio in each of the three IARU Regions. At another level, we have the individual member-societies themselves, the backbone and the strength of the IARU organization.

Member-societies are effective only to the extent that they carry out their responsibilities. Right now, each member-society has one responsibility of the highest priority—to make sure its administration becomes acquainted with, understands *and supports* the IARU position for WARC-92. Only in this way will we achieve success. Only in this way will the interests of Amateur Radio be protected worldwide.

Let me inject a personal word here: I feel strongly about the importance of each IARU society making firsthand and effective contact with its administration. There's a tremendous amount of competition for space in the RF spectrum, and we can be assured of our fair share only by vigorous activity on our part. I'm urging each member of the IARU Administrative Council and the IARU Regional Executive Committees to personally contact each member-society with a view toward ensuring that direct contact is made with administrations to acquaint them with, and to secure their support of, the IARU position in advance of WARC-92.

When the decisions are made at WARC-92 in February or March of 1992, we want to be able to say we did everything we could to gain support for Amateur Radio in preparation for that conference. After 1992, there will be no second chance, not for many years.

So I say to the member-societies of IARU: You have a great responsibility facing you in preparation for WARC-92. We of the IARU Administrative Council and the Regional Organizations will provide support and assistance, but the ultimate responsibility of convincing your administration to support the IARU position is yours.—*W1RU* QST

W1AW Schedule

April 2-October 29, 1990 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0200, 1300, 2300; TThSSn: 2000; Sn: 0200
	Fast Code Practice	MWF: 2000; TTh: 0200, 1300; TThSSn: 2300; S: 0200
	CW Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	Teleprinter Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CDT	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MDT	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PDT	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM
	Fast Code Practice	MWF: 1 PM 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teleprinter Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Voice Bulletins	Dy: 6:30 PM, 9:30 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818*, 3.5815, 7.0475, 14.0475, 18.0975, 21.0775, 28.0775, 50.08*, 147.555* MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 18.160, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from January 1989 *QST*, pages 9 and 100" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 100.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on the regular teleprinter frequencies.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1500 UTC transmissions, and 2200 UTC on WThFSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EDT and on Saturday and Sunday from 3:30 PM to 1 AM EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

*Temporarily off the air on 160, 6, 2

Silent Keys

Administered by Nancy A. Slipski

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

W1AAR, Russell F. Hobart, Colebrook, NH
N1ADI, Antonio Roy, Fairhaven, MA
W1ARO, Donald J. McFarlane, Scituate, MA
W1BB, Stewart S. Perry, Winthrop, MA
W1BDN, Loren E. Baker, Clinton, CT
K1CEL, Marilyn C. Stone, Westwood, MA
N1DEZ, Kenneth W. Mc Nair, Duxdury, MA
W1EOP, Walter E. Dresser, Calais, ME
W1EQ, George R. Caron, Danielson, CT
WB1EWM, Charles N. Benoit, Williamstown, MA
W1EZ, Harold C. Pratt, Pownal, VT
*WA1KVC, John H. Madden, Lynn, MA
K1TNF, Victor R. Montanese, South Portland, ME
WA1VNU, Ronald N. Salmon, Killingworth, CT
W2DBQ, Richard E. Nebel, Lakehurst, NJ
KB2DYD, Stanley J. Chadwick, Beach Haven Park, NJ
KA2DZC, Edward W. Junker, Rochester, NY
KC2GG, Carl E. Hundstad, North Syracuse, NY
W2GIP, George Busse, New Milford, NJ
KB2IRW, Claude P. Haines, Midland Park, NJ
W2JGJ, George Horton, Sidney, NY
WA2OSY, Kurt A. Maier, Port Richey, FL
W2RQR, Ernest R. Pearson, Tonawanda, NY
W2RSJ, Francis C. Schummer, Buffalo, NY
W2SIC, William F. Heinen, Orchard Park, NY
WB2WBT, Clarence E. Bower, Apalachin, NY
N3APK, Harold R. Lytle, Berwyn, PA
W3BHS, Edward A. Gurtowski, Reading, PA
W3CIC, Lawrence A. Laser, Annapolis, MD
N3DEF, Edward F. Harrison, Wilmington, DE
N3DYO, Thomas J. Wholey, Carlisle, PA
K3GFC, Frank J. Winkler, Philadelphia, PA
K3HLS, Walter L. Sherry, Pittsburgh, PA
W3HQO, R. H. Cherrill, Philadelphia, PA
KA3IXM, Carl F. Wermine, Crofton, MD
W3KZH, Charles F. Dohne, Washington, DC
KA3RNL, Elmer S. Steppy, Williamsport, PA
KB3TK, Richard M. Jacobs, Allentown, PA
W3VCL, Willard Hoffman, Glen Lyon, PA
KA4EGP, John E. Kelley, Naples, FL
KA4HHD, Joel R. Berry, Decatur, GA
W4HHQ, Robert S. Embry, Sevierville, TN
KB4JC, Homer C. Barton, Louisville, KY
W4LIP, George Papamarcos, Boynton Beach, FL
W4LXH, Oliver R. Mc Pherson, Mebane, NC
W4MXK, Julian H. Jones, Montgomery, AL
N4NLD, John F. Beamon, Norfolk, VA
W4PWS, Avery C. Baswell, Montgomery, AL
KB4RAM, Robert R. Tripcony, Dallas, GA
W4RTJ, Thomas H. Lipscomb, Jacksonville, FL
W4SLJ, Frank P. Mollise, Mobile, AL
KB4VHP, William D. Laws, Nashville, TN
KA4VXG, Sylvia A. Jennings, St Petersburg, FL
W4YK, Jay R. David, Mountain Home, NC
W5AA, Ralph W. Rea, Oklahoma City, OK
K5GOT, L. K. McClendon, Warren, AR
W5HM, John R. Johnson, Elephant Butte, NM
W5HYW, James B. Dudley, Malvern, AR
KA5IBE, Eguene Reichelt, Mission, TX
W5IZL, Ruth D. Gieske, Electra, TX
KA5PGE, Ralph E. Cox, Harrison, AR
WA5TKW, Ben K. Rush, Lake Kiowa, TX
WD6AHD, Thomas B. Bissett, Ventura, CA
K6AJ, Albert Henderson, San Diego, CA
K6CFV, Saul Kimmel, Las Vegas, NV
W6CQ, David L. Smith, Lomita, CA
K6HLR, William T. Robinson, San Gabriel, CA
K6LJA, Ted Glick, Santa Ana, CA
WA6LQY, Charles H. Carleton, Guadalupe, CA
W6NEQ, Giusseppi B. Costa, San Mateo, CA
N6QAX, Joanne K. Cameron, San Diego, CA
KD6QJ, Melvin R. Hanson, San Diego, CA
W6SH, Sophie K. Heintz, Los Gatos, CA
K6TM, Albert D. La Rue, Los Altos, CA
W6TU, Harold M. Vester, Ventura, CA
WB6VQA, Smiles M. Silva, Paso Robles, CA
W6WAM, E. L. Figard, Richmond, CA
W6ZSM, Fred W. Cota, Santa Barbara, CA
W6ZUB, William G. Humphries, San Rafael, CA
WB7AYK, Martin R. Klein, Salt Lake City, UT
N7JXU, Ted E. Liringis, Las Vegas, NV
WA7KHV, Harry L. Bordsen, Everett, WA
WA7MFF, Henry J. Bittmann, Tumwater, WA
W7PAE, Rodney D. Houghton, Ephrata, WA
KA7PWP, Earle E. Snavely, Three Forks, MT
K7YVN, Faye S. Lyle, Carson City, NV
W8AMT, Howard H. Clark, Flushing, MI
K8BDM, Albert E. Langhorst, Cincinnati, OH
KB8BPN, Paul W. Simmons, Huntington, WV
W8CVQ, Walter G. Marburger, Kalamazoo, MI
W8CZD, Miller D. Crawford, Van Wert, OH
W8EYC, Harvey Knight, Wolverine, MI
KA8MRI, Steven D. Gerke, Rising Sun, IN
WB8NYB, Wilbur S. Adkins, Glen Dale, WV
W8OUF, Stanley O. Noe, Columbus, OH
K8PJO, Orin R. Arnold, Manistee, MI
KW8P, Mervyn T. Walsh, Silver City, NM
WB8RPL, Deane D. Hemsoth, Toledo, OH
WA8TTI, George O. Smith, Wheeling, WV
W8TXI, V. Englehart, Toledo, OH
W8UDO, Walter E. Lang, Ashland, OH
KD8UI, Harry J. Hill, Parma, OH
KB9ABP, Robert C. Ronk, Sherwood, WI
W9AEH, Theodore A. Githens, Hayward, WI
KA9BAI, Sidney L. Morgan, Rantoul, IL
K9DEQ, Ray Hochsprung, Oak Lawn, IL
KA9FFO, Robert W. Long, Monticello, IN
N9FMZ, Alfred W. Brand, Seymour, IN
W9IRT, Edward T. Conner, Jeffersonville, IN
W9KWV, Earl R. Backus, San Diego, CA
W9RK, Roy Halvorsen, Des Plaines, IL
WA9RKZ, Louis H. Sprung, Highland Park, IL
W9RXO, Charles W. Colston, Alton, IL
WØEXJ, J. K. Schultz, Mc Cook, NE
KØFBC, Clarence Reed, Wichita, KS
WDØGBU, Gary L. Butturff, Rochester, MN
KØIJN, Heinrich Theobalt, Minneapolis, MN
WØNZS, Francis Macknikowski, Duluth, MN
WBØPBN, Allen P. Schmidt, Greeneville, TN
WAØQJS, J. S. Nutt, Edwards, MO
WØSGA, Glen E. Swayne, Culbertson, NE
WØUVP, Herman C. Adkins, Crestwood, MO
WBØYBJ, Michael R. Serrage, Gravois Mills, MO
KBØYE, Nelson A. Watkins, Salisbury, MO
WØZYA, Donald G. Stroh, Golden, CO
G3XBG, G. A. Wood, West Yorks HD6 2, Great Britain
DL8ZZ, Heiner Zech, 8500 Nuernberg, West Germany

*Life Member, ARRL

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

In order to avoid 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 p 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 or for 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 1940

☐ "It Seems to Us—," Correspondence from Members and Operating News buzz with hamdom's lively response to A.R.R.L.'s new Code Proficiency program, with W1AW's first qualifying run netting *over 800* awardees, including 31 nonhams.

☐ Visual communication grabs cover- and lead-article slots in "Television Camera-Modulator Design for Practical Amateur Operation" by A.R.R.L. Research Engineer James J. Lamb, W1AL.

☐ "Atlantic Coast Amateurs Render Emergency Service" describes how Amateur Radio stepped in to assist when the August 11th hurricane destroyed lives and property from Florida to Virginia.

☐ "Centimeter Waves Coming Up" describes the Masschusetts Institute of Technology's success at generating 700-Mc. RF for instrument-landing research. In an introductory sidebar, A.R.R.L. President George Bailey describes subsequent developments concerning these "ultra-super-short" wavelengths as "simply amazing" and exhorts hams to follow the field carefully.

☐ If the phrase "screen grids aren't intended to run red hot, but they frequently do" makes *your* scalp tingle, "Fool-Proof Screen Feed" by R.C.A.'s Walter Van B. Roberts, W3CHO, offers tonic for your nerves.

☐ Even though human events and propagation conspired to keep DX doings at an all-time low, Hq.'s E. L. Battey, W1UE, reports that 919 U.S. and 138 non-U.S. amateurs participated in March 1940's 12th A.R.R.L. DX Competition. Highest scorers: U.S. C.W., W6GRL; U.S. 'Phone, W6OCH; Non-U.S. C.W., XF1A; Non-U.S. 'Phone, K4FKC.

☐ A vertical antenna's base needn't be insulated from ground, but hams tend to feed their verticals that way. C. V. Clarke Jr, W5FQS, describes how to feed grounded verticals in "Shunt-Excited Antennas for Amateur Use."

25 Years Ago

October 1965

☐ Emergency communication in Amateur Radio? See "It Seems to Us. . ."; ARRL National Emergency Coordinator George (W1NJM) Hart's "A Tale of Tornadoes," which details how hams helped pick up the pieces after April 11th's Illinois, Indiana, Michigan, Ohio and Wisconsin storms; and "Emergency Drill, Deluxe Style," by Stephen E. McCallum, K4URX. And don't forget that 1965's Annual ARRL Simulated Emergency Test runs on October 9 and 10!

☐ Ted (W6TC) Crosby's "HBR Developments" reports the latest upgrades and modifications to this popular ham-built receiver design.

☐ Irvin M. Hoff, K8DKC, describes aids to accurate incoming-signal tuning in "RTTY Indicator Systems."

☐ How weak can a signal be and still provide solid communication? In "R9/S1," Victor D. Poor, K3NIO, pushes the limits: "We are proposing an approach to weak-signal work that allows you to copy signals that you can't even hear in the speaker."

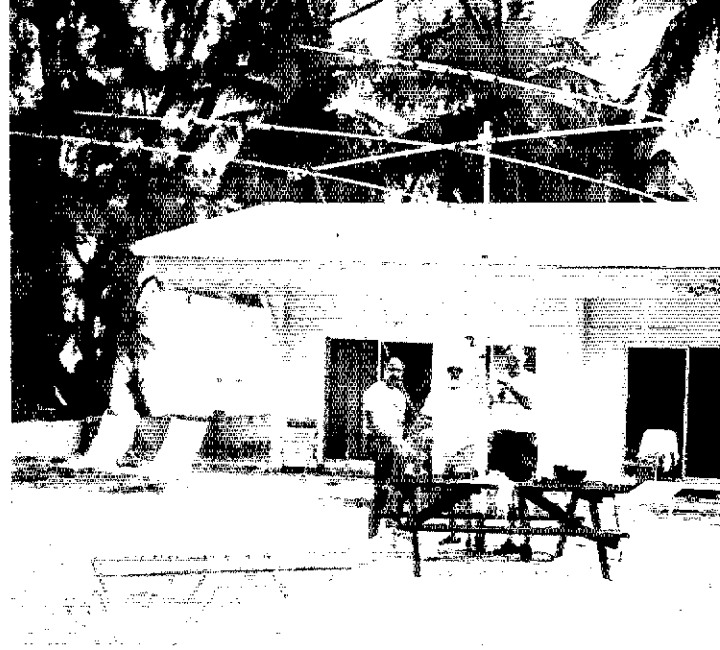
☐ Commercial transmitters capable of output at 160 meters rarely push the legal limits allowed on that band, prompting Robert Sutherland, W6UOV, and Harold Barber, W6GQK, to present "A 'Top-Band' Grounded-Grid Linear Amplifier."

☐ J. W. Dreher, W2TKG, takes up "The Challenge of Milliwatt Power."

☐ Assistant Communications Manager Ellen White, W1YYM, reports that the 1965 ARRL DX Competition generated 1700 logs, both modes, from W/VE and DX stations in 116 countries. Highest single-operator scorers: W/VE C.W., W4KFC; W/VE Phone, K2HLB; DX C.W., HP1IE; DX Phone, HK3RQ. Highest multi-operator scorers: W/VE C.W., W3MSK; W/VE Phone, W3MSK; DX C.W., EL2AE; DX Phone, I1RB. Top low-power W/VE scores were turned in by 21-year-old WA5ALB (phone) and 15-year-old K1ZND (CW).—*AK7M*

Results, 1990 ARRL International DX Contest

By Billy Lunt, KR1R and Warren C. Stankiewicz, NF1J
Contest Manager Assistant Contest Manager



The record-setting Multi-Single team at ZF2KE raises the antenna. (l-r) Ray, K9RS; Frank, K9HMB; and John, K9DX.

The 1990 ARRL International DX Contest was a hodgepodge of mixed propagation conditions. Spirits were high as contesters around the world anxiously awaited the green flag at 0000Z February 17 for CW and March 3 for phone. After last year's superb conditions, everyone was ready for a record-breaking 48-hour CW run to start things off, but Murphy reared his head. A geomagnetic storm on Friday raised the K index to 6, which made for poor propagation in the beginning of the CW contest. As the storm subsided, however, propagation returned to near-normal levels, especially on the second day. During the first hour of the CW contest, there were probably more frantic contesters listening to the WWV bulletins—hoping things would improve—than there were logging QSOs on the high bands. This was a time for heading to the low bands. ZS6BCR claims, "There was an amazing amount of activity on 80 meters the first day! There were some of the biggest pileups I've ever had." If it had been a mere 24-hour contest, it would have been a disaster. W3VT exclaimed, "Thank goodness for the second day!" K3NCO wondered, "Who let the air out of the ionosphere?"

During the phone weekend, conditions were dramatically better. K2MFY notes, "The conditions on 10 meters were fantastic, much better than on the CW weekend!" WAØQOA discovered that "the phone contest was great!" The high bands stayed wide open for most of the contest. WD9FTZ found that "10 and 15 meters were hot throughout the contest, with 10 meters staying open well past 0300Z both days!" The low bands didn't seem too shabby either. WQ2M claims, "There was more activity than usual this year on 40 meters. I had good run rates most hours when the band was open."

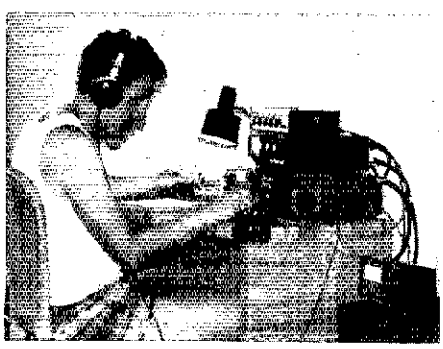
Computer-assisted contesting and computer disk-file entries are the wave of the future and are here now! KR2Q proclaims, "God bless K1EA!" W3FTG swears, "Contesting software for logging and duping is the only way to go, what a breeze!" K7RI says, "Having good computer software sure makes it a lot more fun and less fatiguing. Now when the contest is over, it's over!"

The winners and the "big-gun stations" are not the only faction of the contest. Many people in the contest feel their stations are not good enough to compete for the top honors or their time to operate is limited because of work, family and other obligations. These stations make up the majority of the participants. Without being able to work these stations, the winners would have lower scores. Our hats are off to you folks—thanks for making the contest so big and so much fun; it couldn't be done without you.

In almost every contest, personal goals and records are set without any of the glory from plaques, certificates or being listed in the top-ten boxes. K4BNC explains, "Few people enter the contest expecting to win. We enter for our own fun. Usually, I try to see how many different countries I can work without calling CQ, but this time I decided to add an extra challenge: Can a single operator with an average station work DXCC in one weekend? With only 1½ hours to go, I put number 99 into my log." CN8FC broke his personal record by working six different Montana and North Dakota stations. JM1LRQ boasts, "I worked all states and made 1000 QSOs on 10 meters for the first time." HI8LUZ says, "Thanks to the contest, I was able to complete my Worked All States on 10 and 15 meters." NL7GP claims, "This year's contest was a new personal best for me."

If you're using IBM-compatible software, such as *CT* and others for contest logging, send your entries to ARRL HQ on disk. You don't even have to send in a printout of the file for backup; just the disk file and a summary sheet. Don't forget to include soapbox comments and some good photos, too. Disk entries are easier for you and they save the ARRL Contest Branch many man-hours of log-processing time. If you have a high-scoring entry and use a computer, you will be asked to submit a disk-file entry. If you're not sure whether your software meets the ARRL Suggested File Format, get in touch with the Contest Branch at League HQ and we will be glad to answer any question that you may have.

3345 logs were received for the 1990 contest. Of these, just over 200 were computer-disk log entries. Special thanks to the Frankford Radio Club for submitting all its entries on disk this year and accounting for the majority of the disk entries received. Logs received from DX stations totaled 708 CW and 744 phone; 733 CW and 954 phone logs were received from W and VE participants. Special thanks to the 206 ops who submitted checklogs.



Jim, hard at work at VP5M, amassed over 1.6M points in the CW contest.

W/VE Highlights

John, K1AR, scored 3.2 million points to win the first-place CW plaque. Dan, K1TO, scored 2.5 meg to edge out W1KM, with 2.4 meg, for the second-place spot.

K1RU amassed 3.4 million points from CT to secure first-place phone. N6BV/1 was close behind with 3.3 meg for a strong second-place finish, slipping by K3OO in third with 3.2 meg.

W1PH won a double-header, taking the W/VE Low-Power plaque on both modes. Kurt racked up 1.1 meg on each mode to secure the top spots. On CW, WD4AHZ finished second with 729k points and NT5G was third with 716k. On phone, K8NZ

Top Ten—W/VE CW

Call	Score	160	80	40	20	15	10
K1AR	3,258,528	32/27	225/66	468/72	784/88	623/80	479/83
K1TO	2,544,480	32/23	186/50	290/62	928/91	556/76	288/70
W1KM	2,422,464	13/11	129/50	431/62	718/75	491/73	512/81
N2LT	2,389,803	25/18	115/49	398/77	659/80	497/72	419/81
K1CC	2,351,916	33/26	133/55	418/65	668/82	545/71	345/67
KC1F	2,348,865	35/26	100/48	418/74	616/78	524/78	362/77
K1RU	2,227,104	26/22	75/404	449/68	583/76	562/73	414/73
N6BV/1	2,147,397	19/17	106/45	396/65	596/74	529/73	405/75
N5RZ	2,114,604	17/16	82/41	342/70	505/88	407/84	459/90
K3ZO	2,056,752	28/18	209/60	492/74	419/63	338/75	377/78

Top Ten—W/VE Phone

Call	Score	160	80	40	20	15	10
K1RU	3,436,614	11/10	60/41	83/55	667/100	886/104	1060/104
N6BV/1	3,356,080	12/11	54/39	93/52	653/109	700/106	1128/107
K3OO	3,269,025	17/14	74/47	90/54	455/97	730/101	1139/122
W9RE	3,196,620	18/16	68/42	90/58	469/97	660/102	1173/115
K3TUP (KC1F, op)	3,078,543	13/12	60/42	89/49	589/98	532/94	1226/114
NA8V	3,002,790	11/10	51/35	116/54	545/96	625/90	1186/110
K1YR (K2SS, op)	2,981,664	15/12	67/42	89/56	608/95	535/102	1125/101
K3ZO	2,633,550	5/5	63/42	183/54	552/85	660/83	962/93
KØRF (WØUA, op)	2,578,950	7/6	43/28	150/47	362/71	852/87	1191/91
W2RQ	2,577,744	0/0	71/44	137/61	564/95	505/100	829/108

Top Ten W/VE Single Operator, Assisted—CW

Call	Score	160	80	40	20	15	10
AA1K	2,729,022	61/40	146/68	397/75	536/88	451/89	435/89
K3WW	2,449,272	35/29	144/59	382/79	554/93	376/79	421/88
N3AD	1,939,677	15/13	106/46	319/74	571/80	415/71	375/75
K3IPK	1,926,216	12/15	94/46	327/76	558/81	360/77	375/77
W2GD	1,873,056	51/37	100/60	379/83	456/88	278/85	168/83
NM2Y	1,298,052	28/24	59/46	224/66	366/74	258/69	277/78
K3OO	1,152,228	16/14	102/44	130/41	288/68	303/62	365/90
N7NG	1,010,259	10/9	87/22	220/59	371/73	314/63	205/53
K2NJ	1,005,720	0/0	50/29	78/34	413/65	314/79	305/82
K3SA	914,400	6/6	39/32	132/50	416/75	185/61	238/76

Top Ten—DX CW

Call	Score	160	80	40	20	15	10
TGØAA (OH2BH, op)	5,654,115	208/42	542/62	880/56	1369/57	1425/58	1411/58
HKØ/N3JT	5,231,100	325/49	467/52	785/57	1085/57	1237/57	1401/57
ZD8Z (N6TJ, op)	4,027,452	52/23	324/43	598/52	1154/57	1262/56	1304/55
AH3C	3,051,594	75/26	333/38	642/47	651/53	908/54	1117/55
C6A/K1TN	2,664,723	119/29	378/46	596/51	789/54	745/50	534/51
ZL3GQ	2,375,586	32/19	230/41	536/53	679/54	491/48	954/56
EL2CX (K3RV, op)	2,357,532	0/0	231/42	340/47	852/53	624/55	1109/52
F2CW	1,852,422	48/17	300/41	341/44	469/48	709/56	564/48
YT3AA	1,808,487	22/14	258/38	474/48	501/48	633/52	533/49
J6LSN	1,715,859	0/0	219/43	371/49	342/52	509/52	856/53

Top Ten—DX Phone

Call	Score	160	80	40	20	15	10
P40V (AI6V, op)	8,031,456	114/33	426/55	583/57	1776/57	1570/56	4003/58
FG5R (W7EJ, op)	6,468,489	77/26	628/55	714/56	673/58	1157/58	3674/58
AH3C	5,042,880	59/24	358/53	554/55	783/59	1123/59	2563/59
TI2DU	4,834,200	38/21	183/45	414/48	1346/56	611/53	3163/57
WR6R/KH6	4,312,122	59/23	344/52	592/59	648/57	677/57	2362/59
K1DQV/KP2	4,048,023	145/35	170/40	274/48	424/51	1119/58	2537/57
FG5/KA3DSW	3,181,572	0/0	472/51	262/50	1220/55	787/56	1231/55
DL6FBL	3,158,802	0/0	84/20	234/37	879/56	1202/56	2260/57
OK1ALW	2,835,294	0/0	91/25	319/46	749/55	1157/56	1655/56
ZF2NE/ZF8	2,598,096	0/0	65/33	47/30	838/55	472/51	2410/57

Top Ten W/VE Single Operator, Assisted—Phone

Call	Score	160	80	40	20	15	10
WM5G (KRØY,op)	3,902,892	13/11	59/40	162/72	699/113	440/117	1343/126
K1AR	3,831,828	11/11	60/42	97/64	636/118	766/124	1059/125
N3AD	3,146,880	11/9	65/44	105/58	601/109	609/111	993/109
K3WW	3,101,934	18/16	65/52	104/61	391/106	742/120	866/118
K1DG	2,687,370	16/13	72/43	107/65	597/107	874/110	1030/115
K1TO	2,555,145	14/13	33/32	57/40	423/98	885/114	691/108
K3IPK	2,398,656	5/5	56/45	101/59	508/98	544/97	708/112
WB2P	2,221,380	13/12	39/33	74/49	412/110	439/103	786/113
W3USS (WB2EKK,op)	2,103,375	1/1	32/29	65/56	364/90	614/109	699/110
KI3V/7	1,919,151	3/1	43/25	196/39	250/80	517/95	824/349

finished second with 1.0 meg and K7RI was third with 998k points.

Last year's plaque winner, Doug, KR2Q, returned as QRP CW champ in 1990, scoring 314k points. WØUO finished in second place with 310k. NØAX was third with 248k points. N4KG with 564k points just slipped by W2TZ with 544k points for the W/VE QRP phone plaque. WØUO was third with 322k.

The single-band entry category showed good activity and close finishes. W1NG won the 160-meter CW plaque, scoring 6k points, and veteran K1ZM took the phone plaque with 5k points. The 80-meter W/VE plaques went to W1FV on CW with 126k points and KA1XN on phone with 41k. WOØG finished in first place in the CW single-band 40-meter category, scoring 229k points. K4XS set a new all-time 40-meter phone record with 129,774 points, beating K6NA's 1988 record of 124,860 points. K4VX (W9WI, op) more than doubled W5FO's score to win the 20-meter CW plaque. WØZV easily took the phone plaque, scoring 544k points. WN4KKN/5 won the 15-meter CW plaque, edging out W5VX by 2k points. On phone, W7WA was the clear winner, scoring 745k points. K1ZM led the way for the 10-meter CW plaque, scoring 204k, and K3ZJ scored 726k points winning the 10-meter phone plaque.

The single operator, assisted category



Pilar, EA9AM, and Juan, EA9IE, operated Multi-Two from Ceuta in the phone contest. A heavy storm tore away most of their antenna system halfway through the test.

proved to be a very popular new addition to the DX contest. On CW, AA1K wins the plaque, scoring 2.7 million points. K3WW finished in second place with 2.4 meg and N3AD was third with 1.9 meg. During the phone weekend, KRØY, guest operating at WM5G, scored 3.9 million points to win the single op, assisted phone plaque. K1AR finished right on his heels with 3.8 meg and N3AD finished third with 3.1 meg points.

There was fierce competition in the W/VE multioperator single transmitter category. During the CW contest, W3BGN and crew took top honors, scoring 2.6 million points to edge out rival K1VR with 2.5 meg. On phone, the duel was between W3BGN and AA1K. 'BGN and crew finished in first place by only 2k points. In the multioperator, two-transmitter category, the gang at N3RS ran away with the CW plaque, scoring 4.7 million points. NQ4I was second with 2.4 meg. The phone contest was more of a battle, with K2TR and friends scoring 6.0 meg, edging out KS9K by 70k points for the multi-two phone plaque. W3LPL and ops showed no mercy and blew everybody away, winning the multi-unlimited plaque on both modes. Frank and crew scored 6.9 million points on CW; on phone, they set a new all-time phone multi-unlimited record at 11,002,497 points, beating their 1989 record of 8,953,632 points—

Top W/VE Single-Band Scores—CW

160		80		40		20		15		10	
W1NG	6,120	W1FV	126,603	WØØG	229,890	K4VX (W9WI,op)	335,400	WN4KKN/5	300,768	K1ZM	204,444
K4TEA	5,250	K2EK	123,360	W6XX	172,368	W5FO	155,388	W5VX	228,252	K5RX	162,378
K2RIH	3,483	WØZV	48,675	AA4S	159,732	N2DTW	140,220	W7WA	226,260	KM1C	133,110
VE3DO	2,688	KBØG	35,526	KVØQ	148,248	WF5E	132,432	N8CXX (K8JM,op)	203,949	N4ZZ	131,097
W2FCR	2,208	KC7EM	33,276	K3WUW	136,320	KM5G	117,552	KJ9D (KK9V,op)	151,389	W2SC	128,160
N6SS	1,674	WB9Z	32,712	K5IL	124,488	N3RR	98,118	N4IR	143,520	WB4TDH	112,992
W2BN	1,638	N2NU	25,536	K1WGM	122,304	WA2ASQ	71,994	K4TKM/6	129,120	W5VGX	103,284
W8CD	1,254	N2AU	24,360	WA4JTI	83,916	K6XO	63,063	W6BSY	114,579	W5YZ	102,255
KC8JH	630	KØLUZ	19,950	K5IU	37,944	KA7T	56,595	WB5UDX	92,568	K9BGL	94,350
N6LL (WA6CDR,op)	594	KØII	15,450	KJØB	35,280	AA4NJ	53,184	NI5M	70,863	NC1E	76,518

Top W/VE Single-Band Scores—Phone

160		80		40		20		15		10	
K1ZM	5,508	KA1XN	41,724	K4XS	129,774	WØZV	544,236	W7WA	745,173	K3ZJ	726,516
K5UR	4,002	WB8JBM (NZ4K, op)	35,916	KM2P	85,779	KS1L	427,635	KB1WH	604,992	N8CXX	631,158
W2FCR	1,071	K4HJJ	29,547	WQ2M	81,786	AB1A	289,800	WOØG	552,636	N2IC/Ø	617,040
K5WXZ	855	K3WUW	15,408	KA5W	64,449	W8TWA	221,862	KJ9D (KK9V,op)	353,199	W5WMU (KE5FI,op)	581,910
		N2WK	13,113	N8RA	46,920	W5FO	117,459	W7FP	235,431	NK1F	571,356
		W3EWL	11,610	W9CH	30,720	K9CAN	99,465	WB5UDX	234,990	KW8N (KU8E,op)	563,250
		W2FR	5,438	KB1HC	28,365	K1JB	92,565	NX9T	182,103	KE3Q	506,496
		KM1R	5,916	KZ2I	28,086	WF5E	85,320	WJ2D	163,053	KQ9L	445,395
		WA4SVO	5,247	K7UR	23,493	KK9L	73,458	WB2YQH	154,350	K1NG (KB1EM,op)	419,628
		K6VI	4,536	NA2R	21,000	K6XO	59,535	N2DTW	130,566	W9X1	392,223

Top DX Single-Band Scores—CW

160		80		40		20		15		10	
YV1OB	59,535	OK3CBU	63,855	KØGVB/C6A	189,000	IA8A (IK8DOI,op)	174,735	G3FXB	184,338	N6OP/NP2	380,475
VP2EXX	28,842	SP3HLM	59,985	Y42MK	160,875	OH3TR (OH6LI,op)	152,772	PY2RN	170,115	LO5E (LU5EIC,op)	190,245
CT1AOZ	27,750	4N1A (YU1EA,op)	54,288	4N4A (YU4EU,op)	143,856	DL1HBT	149,640	DL3HAH	144,045	KH2D	146,772
F6CNI	13,224	I2UIY	52,890	EA4KR	109,956	JA1YFG	149,292	LZ5W (LZ1BP,op)	133,896	JH0KHR	109,089
OK5TOP	9,900	JA3YKC	36,972	OK3CQR	105,264	KL7Y	135,744	4N3E (YT3NA,op)	133,728	9J2AL	97,020
I3VHO	6,552	F6EPO	27,405	OK3KAG (OK3WDX,op)	83,202	OH1AA (OH1SY,op)	122,949	DLØIU (DL4AAE,op)	130,086	G4BUO	93,639
Y33UL	1,404	YT2D	20,088	4M7A (YV7QP,op)	81,249	JF1PUW	111,132	4N1W (YU1SV,op)	129,528	JM1LRQ	90,636
OK1JDX	1,053	OK2FD	19,320	YU3RO	78,819	JA7FTR	98,748	NL7GP	119,295	KH6XT	89,046
OK2BQU	858	SM6CPY	16,800	YT2IQ	75,504	UAØQBR	88,740	HAØLM	107,415	IO4IKW	87,906
OL8CVU	459	Y43GO	12,717	DF2WV	70,932	4K2BDU	84,975	EA2IA	104,004	G3SXW	78,678

Top DX Single-Band Scores—Phone

160		80		40		20		15		10	
YV1DRK	12,852	T32AF	141,075	4M5T (YV5JBI,op)	101,736	G3FXB	376,014	NP4CC	497,292	PJ9M (OH6RM,op)	689,130
CT1AOZ	8,004	CU2AF	59,690	TG9AJR	81,855	YU1KO	367,137	HC1HC	459,708	ZX5C (PY5CC,op)	641,250
GM4OBK	3,120	YU1EXY	62,235	JA2BAY	62,550	ZW5B (PY5EG,op)	357,744	CT1BOP	438,828	L2E (LU8DPY,op)	577,440
LZ1KOZ	756	HK1LDG	46,494	I5OYY	52,416	YZ1E	339,300	LZ5W	367,629	GW4BLE	459,819
Y33UL	576	4N1A	23,532	LZ1KXA (LZ3ZZ,op)	48,336	YT3T	333,558	ES2RR	315,636	YU3FW	450,576
		WL7BIL	10,695	PA3EPN	45,072	KP4FP	319,770	YZ3A (YU3WE,op)	300,060	CQ5T (CT1DTH,op)	446,823
		CT1DGK	8,925	ES2RJ	41,310	CE6EZ	281,532	8P6SH	272,136	GWØARK	445,968
		JA3YKC	4,692	EA1AK	23,166	I4FYF	265,734	LY2BTA	247,950	IU4K	435,366
		N7DF/KH2	4,335	YU7AV	17,226	OH3TR	263,436	JA1YXP (JO1JOZ,op)	226,746	EL2CX (K3RV,op)	395,181
		YU3QI	2,295	RC2AZ	13,182	YZ7V (YU7ECD,op)	262,827	4K2OT	220,077	WL7E	390,735

great going, guys! In second-place CW was K1ST with 5.7 meg and on phone was N2RM with 9.1 meg.

DX Highlights

The competition for the DX plaques was close, as usual, with DXpeditioners trying to justify their trips. TGØAA (OH2BH, op) with 5.6 meg points, skirted past HKØ/N3JT with 5.2 meg for the single-operator win on CW. During the phone weekend, P40V easily won the single-op plaque, scoring 8 million points. FG5R was in second place with 6.4 meg.

N6OP's CW DXpedition to the US Virgin Islands paid off. Bill set a new all-time 10-meter single-band CW record at 380,475, beating HC2G's 1989 record of 306,600 points—great work!

The crew at ZF2KE finished in first place, DX multioperator, single transmitter CW category, scoring 5,980,590 points, beating their 1988 all-time record of 5,851,110 points. VP2E also set a new all-time record for multi-single phone at 9,764,490 points, beating the 1981 record of 9,685,170 points. The multi-two transmitter plaques went to JA1YDU on



Yoshiharu, JA9CWJ, running W/VEs on CW to the tune of 735 QSOs and 282k points.

Top W/VE Multioperator Scores—CW

Single Transmitter

Call	Score	160	80	40	20	15	10
W3BGN	2,695,899	49/37	148/56	408/80	523/89	553/87	366/90
K1VR	2,508,921	23/17	129/53	565/79	598/82	510/77	336/79
K2WI	2,020,545	58/36	171/63	317/71	439/79	463/85	293/86
W2HPF	1,898,235	19/17	102/50	379/79	404/77	463/85	268/79
K2SG	1,710,456	35/26	83/41	338/74	420/59	434/70	362/71

Two Transmitter

N3RS	4,763,913	50/37	244/67	696/90	894/103	830/106	443/100
NQ4I	2,468,400	14/11	158/58	504/79	462/78	351/74	568/100
N2IC/Ø	2,105,112	18/15	114/38	346/66	448/43	500/88	486/79
WD8LLD	1,506,270	21/20	66/41	264/81	453/78	366/73	187/77
KS9B	1,175,082	0/0	71/3	228/56	423/75	334/71	241/67

Unlimited

W3LPL	6,975,414	74/43	503/78	933/104	1161/119	849/99	677/111
K1ST	5,781,888	38/29	279/73	897/99	1327/109	867/101	416/93
K5NA	5,238,870	44/34	412/85	541/87	1164/107	745/95	552/97
KY1H	5,030,928	49/35	240/67	797/94	1118/103	747/89	521/95
W3GM	4,577,580	38/29	298/69	617/91	989/104	717/100	495/97

Top W/VE Multioperator Scores—Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
W3BGN	3,650,832	22/18	88/52	172/68	651/110	648/115	923/123
AA1K	3,648,231	19/16	71/45	160/64	603/107	803/111	1005/114
W3XU	3,164,214	0/0	34/29	69/44	723/107	815/104	1036/110
WB2ULI	2,693,655	9/8	55/35	137/64	428/89	384/90	1204/119
KA1GG	2,670,336	6/6	63/38	103/50	520/90	547/87	1079/113

Two Transmitter

K2TR	6,020,253	24/21	102/53	156/68	617/112	1550/133	1393/136
KS9K	5,950,206	15/12	62/40	194/77	910/119	1176/126	1594/128
N3RS	5,549,334	20/18	100/52	180/65	889/122	1313/135	1069/126
KQ2O	4,381,470	0/0	78/50	108/54	801/107	879/111	1416/123
WØAIH/9	3,904,992	15/13	56/34	128/54	635/101	771/118	1307/127

Unlimited

W3LPL	11,002,497	40/31	203/76	311/82	1527/160	1717/152	1853/148
N2RM	9,158,136	25/21	153/62	353/77	1097/142	1970/153	1524/141
NB1H	8,741,952	21/19	112/55	316/79	1469/147	1464/138	1677/139
KY1H	8,469,621	32/27	172/72	316/77	1518/140	1445/146	1294/129
K5NA	7,852,464	30/26	230/80	256/76	1361/135	1174/130	1431/137

Top DX Multioperator Scores—CW

Single Transmitter

Call	Score	160	80	40	20	15	10
ZF2KE	5,980,590	315/47	645/56	893/56	1270/57	1402/57	1516/57
PJ2J	5,241,753	289/51	512/55	755/55	1021/58	1135/58	1535/56
J34A	4,465,884	119/36	554/51	748/56	1136/58	1155/57	1044/55
XE2UZL	3,849,408	216/48	618/55	627/55	934/56	750/57	791/55
F5IN	2,447,856	83/21	425/45	537/47	584/51	695/52	741/51

Two Transmitter

JA1YDU	1,579,905	0/0	158/34	332/44	638/56	564/51	549/50
JA1YXP	1,034,892	0/0	113/21	141/31	691/56	565/51	511/45
LZ5M	995,220	0/0	210/27	386/40	519/50	422/48	173/29
JA7YCQ	874,350	16/7	122/21	109/33	397/52	424/48	382/50

Unlimited

YT2R	3,325,608	188/31	391/41	745/51	1078/58	847/53	627/52
JP1DMX/HI8	2,931,390	171/35	491/51	468/49	552/53	613/52	995/57
JE2YRD	2,475,264	22/7	269/39	506/48	1069/56	770/55	587/51

Top DX Multioperator Scores—Phone

Single Transmitter

Call	Score	160	80	40	20	15	10
VP2E	9,764,490	300/46	812/57	756/57	1217/58	2105/58	4965/58
PJ0B	8,692,464	162/40	499/56	642/58	2005/57	1458/57	4122/58
ZF2JR	7,000,974	261/48	960/57	1010/58	878/57	1165/57	2713/57
J34A	6,024,834	82/25	454/54	727/56	1337/57	1346/56	2613/58
F6CTT	5,041,326	14/9	418/43	459/51	1510/57	1500/58	2232/56

Two Transmitter

K6GSS/KH6	4,481,583	9/7	340/48	496/55	595/53	1267/56	2686/58
4U1ITU	3,193,596	0/0	54/21	404/34	1384/57	1324/58	1693/58
JA8YBY	2,283,147	0/0	94/12	211/30	785/57	979/57	1507/57
JA6YJS	1,124,820	0/0	39/6	100/17	420/51	452/51	1072/55
JH1YDT	1,103,394	0/0	5/2	86/19	485/51	347/45	1203/56

Unlimited

4B2A	11,137,392	273/50	935/56	1132/58	3017/57	2299/58	3383/57
I3MAU	5,551,902	5/5	239/29	629/52	2087/58	1855/57	2358/57
4N2N	3,112,647	8/8	92/19	281/34	1255/57	1015/58	1802/57
JA1YDU	2,277,405	0/0	91/19	243/33	762/55	868/56	1471/58
ZZ4Y	952,569	0/0	1/1	4/3	201/44	1061/56	730/55

CW and K6GSS/KH6 on phone. In the DX multioperator, unlimited category, YT2R took top honors on CW and 4B2A easily won the phone plaque.

Affiliated Club Competition

The club competition was as popular as ever, with several close contests. The Frankford Radio Club ran away with the unlimited gavel this year, amassing 154 million points, outdistancing the second-place Yankee Clipper Contest Club with 104 million points. In the medium-club category, the Society of Midwest Contesters won the gavel with 18 million points, beating second-place North Coast Contesters with 12 million points. The Overlook Mountain ARC easily took the local-club gavel, accumulating 15 million points. The Hoosier Contest Club was in second place with 4 million points.

The Contest Branch would like to thank all who participated in the 1990 contest. Special thanks to Contest Assistant Mark R. Burke, KA1MIS, for his help in preparing this report. We hope to see you next year in the 1991 ARRL International DX Contest!

SOAPBOX

W/VE CW

I made several contacts QRP from my random wire *and thoroughly enjoyed the DX on 40 and 80 meters* (WB7EZO/1). This proves that an indoor dipole really can work (NF1J). My electronic keyer gave out and after four contacts with a straight key, I gave out (W1RFQ). After this contest, I am now able to express Murphy's Law as an equation: 72-hour flu (temp = 102°) + Geomagnetic storm (K = 6) + Ice storm (-40-m sloper) = 467 QSOs (KZ1M). Winning isn't everything (WA1YUA). This was my first effort at QRP and I love it (K2SIG). The band conditions were disappointing; I had hoped for better 10-meter activity (WB2TPS). The contest was great, but I needed the linear to make contacts on Saturday (KT2D). The fourth greatest lie: "But dear, I'll only be on the air until dinner" (K2MK). Because of bad propagation, this was only a 30-hour effort (W3HVQ). With the lousy conditions, this wasn't a good time for me to make my first attempt at QRP (WA3EEE). I really enjoyed it! (KC4CSD). There were some weird calls in evidence (AB4SW). 100 watts and a G5RV at 35 feet can work DX on 40 meters—I covered WAC and 37 countries in just over four hours! (W3FTG). I enjoyed it—see you next year (W5FO). Ten meters is the only band my tiny vertical works well on, and unfortunately for me, it was not very hot for this contest. My score didn't set any records, but it's not bad for the few hours I was operating (W6BKY). Rain broke the intermittent in my trap vertical and put me off the air for most of the contest (AA4Q). What a difference a good QTH can make! I shall return next year (KI6EZ). This was my first contest in more than 10 years and I had a great time; I just wish my signal reports were as good during regular *operation as they were during the contest* (WB7VKD). I had surgery about ten days before the test and then caught the flu, so this was a limited operation (W8VSK). This wasn't a great effort, but it was a lot of fun (K8MJZ). QRP is tough work! (N8CQA). Compared to 1988 and previous years, this contest was great. The 1989 conditions spoiled *me, however, making this year's action seem* mediocre (W9HE). This was the first time I worked a contest and sent in the logs, and I enjoyed it (WA9TZE). There wasn't much difference between the dummy load and the beam (KTØF). The conditions were bad, the weather was bad, I got sick two days before the contest and quit smoking the same weekend. I still had fun (NRØE). Ten meters, phone home (WØUA). The band was essentially wiped at this QTH (VE5ZX). I enjoyed the contest, but 55 dupes on 40 meters cost me close to 17k (VE6BF). Conditions were not so great this year, but I still worked a few new ones! (N6IP). I'm still amazed at what 100 watts will do in this contest! (NC7K).

DX CW

This was my final ARRL DX CW test from CN8. I'll just be another WA4 in the pileups next year (CN8FC). I had to stick with 10 meters, as the North African and European QRM put me at a disadvantage (9J2AL). I envied the Americans—they had a national holiday after the contest, but in Japan, the contest ended just in time for me to go to work (JH6NBW). I could paint the East Coast on the last day (JM1LRQ). Despite the high solar activity, propagation to the US was poor (UF6CX). It was a nice contest! I hope to be in it again next year (EA7AAW). This was my first DX test and it was just great! I'm making preparations for next year (EA3FNT). See you in 1991! (EC7DMU). It's a pity domestic events always seem more plentiful during a contest weekend (EI9FK). High winds, power failures and an illness got me this year, not to *mention the poor conditions (G4BKI).* Where were the VE stations? (GM4HQF). It was wonderful to be at the other end of the pileup for once (GU4ARI). The test was good, but not the propagation (IKØADY). We had aurora conditions with few openings on 10 and 15 the first day, but things improved the second day. It was an excellent *contest, but we have the usual northern handicap* (LA6FC). Activity was low from this side! I'll try

Contests: Everyone can Play to Win!

Almost every ham would like to win a contest, but not everyone has the time, inclination, resources or wherewithal to go head-to-head with the "big guns."

Many hams don't know that low power, a simple antenna and a few hours of fun could net them a place among the winners. Every contest has categories that beg for someone to take interest and pick up a nice certificate for the shack wall.

For instance, the rules published in *QST* (December issue) for the annual ARRL DX Contest (run in February and March) show two all-band awards, 160-10 meters, for a single operator in the low-power category (excluding QRP) for phone and CW. There are also awards for single-band entries in the phone and CW categories without power specifications. Because there are six bands involved, there are 12 ways you can obtain a single-band award in the DX contest in your ARRL section.

For years, I made a serious effort to win several contests, but never did better than second place, which doesn't get you an award. I continued to dabble in the contests half-heartedly and much to my surprise, after many more years, I received a certificate from the ARRL for First Place, 20-Meter Phone in the 1985 International DX Contest. At the time, I didn't realize I had unwittingly qualified for an award in one of the categories, but since then I've earned six more in various contests.

The only mandatory thing to do is study the rules of the particular contest you plan to enter so you'll completely understand the different categories available. On the air, work at your own pace and put in as many or as few hours as you like. A simple dipole or vertical will get the job done with a 100-watt rig, but if you've got a beam antenna, so much the better.

To win a contest, you need multipliers, so do what it takes to accumulate as many multipliers as possible. Unless you're going for a single-band award, operate on as many bands as you can. You can work the same station on six bands to get six multipliers in the ARRL DX Contest.

Don't just sit on one frequency and call "CQ contest" or waste your time in a pileup if you're running low power. It never fails that after spending a long time in a pileup, you tune up the dial a few kilohertz and find someone from the same country frantically calling CQ. Tune around the band and listen for new multipliers and look outside the highly active areas of the band you're operating on. Many of the contacts you'll be looking for are running low power, too, and take up residence "up the band," away from the crowd.

One last comment: You may think that you're no good at CW and limit yourself to working the phone contest. Although the din of the CW subbands during a contest sounds awesome, it's no different than a phone competition and CW is easier to hear in a crowded band. The exchanges are usually short and once you get into the swing, which doesn't take long, you'll be rolling along with the rest of the gang, no matter what your code speed. By the time you finish, you'll have a definite feeling of accomplishment. Try it; you'll be surprised at how easy it can be.

Whether you enter the phone or CW contests or both, don't make a lot of hard work out of it. If you own a personal computer, logging and scoring is a breeze with the software available today. The most important thing is to send your entry forms in to ARRL HQ, no matter what *you* think of your score; you could be among the winners!—*Lewis Prescott, W1RFQ, Lincoln, Rhode Island*

W/VE Low-Power Top Ten (<150 W)

CW		Phone	
Call	*Score*	*Call*	*Score*
W1PH	1,112,364	W1PH	1,151,124
WD4AHZ	729,015	K8NZ	1,050,516
NT5G	716,862	K7RI	998,460
W6JTI	636,417	N5AW	798,795
KM9P/4	572,166	WO9Z	758,016
W7YAQ	547,008	KM9P/4	751,308
K9ALP	521,928	N4UH	634,032
K9QVB	468,930	W7YAQ	621,756
W6UQF	468,141	NO1Y	535,482
KF5AA	435,132	KD5GD	509,571

W/VE QRP Top Ten

CW		Phone	
Call	*Score*	*Call*	*Score*
KR2Q	314,766	N4KG	564,186
W0UO	310,128	W2TZ	544,050
N0AX	248,217	W0UO	322,599
N7IR	236,208	K7GEX	118,680
KK2E	157,791	AA5GY	99,603
N1AFC	154,707	KE0KB	99,225
K2DM	146,964	WD4OHD	57,330
WB2ENW	117,306	KB4GID	55,257
W8VSK	102,870	N6RUX	48,573
K2GIG	100,920	W6YVK/7	28,998

Top DX QRP Scores—CW

Call	*Score*
K7SS/KH6	1,394,271
XF1C	852,768
HB9ADD	337,050
YU2TY	160,083
NH6T	158,592
EI3DP	103,626
JA9RPU	98,325
VP2V/W8KIC	94,743
I0KHP	63,336
4X1IF	61,320

Top DX QRP Scores—Phone

Call	*Score*
HB9ADD	190,512
F1BEG	122,715
I0KHP	116,820
NH6T	115,239
JA2JSF	108,888
EI8AU	60,945
OK1DKS	43,260
LA5JX	33,768
IK3JLU	26,730
SP3RBI	24,231

to do better next year, HI! (LA9DFA). It was nice to contact Mississippi for my 40-meter WAS (OH6YF). There was nothing to be heard on 10 meters the first day, but conditions were good the second day. Where were the VE stations? (OE6IMD). This was the first time I operated a 48-hour contest alone—I slept for only four hours (OH6LI). Conditions were strange: There was no propagation to the East Coast and most stations I worked were from California and W7 (OH6NIO). I hope the conditions are better next year (OZ1FFG). Conditions on 10 were almost as good Sunday as they were had on Saturday (OZ1IOC). It was fun to operate "search and pounce" style. In particular, I enjoyed the low-band conditions (PA0ERA). I had a lot of fun, thanks to the good antennas stateside (PA3ELD). 80 meters was open early (PA3BNT). I was able to work a lot with QRP (PA2JCG). It's a pity that conditions on Saturday were so poor (PA3EZL). In this area, we had the worst conditions during any ARRL DX contest I can remember. Anyhow, I feel satisfied with the result and look forward to 1991 (SM5CLE). Conditions were not as good as they were the year before, with many states unheard (SP5TT). I worked all the West Coast with my dipole. I hope next year will be the same (SV1RP). We enjoyed making a lot of friends and working a full CW WAS in a weekend (F2CW). I enjoyed working more than 100 stations the first night on 160 (F6CNI). I had some QRN on 80 and was not able to copy the weaker stations (DL4YAO). I particularly enjoyed the 80-meter pileups, they were a surprising experience (DL1SBR). This is a nice way to meet many old friends (DK3GI). This was the first time I worked the US on 80 meters (DL4MCF). This was my first participation in the contest in 16 years (DA1SQ). I'm sorry I couldn't pay much attention to this year's contest due to time limitations, but will try to do better next year (UT4UZ). Conditions were great to the West Coast, but poor to the East Coast (UT5UGR). My quad didn't save me from the bad propagation (UB5LCV). There were no good conditions (UC2ADX). It seems like I hear the same call signs every contest. Where are all the new guys? Scared by VEs? (UC2AB). It was a nice experience (ES5MC). 80-meter propagation was good, but the other bands were poor from southern Europe (YT3AA). This year was a lot better than last year (YU1EA). The US stations are good contest operators, but propagation was not good on 40 (YT2IQ). There were too many DX stations and not enough US (KL7Y). I went to town on Saturday and never came back (NL7GP). There was too much aurora and not enough MUF (WL7E). This was the most fun I've had contesting in quite a while. 30 watts into a long wire makes 160 meters a challenge (VP2EXX). I'm sure glad 10 came back to life during the last three hours of the contest (KG6DX). Two side benefits of 80-meter single-band are all the free time during daylight hours and not having as many QSLs to answer (N7DF/NH2). Conditions were very poor (YB2FEA). It was fun, even if I didn't have much time for the contest (OH6VR). This was my second big contest and it was a great pleasure (PA1LJA). Conditions were very poor (HZ1AB). It was thrilling to work so many East Coast stations on 80 meters (JA7YAA). The solar flux was only 106 for the weekend! (DL5XX). We enjoyed fighting the bands and making our own propagation through the aurora (OH1AD). Unfortunately, we did not get one contact on 160. It was a beautiful contest. We really enjoyed it (UZ2FWA). From this location, the results always depend on "His Majesty of Aurora." Sometimes even 25 elements per band is not enough! (ES2WX).

W/VE phone

The contest gave me a good boost on my DXCC (KA1OCZ). No, I really wasn't running QRP (KA1MIS). I learned that my two G5RVs don't work well enough into Japan (KB1HC). Using an old (and tired) HW-101 to a vertical, I was thrilled to work a TL, a YB and a 5H (KB1GN). I was glad to be the only station answering the CQ of 5T5CK (WA1QGC). From a 75-meter single-op point of view, the lack of Pacific activity was a disappointment. But working TL8WD with three minutes left in the contest made up for it (KA1XN). 80 meters had good openings Sunday morning to the Pacific, including Johnston Island. It was unusually tough to find many German stations on 80 and 40 this year (WB2AMU). This is my first effort at contesting! I loved it and will do it again (WJ2D). Due to bad connections, the computer crashed at least once for each JA worked Sunday (N2IZJ). This was my first serious effort, but not my last. Next year I plan to work the full 48 hours (NM3E). My score this year was nailed by the terrible toos—too little sleep before the test and too nice a day outside on Saturday to stay in the shack all day (KQ3V). Between having to work and having a cold, I had a ball (KA3SDP). This was a great contest. Band conditions were better than the CW weekend. I just wish I hadn't slept so late Saturday morning, but I still broke my own personal QSO and multiplier

W/VE Plaque Winners—CW

Single Operator

Category	*Winner*	*Donor*
All-Band	K1AR	Frankford Radio Club
1.8 MHz	W1NG	Gordon F. Durk, KA1DWX
3.5 MHz	W1FV	Dayton ARA
7 MHz	WØØG	Northern Arizona DX Assn
14 MHz	K4VX (W9WI,op)	Fox Cities ARC, W9ZL
21 MHz	WN4KKN/5	Carl Luetzelschwab, K9LA
28 MHz	K1ZM	Mike Badolato Jr, W5MYA
Low-Power	W1PH	Dauberville DX Assn
QRP	KR2Q	Tod Olson, KØTO
Assisted	AA1K	Billy Lunt, KR1R

Multioperator

Category	*Winner*	*Donor*
Single Transmitter	W3BGN	Northern Illinois DX Assn
Two Transmitter	N3RS	Kenwood USA Corporation
Unlimited	W3LPL	ETO, Inc/ALPHA

DX Plaque Winners—CW

Single Operator

Category	*Winner*	*Donor*
World	TGØAA (OH2BH,op)	North Jersey DX Assn
Africa	ZD8Z (N6TJ,op)	WB3KTX
Asia	JA7FWR	Alamo DX Amigos
Europe	F2CW	Clarke V. Greene, K1JX
North America	HKØ/N3JT	Vic Clark, W4KFC, Memorial Award—PVRC
Oceania	AH3C	Robert J. Halprin, K1XA
South America	OA4ZV	Herbert Hoover Jr, W6ZH, Memorial Award
1.8 MHz	YV1OB	Fred Race, AL7JO, in Memory of "Mac," WB2HCT
3.5 MHz	OK3CBU	Mad River Radio Club
7 MHz	KØGVB/C6A	Gordon F. Durk, KA1DWX
14 MHz	IA8A (IK8DOI,op)	Bencher Inc.
21 MHz	G3FXB	Southern New England DX Assn
28 MHz	N6OP/NP2	ZP6XDW (N4PW)
QRP	K7SS/KH6	Gerald Griffin, MD, W8MEP
Assisted	JA7YAB (JA1-36363,op)	ARRL

Multioperator, Single Transmitter

Category	*Winner*	*Donor*
World	ZF2KE	John Brosnahan, WØUN
Asia	JA7YAA	Kenwood USA Corporation
Europe	F5IN	The Radio Place
North America	J34A	Kenwood USA Corporation
Oceania	V73AQ	Gary Stilwell, KI6T, and Glenn Stilwell, WR6O
South America	PJ2J	Kenwood USA Corporation

Multioperator, Two Transmitter

Category	*Winner*	*Donor*
World	JA1YDU	Kenwood Employees ARC, WD6DJY
Asia	JA1YXP	Kenwood USA Corporation
Europe	LZ5M	Kenwood USA Corporation

Multioperator, Unlimited

Category	*Winner*	*Donor*
World	YT2R	H. Stephen Miller, NØSM
Asia	JE2YRD	Kenwood USA Corporation
North America	JP1DMX/HI8	ETO, Inc/ALPHA

Special Plaques

Single Operator

Category	*Winner*	*Donor*
W/VE Combined Score	K1RU	*National Contest Journal*
W/VE Low-Power Combined Score	W1PH	Rochester, NY, DX Assn
W/VE Under-18 Combined Score	KI6ZH	Connecticut DX Assn
World Combined Score	AH3C	Mike Manafo, K3UOC, 4M4A, P46S
Europe Combined Score	F2CW	Chris Williams, KG6AR
Japan Combined Score	JA8RWU	JA7WME, JG7SVZ and JH7AFR
Atlantic Division CW	K3ZO	K2NY Memorial—Salt City DX Assn
Great Lakes Division CW	K8AZ (K6NZ,op)	Livonia ARC, Livonia, MI
Great Lakes Division Phone	NA8V	Livonia ARC, Livonia, MI
Hudson Division CW	N2LT	W2AO Memorial—Order of Boiled Owls
Israel CW	4X1IF	Robert B. Weinstock, KN1K
Japan Low-Power All-Band CW	JA1BNW	W7PHO Memorial—Western Washington DX Club
Poland Phone	SP9PT	Stan Wisniewski, FO5IW
Seventh Call Area All-Band CW	W7EJ	Willamette Valley DX Club
Seventh Call Area All-Band Phone	N7TT	Willamette Valley DX Club
Single-Operator Under-18 CW	WE7B	Virginia A. Greene, WB1AVA
Single-Operator Under-18 Phone	K6XT (KI6ZH,op)	Virginia A. Greene, WB1AVA
USSR All-Band CW	YL1WW (UQ2-037-83,op)	Warren C. Stankiewicz, NF1J
USSR All-Band Phone	*YL1WW*	*Warren C. Stankiewicz, NF1J*

Multioperator

Category	Winner	Donor
Caribbean Multi-Single CW	ZF2KE	The YASME Foundation
Caribbean Multi-Single Phone	VP2E	W5MYA

W/VE Plaque Winners—Phone

Single Operator

Category	*Winner*	*Donor*
All Band	K1RU	Frankford Radio Club
1.8 MHz	K1ZM	Butch Greve, W9EWC, Memorial
3.5 MHz	KA1XN	Lance Johnson Engineering, KØCS
7 MHz	K4XS	David Thompson, K4JRB
14 MHz	WØZV	Dayton ARA
21 MHz	W7WA	Kenwood USA Corporation
28 MHz	K3ZJ	Windsor ARC, VE3OW
Low-Power	W1PH	Dauberville DX Assn
QRP	N4KG	Michigan QRP Club
Assisted	WM5G (KRØY,op)	Corona Norco ARC

Multioperator

Category	*Winner*	*Donor*
Single Transmitter	W3BGN	Kenwood USA Corporation
Two Transmitter	K2TR	Kenwood USA Corporation
Unlimited	W3LPL	Western New York DX Assn, W2RR

DX Plaque Winners—Phone

Single Operator

Category	Winner	Donor
World	P40V	North Jersey DX Assn
Africa	5H3TW (K3TW,op)	Kenwood USA Corporation
Asia	JA8RWU	Acadiana DX Assn
Europe	DL6FBL	Gerald Griffin, MD, W8MEP/6
North America	FG5R (W7EJ,op)	Chod Harris, VP2ML
Oceania	AH3C	Doc Sayre, N7AVK
South America	HK3JJH	Kenwood USA Corporation
1.8 MHz	YV1DRK	*Fred Race, AL7JO, in Memory of Charlie, W8TCA*
3.5 MHz	T32AF	Kenwood USA Corporation
7 MHz	4M5T (YV5JBI,op)	Central Arizona DX Assn
14 MHz	G3FXB	Don Wallace, W6AM, Memorial, Central CA DX Club
21 MHz	NP4CC	Ray Molony, W2NCL, Memorial, Long Island DX Assn
28 MHz	PJ9M (OH6RM,op)	LIMARC
QRP	HB9ADD	Gerald Griffin, MD, W8MEP/6
Assisted	SP2UUU	ARRL

Multioperator, Single Transmitter

Category	*Winner*	*Donor*
World	VP2E	Carl Cook, AI6V
Asia	JE2YRD	Kenwood USA Corporation
Europe	F6CTT	Kenwood Employees ARC, WD6DJY
North America	ZF2JR	Society of Midwest Contesters
Oceania	FOØXXL	ARRL
South America	PJØB	Kenwood USA Corporation

Multioperator, Two Transmitter

Category	*Winner*	*Donor*
World	K6GSS/KH6	Kenwood USA Corporation
Africa	EA9IE	Stanley Cohen, WD8QDQ
Asia	JA8YBY	Kenwood USA Corporation
Europe	4U1ITU	KB4OMW and WB4CKY, *The Middletons*

Multioperator, Unlimited

Category	*Winner*	*Donor*
World	4B2A	Wayne Yoshida, KH6WZ
Asia	JA1YDU	Kenwood USA Corporation
Europe	I3MAU	Doug Robbins, KY2O
South America	ZZ4Y	Kenwood Employees ARC, WD6DJY



WX6M "had a lot of fun in the contest." Art made about 900 combined QSOs in the Single-Assisted category.

DX Continental Leaders—CW

Single Operator	Africa	Asia	Europe	North America	Oceania	South America
All-Band	ZD8Z (N6TJ,op)	JA7FWR	F2CW	HKØ/N3JT	AH3C	OA4ZV
160	—	—	CT1AOZ	VP2EXX	—	YV1OB
80	ZS6BCR	JA3YKC	OK3CBU	—	N7DF/NH2	—
40	—	JE7JDL	Y42MK	KØGVB/C6A	—	4M7A (YV7QP,op)
20	—	JA1YFG	IA8A (IK8DOI,op)	KL7Y	—	—
15	—	JA9NFO	G3FXB	NL7GP	KH6WT	PY2RN
10	9J2AL	JHØKHR	G4BUO	N6OP/NP2	KH2D	LO5E (LU5EIC,op)
Assisted	—	JA7YAB	—	—	—	—
Multioperator						
Single Transmitter	—	JA7YAA	F5IN	J34A	V73AQ	PJ2J
Two Transmitter	—	JA1YXP	LZ5M	—	—	—
Unlimited	—	JE2YRD	—	JP1DMX/HI8	—	—

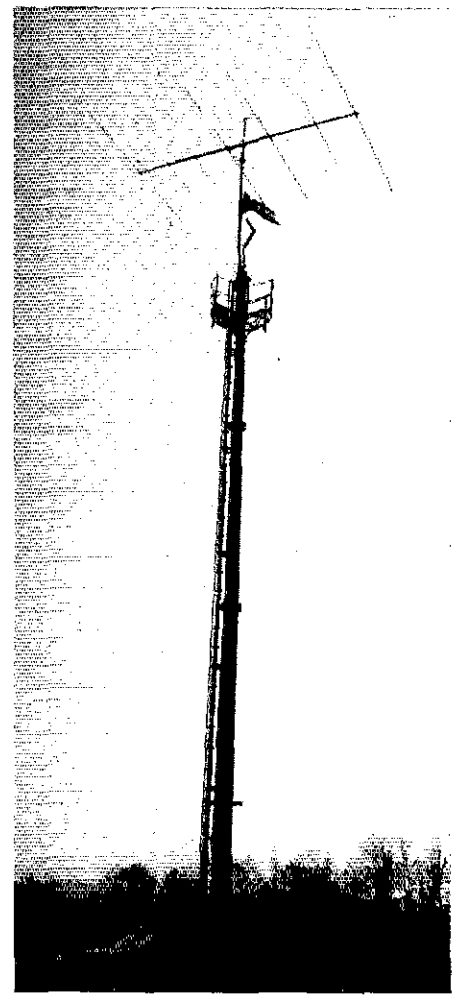
DX Continental Leaders—Phone

Single Operator	Africa	Asia	Europe	North America	Oceania	South America
All-Band	5H3TW	JA8RWU	DL6FBL	FG5R	AH3C	HK3JJH
160	—	—	CT1AOZ	JP1DMX/HI8	—	YV1DRK
80	—	JA3YKC	CU2AF	WL7BIL	T32AF	HK1LDG
40	—	JA2BAY	I5OYY	TG9AJR	—	4M5T (YV5JBI,op)
20	—	UW9LA	G3FXB	KP4FP	—	ZW5B (PY5EG,op)
15	—	JA1YXP (JO1JOZ,op)	CT1BOP	NP4CC	YC2IAB	HC1HC
10	EL2CX (K3RV,op)	JA0JHA	GW4BLE	WL7E	KH6DLW	PJ9M (OH6RM,op)
Assisted	—	—	SP2UUU	—	—	—
Multioperator						
Single Transmitter	—	JE2YRD	F6CTT	ZF2JR	FO0XXL	PJ0B
Two Transmitter	EA9IE	JA8YBY	4U1ITU	—	—	—
Unlimited	—	JA1YDU	I3MAU	—	—	ZZ4Y

Affiliated Club Program

Unlimited Category	Score	Entries	CW Winner	Phone Winner
Frankford Radio Club	156,060,143	141	N2LT	K3OO
Yankee Clipper Contest Club	104,309,259	94	K1AR	K1RU
Potomac Valley Radio Club	45,115,665	53	K3ZO	K3ZO
Northern California DX Club	26,809,479	81	N6TV	K6HNZ
Medium Category				
Society of Midwest Contesters	16,043,200	32	W9OP	WB9Z
North Coast Contesters	12,578,871	16	K8AZ (K8NZ,op)	WB3KKX
North Texas Contest Club	12,497,661	18	N5RZ	N5AU (WB5VZL,op)
Minnesota Wireless Assn	9,100,011	10	N0AT	N0AT
Rochester (NY) DX Assn	8,180,781	24	KM2P (N1ATN,op)	W2HPF
Mad River Radio Club	6,854,523	15	W8UA	N8CXX
Western Washington DX Club	6,607,698	28	N7TT	N7TT
San Diego DX Club	6,326,199	14	K6NA	K6XT (KI6ZH,op)
Willamette Valley DX Club	4,757,664	6	AI7B	WR7E
Northern California Contest Club	4,342,188	8	AD6E	—
Dixie DXers Contest Club	3,179,685	7	N8LM	AA4GA
Southern California Contest Club	2,960,922	7	N6LL (WA6CDR,op)	N6AA
Albany ARA	2,461,233	20	K2ONP	NW2J
Redwood Empire DX Assn	2,166,183	13	W6FSJ	W6PM
Southern California DX Club	2,064,861	11	W6UJX	KK6BB
South Jersey Radio Assn	1,660,635	24	K2JLA	W2PAU
Murphy's Marauders	1,532,973	11	K1IN	KG1D
Grand Mesa Contesters	1,473,675	8	KJØG	N0ZA
Western New York DX Assn	1,473,645	8	WB2ABD	KD2YP
Western Illinois ARC	1,321,218	13	KIØW	N9JF
Long Island DX Assn	906,783	9	K2MFY	K2MFY
Kansas City DX Club	769,080	5	KMØL	WJØI
Southeastern DX Club	739,857	7	W4DXI	AB4RU
Central California DX Club	695,847	10	W6MUS	K6DT
Metro DX Club	683,973	13	WD9GGY	K9MDO
Eastern Iowa DX Assn	590,862	9	KEØY	WØPPF
West Park Radiops	387,783	9	W8BE	W8BE
Local Category				
Overlook Mountain ARC	15,585,609	8	W2XL	N2AAK
Hoosier Contest Club	4,564,218	7	N9NS	W9RE
Carolina DX Assn	3,058,341	8	AA4S	K4YYL
Central Arizona DX Assn	2,677,767	6	K7GM	K7WK
Northern Ohio DX Assn	2,183,973	4	—	K8DJC
Dauberville DX Assn	2,162,565	9	WA3LFY	NM3E
Boiled Owls of New York	1,727,580	5	K2SX/1	K2SX/1
Mile-Hi DX Assn	1,671,843	5	WØUO	WØUO
Utah Contest Club	1,232,538	4	WE7B	WE7B
Alamo DX Amigos	815,220	9	K5DB	N5HB
Columbus (OH) ARA	706,734	3	K9ALP	W8NPF
No Dot DXers	677,391	3	K9QVB	K9QVB
Ogdenburg ARC	218,856	3	—	WN2R
River City Contesters	158,247	4	K6SG	K6SG
Douglas Co ARC	145,776	3	W4JFL	—
Sturdy Memorial Hospital ARC	89,559	6	K1ZZJ	K1ZZJ
Naked Chicken Contest Club	85,419	6	NF1J	NF1J
Radio Amateur Transmitting Society	35,103	4	—	W4AY (WA4ZZU,op)

records (WB4KOT). I was surprised and delighted with the effectiveness of my 60-100 watts on all bands after years of high-power contest operation. The conditions were good for this 70-year-old ham (N4UH). I had a lot of fun! I worked the contest with a barefoot TS-930S into a ground-mounted vertical. I was sick with the flu Sunday and didn't get to finish as I had hoped! (KC4DO). I enjoyed operating single-band for a change. My wife saved the day by letting me use her computer for logging purposes (NX9T). This was my first contest since getting my Novice license. I enjoyed it and am looking forward to more (KC4NKR). In spite of external happenings, I was surprised by my score (W9LSD). I had a fantastic run of JAs for about an hour on 40 Sunday morning (K4XS). This was my first-ever contest. It was fun, even though I discovered that the dipoles were tangled at 2355Z! K1EA deserves a special plaque from all contesters for his FB software (KM4YY). It was a great contest —there were a lot of openings. I'm sorry I had to quit so early the second day, but I did manage to work quite a few new countries (N4PUV). My heart just wasn't in it this year (W5FO). Someday I'll find out what a real effort might generate, with a lot of time devoted to that weekend (KA5PVB). I worked more Europeans than JAs! (K6SVL). It was good fun, considering the time I actually spent operating (KI6CK). Having good software sure makes it a lot more fun and less fatiguing. Now when the contest is over, it's over! (K7RI). It was a nice contest and lots of fun (WO7Y). I was impressed with professional operation by some of the DX stations. Without it, I'd never have made it through the pileups for ops like T77C (WB7VKD). Thanks for



Here's a view of part of the antenna farm at HB9ADD. Eric operated his station QRP, finishing third-place World CW and first-place World phone.

Overall Division Leaders

CW	Division	Phone
K9ZO	Atlantic	K3OO
K9MA	Central	W9RE
NØAT	Dakota	NØAT
W4XJ	Delta	W5WMU (KE5FI,op)
K8AZ (K8NZ,op)	Great Lakes	NA8V
N2LT	Hudson	W2RQ
WØEJ	Midwest	WØEJ
K1AR	New England	K1RU
W7EJ	Northwestern	N7TT
N6TV	Pacific	K6HNZ
KØRF (WØUA,op)	Rocky Mountain	KØRF (WØUA,op)
K4PQL	Roanoke	KX3Q
WZ4F	Southeastern	WZ4F
K6NA	Southwestern	K6XT (KI6ZH,op)
N5RZ	West Gulf	N5AU (WB5VZL,op)
VE3KP	Canada	VO1MP

Low-Power Division Leaders (<150 W)

CW	Division	Phone
K3OX	Atlantic	NM3E
K9QVB	Central	WO9Z
KEØUI	Dakota	ACØW
NT5G	Delta	W4AY (WA4ZZU,op)
K9ALP	Great Lakes	K8NZ
K2MFY	Hudson	K3FNW
NDØF	Midwest	WBØYJT
W1PH	New England	W1PH
W7YAQ	Northwestern	K7RI
W6JTI	Pacific	WA7CWM
WØIZV	Rocky Mountain	KDØNB
NU7F/4	Roanoke	N4UH
WD4AHZ	Southeastern	KM9P/4
W6UQF	Southwestern	N6ADK
KF5AA	West Gulf	N5AW
VE6BF	Canada	VE7HBQ

QRP Division Leaders (<5 W)

CW	Division	Phone
K3NCO	Atlantic	W2TZ
WB9HRO	Central	K9PNG
WØNGB	Dakota	KEØKB
NU4B	Delta	AA5GY
W8VSK	Great Lakes	W8EAO
KR2Q	Hudson	—
—	Midwest	NOØY
N1AFC	New England	KN1M
NØAX	Northwestern	K7GEX
WB6IIM	Pacific	N6RUX
WØUO	Rocky Mountain	WØUO
—	Roanoke	WD4OHD
KA4YAE	Southeastern	N4KG
N7IR	Southwestern	—
AK5E	West Gulf	KA5PVB
—	Canada	VE6MAA

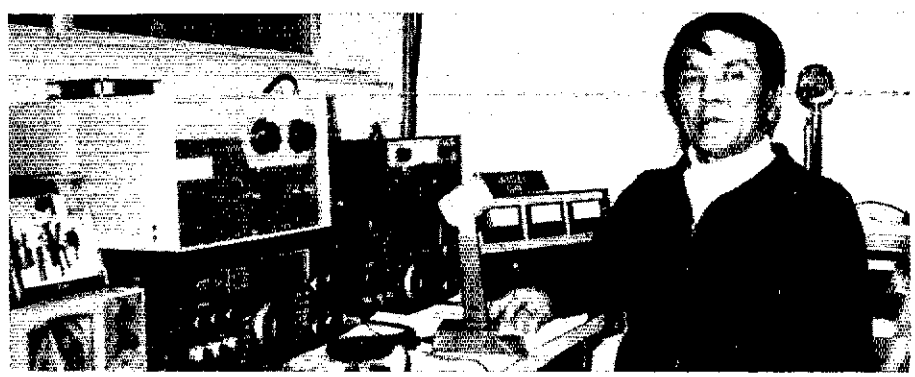
another great DX contest this year! (WE7B). Conditions were good the first night, but line noise on the Beverage hurt the second night (NZ4K). This was my first try at single-band operation and I had a ball on 10 meters! (N8AGU). EA3EA said he was running 100 milliwatts; ten minutes later HA8OO confirmed 10 kilowatts. These were the low and high powers received in the contest (K3ZJ). It's always a joy to participate with and meet the sharpest operators in the world (W9GXR). The HW-101 and trap vertical I've been using for the past 10 years are still running well for casual contesting (KAØP). I had a ball in this year's contest with my low-power station (VE3NYT). Conditions on the first day were great (VE6SH). This one was just for fun (VE6CWW). It was a treat to get into a lot of the big-gun pileups (VE6MAA). Thanks to K1EA and AK1A for making DX contesting more fun than ever! (KRØY). Murphy made it into my shack this year, as I found after the contest that both of my antennas were shunted to ground (KG5VK). My rotator stuck due south Saturday afternoon. I learned that Europe works poorly off the back of the beam (WW6I). The 10-meter propagation was great (AI7B). 100 watts in an SSB contest is work! (NC7K). I worked A41JR on 20 when he called a "normal" CQ. After the nice chat, I felt bad when I left him with a massive pileup (K1SSN). The contest was fantastic! Special thanks to AH3C (N3BNA). This was my first major contest from my new QTH. The JAs sure are loud! (WB2ULI).

DX phone

My operation was from the VOA Botswana Relay Station using an idle commercial rhombic antenna aimed at the US, which proved to be quite a thrill! (A22AA). I missed many multipliers on the low bands due to poor conditions (5H3TW). I only operated for 15 hours—the bands sure were crowded! Conditions were good (JF2GYH). This was my first contest (JE8PHS). The conditions on 10 were not so good (JA3GLU). I thank the 45 stations that heard me (JJ1RBF). I am happy to have worked over 500 stations (JE7DOT). Someone said "My wife has gone away" (JP1SRG). Thanks for the nice contest (UWØCV). This year's contest held quite a few surprises. Normally the 10-meter band is only open for short periods, but during this contest we had long openings (VU2GDG). It was a pleasure working US hams on a rare opening for low-power stations like mine (VU2UR). There wasn't much activity on the lower frequencies (CU2AF). My thanks to everyone and congratulations to CT2A (CT1BOP). It's always a real pleasure to be in the contest. I heard a lot of stations on 160, but didn't meet with any success (DL8PC). Outstanding conditions on 10 meters made this a highlight in my contest life (DL7ON). It's difficult to open a window among the kilowatts of Europe with only 100 watts, but it was a wonderful contest (EA1AK). Signals were beautiful from the West Coast on Friday (EA3GBU). The going was hard, but exciting. (EI8AU). I enjoyed meeting a lot of friends and working all states in a full weekend on 20 and 10 meters (F2CW). 80-mi/hr gusts followed by blizzards made a six-hour scenic drive into a 10-hour nail-biter. Try saying this 3000 times—Hotel Bravo Zero Portable Whiskey Bravo Eight Hotel Yankee Lima. (HBØ/WB8HYL). The activity was just tremendous and the propagation did help a lot to make this contest an enjoyable one. I was so busy writing the QSOs at one point that my hand hurt (HAØDR). Signal levels were quite low, but so was the QRN, making virtually everyone easy copy (GM4OBK). Conditions were poor for the Midwest and West Coast (I5OYY). I worked all states but one in the first hours (IO8RS). I worked W6 and VE7 just before I fell out of my chair in the shack (LA5JX). This may not be a winning log, but it was nice to be in there anyway (LA9DFA). This was my first phone test! It was big fun until 0800Z Sunday, when I ran out of voice (OH3TR). It seemed that 15 suffered from the super conditions (OH6NIO). I didn't anticipate working the full contest, but I worked six new states! (OZ7AX). I still enjoy participating in this contest and it is a great pleasure to be greeted with "Nice to meet you again" by old friends (OZ8T). It was nice to work so many stations with a simple rig (PA2JCG). Thanks to all those stations who copied my QRP signals (PA3ELD). We just took part in the contest to try out the new 40-meter Yagi and were kept busy for six hours (PA3EPN). We'll see you again next year (SP4GFG). I worked Washington, Idaho and Minnesota with only five watts! (SV1NA). The conditions were poor here (UA6LTI). The conditions were better than they were for phone, but my score was higher (UA6LLT). It was really enjoyable, even without a high-gain antenna. I couldn't operate the entire contest because of our wedding anniversary (UA3DPX). It was an interesting contest this year (UB3MW). W3LPL was a beacon here in Europe (UT4UZ). The door between North America and Europe opened at 2317 UTC. What a great pileup! (ES2RJ). This was my record for 20 meters (YU1KQ). This year's propagation on 20 meters was tremendous. The band was open both nights and extremely open both mornings. There was even long path during the afternoons (YT3T). Band conditions were great! I worked 44 states with only 25 watts and a quarter-wave vertical (HP1COO). Conditions were so good this year, I wish I could have worked DX! It's been a long time since I worked W1 and W2 at 0400Z on 10 meters (WL7E). This was the first year I ran all-band and it was a challenge. 40 and 15 were crowded, but it was a treat to work so many stations on 160 with only 100 watts (T12DU). It was great fun being pursued for a change (V2/G6QQ). My experience over the past several contests is that working Washington, DC, is about as common as working Yemen. I guess a couple of XEs will have to come up and activate it (XE2GAT). This year's noise level was S7, sometimes higher (XE2HWH). Where were all the stations on 15? (8P6SH). The comments I received ranged from "You QRP guys really make my ears tired" to "What power are you *really* running?" (NH6T). This was my first contest on 160 (YV1DRK). The propagation the first day was very poor, but got better by the afternoon of the second day (YV6BXN).



Takeo, JR1GSE, poses by his station.



Two-time plaque winner Elvin, JA3CZY, made over 900 contacts on 15-meter phone.

Scores

The scores are listed by mode—CW and phone. For 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 sign, 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 K1TO. The top Low-Power (150 W or less) entrant is WB7EZO/1. W1NG has the top 160-meter Single-band score, KS1L has the top 40-meter Single-band score, NF1J has the top 20-meter Single-band score and NC1E has the top 10-meter Single-band score. KA1CZF has the top QRP score.

Eastern Pennsylvania

W/VE CW

Single Operator

1

Connecticut

K1TO	2,544,480	2280	372	C
K1CC	2,351,916	2142	366	C
K1RU	2,227,104	2109	352	C
K2SX/1	1,151,250	1250	307	C
KG1D	876,177	1119	261	C
K1IN	305,772	614	166	C
K1BV	104,133	337	103	C
AA2Z	39,366	162	81	C
WB7EZO/1	17,472	104	56	B
W1CNU	13,350	89	60	C
KA1CZF	9,504	66	48	A
W1NG	6,120	60	34	C-160
KS1L	124,488	532	78	C -40
NF1J	1,326	26	17	B -20
NC1E	76,518	327	78	C -10

Eastern Massachusetts

W1KM	2,422,464	2294	352	C
N6BV/1	2,147,397	2051	349	C
W1IHN	963,884	1917	264	C
KA1DWX	456,213	631	241	C
KQ1V	192,222	362	177	B
WA1UAR	135,368	293	154	B
N1DG	25,344	128	66	B
N1EDM	23,424	122	64	B
KQ1F	21,630	103	70	B
K1ZZJ	12,240	85	48	B
W1FV	126,603	521	81	C -80
W1FM	13,932	108	43	B -15
KM1C	133,110	493	90	C -10

Maine

K1JB	396,675	645	205	C
N1AFC	154,707	371	139	A
K1ZOC	58,140	190	102	B
KN1M	4,263	49	29	A

New Hampshire

K1AR	3,256,528	2611	416	C
KC1F	2,348,865	2055	381	C
W1PH	1,112,364	1166	318	B
WA3ECT	219,420	460	159	C
K1NH	146,880	320	153	B
NB1H	69,888	208	112	C

Rhode Island

KS1J	1,318,742	1498	293	C
K1VSJ	76,014	206	123	B
WA1HYN	12,126	94	43	C -80
K2MN	432	16	9	B -20
W1RFQ	48	4	4	B -20

Vermont

N4DW	310,761	473	219	C
W3SOH	249,600	416	200	B
WA1OGC	55,968	176	106	B
WA1GUV	43,050	175	82	B

Western Massachusetts

K1BW	231,861	427	181	C
KZ1M	229,764	467	164	B
K1DPB	194,220	415	158	B
W2SC	128,160	480	89	C -10

2

Eastern New York

W2XL	887,139	1133	261	C
KF2O	230,580	366	210	C
NA2M	148,500	330	150	C
K2ONP	143,820	340	141	C
NW2J	137,655	345	133	C
W2AWF	120,498	302	133	C
K2SIG	100,920	290	116	A
WT2F	82,472	241	114	B
W2QYA	11,481	89	43	A
KA2AQV	10,449	81	43	B
AA2Y	4,704	49	32	B
WF2B	108	6	6	B
K2RIH	3,483	43	27	C-160
K2EK	123,360	514	80	C -80
W2DW	6,612	76	28	B -40
KB2AUQ	20,736	144	48	B -15
K1ZM	204,444	831	108	C -10

NYC-Long Island

N2UN	386,280	580	222	C
K2LE	376,290	678	185	C
WB2TPS	313,110	497	210	C
K2MFY	301,485	605	199	B
KK2E	157,781	353	149	A
WB2ENW	117,306	294	133	A
KD2HE	49,392	168	98	B
W2DX	41,040	190	72	B
K2KTT	31,879	126	85	B
W2GKZ	24,717	107	77	C
W2KTF	22,470	107	70	B
WB2AMU	5,940	60	33	B -80
N2DTW	140,220	570	82	C -20
N2KW	48,204	206	78	B -10

Northern New Jersey

N2LT	2,388,803	2113	377	C
W2RQ	1,909,440	1872	340	C
N2NT	1,714,850	1610	355	C
K2PS	1,217,130	1399	290	C
KZ2S	608,580	828	245	C
KR2Q	314,766	522	201	A
KB2H7	240,084	351	228	C
K2OM	148,964	331	148	A
KT2D	133,182	302	147	C
WR2G	97,722	287	122	C
K2PH	71,928	216	111	C
W9NTU	26,718	122	73	B
W2AOY	17,934	98	61	C
W9FFC	16,254	86	63	C
W2FCR	2,208	32	23	C-160
WA2ASQ	71,994	338	71	C -20
NF2K	22,500	150	50	B -20

Southern New Jersey

K2FL	400,890	581	230	C
N2MR	306,768	581	176	C
K2MK	259,350	455	190	C
K2JLA	238,425	425	187	C
W2PAU	160,719	317	169	C
WA2AXJ	159,795	335	159	B
W2EA	144,648	328	147	B
N2FY	77,280	224	115	B
K2SWZ	51,860	164	105	B
K2OSV	50,196	188	88	C
W2CN	28,194	127	74	C
K2LOO	27,900	124	75	B
KE2OP	9,699	61	53	B
WA2VSQ	7,503	61	41	B
W3ELJ	2,325	31	25	B
W2BN	1,638	26	21	C-160
N2NU	25,536	152	56	C -80
KC2TA	5,088	53	32	B -20

Western New York

KM2P (N1ATN,op)

	496,179	799	207	C
WB2ABD	438,687	617	237	C
K2NV	339,048	554	204	C
N2WK	260,154	447	194	C
W2HG	177,507	383	163	C
W2QIP	176,529	361	163	C
KD2YP	155,040	304	170	C
WE2K	113,322	374	101	B
NS2X	53,580	188	95	B
K1JUL	45,264	184	82	C
WJ2O	21,777	119	61	C
W2FUI	17,955	105	57	B
W2RUK	8,424	78	36	B
N2AU	24,360	145	56	C -80
W2FR	12,672	96	44	C -80
WA2AOG	10,932	84	41	C -80
W2FXA	60,444	276	73	C -15
WB2YQH	39,744	192	69	C -10

3

Delaware

NW3Y	214,722	474	151	C
W3NX	214,230	386	185	C
K3WUW	136,320	568	80	C -40

Eastern Pennsylvania

W3UM	1,112,616	1212	306	C
K3NW	918,818	1082	283	C
K3TEJ	837,768	1042	268	C
K3WJV	608,304	867	304	C
K3OX	192,699	351	183	B
W3EVW	171,288	366	156	C
KL7HIR/3	164,379	349	157	B
KU3K	148,869	357	139	C
NK3U	137,241	299	153	B
W3EHZ	108,528	272	133	B
KW3W	105,648	284	124	C
W3QIR	77,343	303	127	C
NQ3S	4,617	57	27	C
K3NL	3,159	39	27	B
K4JLD/3	7,425	75	33	C -80
WA3LFY	5,472	75	24	C -80
W1VY/3	18,492	92	67	C -20
AA4MD/3	25,254	183	46	C -15

Maryland-DC

K3ZO	2,058,752	1863	368	C
K3NA	1,649,408	1474	373	C
W3HVQ	290,265	523	185	C
K3EI	234,930	410	191	C
K3AV	138,033	313	147	C
W3HVM	62,130	218	95	C
W3CPB	53,628	164	109	B
K3NCO	52,965	165	107	A
WA3EEE	46,137	169	91	A
K3YDX	16,443	87	63	C
WA3YVI	14,274	78	61	B
W4KM	3,592	32	27	C
KN3T	147	7	7	A
W3CDG	300	10	10	C-160
N3RR	98,118	414	79	C -20
W3TUX	3,888	54	24	B -20

Western Pennsylvania

K5ZD/3	1,412,460	1330	354	C
N3GLK	396	12	11	A

4

Alabama

WZ4F	1,046,760	1144	305	C
KK4SM	38,295	185	69	B -15

Georgia

KM9P/4	572,166	717	266	B
N8LM	279,972	462	202	B
W4DXI	210,276	396	177	C
K4MJ	100,800	240	140	C
W4JFL	74,640	311	80	B
AB4RU	71,217	193	123	C
K4TEA	5,250	50	35	C-160
AB4LX	1,782	33	18	B -80
W4JKC	27,789	157	59	B -40

Kentucky

N4AR	1,014,720	1120	302	C
N4XM	395,064	558	238	C
WB4FOT	225,099	397	189	C
K4FU	27,888	166	56	C -40
AA4NJ	53,184	277	64	C -20

North Carolina

K4POL	1,781,136	1736	342	C
K4PB	306,220	467	220	C
KB3MP	175,988	358	162	C
N4QVM	41,100	137	100	B
K4FGY	26,412	124	71	B
N4UH	28,082	126	69	B
KA2CDJ/4	9,216	64	48	B
K5LZT	330	11	10	B
AA4S	159,732	612	87	C -40
N4HEK	4,929	53	31	B -40

Northern Florida

WC4E	595,752	824	241	C
KC4CSD	200,910	362	185	B
W4WKQ	179,172	378	158	C
K4LUZ	19,950	133	50	C -80
KD1U	2,838	43	22	B -40
N4EEB	71,610	310	77	C -10

South Carolina

W3VT	1,266,506	1253	334	C
W6OKX/4	219,852	394	186	C
NU7F/4	129,054	314	137	B
W8CNU/4	48,654	153	106	B
K4HOG	27,051	127	71	B
K4WJV	23,595	121	65	C

Southern Florida

WD4AHZ	729,015	917	265	B
K4MF	657,552	824	266	C
KM4KJ	64,800	200	108	B
WA5OTK	63,024	208	101	C
KA4YAE	50,700	169	100	A
KN4BP	36,261	153	79	C
AB4RL	20,022	94	71	B
N4AW	19,431	127	51	C -40
WB4TDH	112,992	428	88	C -10
K5OTI/4	49,950	222	75	C -10
WA4OML	22,680	140	54	C -10

Tennessee

W4XJ	1,231,650	1275	322	C
AB4SW	69,480	193	120	B
NU4B	65,844	177	124	A
WA4JTI	83,916	444	83	C -40
N4IR	143,520	598	80	C -15
N4ZZ	131,097	491	89	C -10
KI4UZ	47,637	237	67	C -10

Virginia

AA4XU	268,272	552	162	C
K1ZZI	227,340	842	90	C
N3OS	199,200	400	166	C
N4MO	180,048	682	88	C
WB4UBD	66,267	199	111	B
K6ETM/4	64,974	221	98	C
N4ZR	42,733	141	101	C
W3FTG	39,690	135	98	B
AA4KD	25,536	112	76	B
N4RUM	23,862	97	82	B
N4MM	19,809	93	71	C
NI4Y	8,967	61	49	C
N4UA	7,245	69	35	C -80
AA4UJ	4,446	57	26	C -80
K1WGM	122,304	637	64	C -40
W4YE	28,880	160	56	C -40
W4KMS	5,226	67	26	C -40

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Arkansas

K5HYB	169,548	398	142	C
K5XK	38,664	179	72	C
NJ1V	20,604	101	68	C
W5EU	12,600	75	56	C
KM5G	117,552	496	79	C -20

Louisiana

NT5G	716,862	761	314	B
K5KLA	253,011	451	187	B
NO5W	14,025	88	56	A

Mississippi

W1MK	807,576	1064	253	C
WA5OYU	284,280	460	206	C
KC5EF	39,640	198	80	C -15

New Mexico

AA5B	245,760	512	160	C
W5FS	174,798	351	166	C
AG5S	46,560	194	80	C
W5YZ	102,255	401	85	C -10
W5DO	25,578	174	49	B -10

North Texas

N5RZ	2,114,604	1812	389	C
WM9G (KR8Y,op)	1,955,016	1724	378	C
N5RM	478,800	700	228	C
W5UDA	430,980	653	220	C
WA5GIK	87,360	280	112	B
K5WXZ	585	15	13	C-160
K5IU	37,944	204	62	C -40
W5FO	155,388	563	92	C -20
WN4KKN/5	300,768	964	104	C -15
NI5M	70,863	299	79	B -15
K5RX	162,378	558	97	C -10

South Texas

KF5AA	435,132	711	204	B
K5DB	247,446	466	177	C
N5HB	234,264	454	172	B
KG5OA	118,818	287	138	B
W5NR	61,740	210	98	C
WC5D	31,248	112	93	B
W5HRF	4,563	39	39	C
W5VX	228,252	827	92	C -15
N5BR	15,594	113	46	B -15
AK5E	10,773	63	57	A -10

West Texas

WF5E	132,432	486	89	C -20
WB5UDX	92,568	306	76	C -15
W5VGX	103,284	453	76	C -10

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East Bay

N6EK	475,740	881	180	C
K6ATV	321,456	592	181	B
K6HIH	239,400	600	133	C
W6FSJ	124,620	335	124	C
W6BSY	114,579	439	87	C -15

Los Angeles

N6IBP	100,890	295	114	B
W6OES	80,616	222	76	C
W2LF	13,965	95	49	B
W6FA	12,699	83	51	B
N6LL (WA6CDR,op)	594	18	11	C-160
K5KT/6	11,466	78	49	C -40

Orange

N6AV	277,704	532	174	C
W6BA	102,144	256	133	C
NW6S	72,468	366	66	B

Santa Barbara

W6UM	380,150	510	255	C
W6UJX	300,510	530	189	C
WA6HGV	145,542	382	127	B
W6OUL	133,434	353	126	C
AA6EQ	115,758	354	109	B
W6MUS	68,405	233	95	C
W6BKY	25,116	182	46	B
AA4Q	3,888	54	24	A
W9GIL/6	22,140	164	45	C

Santa Clara Valley

N6TV	1,069,908	1316	271	C
AD6E	219,897	461	159	B
N6AN	142,308	354	134	C
K6CXT	69,972	238	98	C
W6ERS	63,063	147	143	C
K6SMH	43,200	200	72	B
W6PLJ	42,720	178	80	B
W6FGD	12,144	88	45	C
W6SYL	9,996	68	49	B
W6XX	172,368	684	84	C
AA6KX	36,180	201	60	C
N6NF	35,955	255	47	C

San Diego

K6NA	1,280,268	1342	318	C
K6JYO	478,116	699	228	C
W8UQF	468,141	817	191	B
KW6Q	274,248	585	156	B
W6MVW	226,044	483	156	B
KI6ZH	196,686	446	147	C
K6NY	76,752	312	82	B
AA6EE	7,296	76	32	B

San Francisco

W6JTI	636,417	873	243	B
K6ZUR	103,659	317	109	C
WA6CTA	50,688	176	98	C
WW6D	13,068	99	44	C
W6PM	4,212	52	27	C
K4TKM/6	129,120	538	80	C
KI6EZ	40,635	315	43	C

San Joaquin Valley

KA6BIM	132,696	291	152	C
W8AKS/6	75,582	247	102	B
WB6IIM	51,060	185	92	A
N6OT	30,030	154	65	C
K6DT	12,768	76	56	C
W6IFC	588	14	14	B
W6BVM	2,052	38	18	C

Sacramento Valley

K6DR	195,315	449	145	C
W6NKR	187,929	399	157	C
N6JM	47,502	174	91	B
K6SG	25,434	157	54	C

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Arizona

K7GM	1,047,837	1217	287	C
K7WK	424,944	681	208	C
N7IR	236,208	532	148	A
W7YS	145,494	354	137	C
W2HTX	58,056	236	82	B
NN7A	3,042	39	26	B
N6SS	1,674	31	18	C-160
WA7AYY	31,464	184	57	C
KX7J	18,848	117	48	C
N7MW	11,286	99	38	B

Eastern Washington

W7LGG	72,324	246	98	C
K5ZV	45,360	218	70	B
K7EFB	1,512	24	21	B

Idaho

KA7T	56,595	343	55	C -2

Montana

KS7T	339,760	540	148	C
W7LR	58,160	180	104	C
K7ABV	14,832	103	48	C -4
W6ALQ	51,875	265	65	C -2

Nevada

KZ4H/7	67,512	232	87	B

regon

7EJ 1,126,734- 1351-276- C
7B 1,062,888- 1322-268- C
7YAQ 547,008- 814-224- B
G7A 191,268- 483-132- C
Q7T 75,516- 203-124- B
J7R 66,799- 377- 58- C
B7VKU 66,123- 279- 79- C
7MMQ 55,845- 258- 73- C
7KSA 44,352- 154- 96- B
K7U 38,220- 196- 65- C
S7P 29,280- 160- 61- C
6YVK/7 10,170- 113- 30- A
7QK 6,600- 55- 40- B
C7EM 33,276- 236- 47- C -80
7FAB 27,930- 190- 49- C -40
37J 52,059- 259- 67- B -15
7DVM 45,288- 296- 51- B -15
A7FEF 8,400- 100- 28- B -15
Q7I 18,720- 160- 39- C -10

tah

7CFL 510,414- 877-194- C
E7B 450,258- 743-202- C
6XO 63,063- 273- 77- C -20

estern Washington

7TT 594,711- 887-221- C
0AX 248,217- 527-157- A
7HUS 197,904- 436-133- B
7IIT 196,407- 471-139- C
A7UVJ 139,920- 440-106- B
A6RJY 77,265- 255-101- B
7QN 62,640- 232- 90- C
7VIH 27,540- 153- 60- B
6VNJ 24,480- 120- 68- C
W7Q 33,696- 234- 48- C -20
7WA 226,260- 838- 90- C -15
7QQ 49,680- 276- 60- C -10

yoming

7MM 336,039- 599-187- C
C7S 25,992- 152- 57- C
C7O 5,376- 64- 28- A

ichigan

A8V 1,660,584- 1624-347- C
8UA 400,902- 613-218- C
8TWA 377,118- 574-219- C
G8M 169,335- 355-159- B
3CV 124,962- 353-118- C
8VSK 102,870- 254-135- A
8WVU 19,800- 100- 66- B
C8W 16,800- 100- 56- B
8MJZ 11,562- 94- 41- C
8CEO 6,084- 52- 39- B
8QLK 5,520- 46- 40- B
A8ADJ 5,382- 48- 39- B
8CQA 4,320- 40- 36- A
8QWG 630- 15- 14- B
ØCD 1,254- 22- 19- C-160
A8RTP 10,710- 85- 42- C -40
8DD 46,800- 240- 65- C -20
8TJQ 19,500- 100- 65- B -20
3CXX (K8JM,op)
203,949- 731- 93- C -15

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AAZ (K8NZ,op)
1,840,941- 1663-369- C
B3KKX 977,550- 931-350- C
V8Q 719,946- 851-282- C
9ALP 521,928- 659-264- B
9AA 425,691- 609-233- B
8RSW 314,496- 546-192- C
8AGU 259,119- 457-189- B
B8YJF 111,782- 274-136- B
8NPF 95,589- 247-129- C
8YGR 92,016- 216-142- B
8UPH 91,770- 268-115- C
8GQC 60,027- 187-107- B
8BE 53,214- 181- 98- B
8MHW 50,544- 158-108- B
8EF 46,452- 158- 98- B
8IDM 39,468- 143- 92- B
8SJ 36,210- 142- 85- B
8KR 22,848- 119- 64- C
8FDN 18,810- 114- 55- C
8FLX 7,290- 54- 45- C
8PN 6,966- 54- 43- C
8EAO 3,024- 56- 28- A
8XT 75- 5- 5- B
C8JH 630- 15- 14- C-160
A8RCN 24,111- 141- 57- C -40
C8UR 41,358- 228- 61- B -20
8IQ 56,250- 250- 75- B -15

est Virginia

8UMR 17,484- 124- 47- C -20

inois

QVB 468,930- 638-245- B
69JKI 214,368- 352-203- C
9UQN 213,219- 447-159- C
9TI 178,848- 368-162- C
9ZO 177,288- 356-166- C
9ACU 82,077- 251-109- B
9FFZ 54,693- 177-103- B
9JF 53,665- 189- 95- B
9PPW 47,121- 139-113- B
M9C 46,458- 178- 87- B
9CA 42,768- 162- 88- C
D9GGY 36,195- 127- 95- B

K9PNG 32,568- 118- 92- A
WD9IWP 14,040- 78- 60- A
W9ILY 12,720- 80- 53- B
W9LNQ 10,080- 60- 56- A
WB9MLY 3,330- 37- 30- C
KA9AOS 48- 4- 4- B
KG9N 297- 11- 9- C-160
WB9Z 32,712- 188- 58- C -80
KB9PY 2,025- 27- 25- B -15
K9BGL 94,350- 370- 85- C -10

Indiana

NJ9C 344,850- 550-209- B
W9KTP 133,110- 306-145- C
AG9S 89,211- 227-131- C
N9NS 34,188- 154- 74- C
WB9IWN 1,575- 25- 21- C
W9JOO 26,536- 164- 58- B -20
WA9NPM 18,495- 137- 45- C -20
KJ9D (KK9V,op)
151,389- 567- 89- C -15
NT9O 11,232- 104- 36- B -15

Wisconsin

K9MA 561,250- 750-245- C
W9OP 343,347- 593-193- C
W9NA 233,100- 420-185- C
W9HE 160,284- 361-148- B
NI9C 131,052- 268-163- B
WB9HRO 91,512- 246-124- A
KQ9L 90,024- 242-124- B
NG9L 23,520- 112- 70- B
WA9TZE 15,480- 86- 60- B
AJ9K 8,448- 64- 44- B
W9YCV 7,497- 51- 49- C
K1TMM 4,212- 39- 36- B
W9GXR 14,256- 108- 44- C -40
K9OSH 8,094- 71- 38- C -40

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Colorado

KØRF (WØUA,op)
1,876,488- 1907-328- C
KJØG 319,131- 601-177- C
WØUO 310,128- 497-208- A
NØZA 201,228- 409-164- C
AC8S 181,476- 426-142- C
WØCP 150,960- 296-170- C
WØIZV 141,795- 345-137- B
NØGOS 100,224- 288-116- B
K9BQL 72,630- 269- 90- B
K3GWA 62,274- 214- 97- B
KØIYF 38,016- 198- 64- A
KTØF 27,308- 222- 41- C
NNØM 24,750- 125- 66- C
KIØG 7,194- 109- 22- A
WØZV 48,675- 275- 59- C -80
KVØQ 148,248- 568- 87- C -40
NØTK 18,576- 129- 48- C -40

Iowa

WØEJ 677,952- 856-264- C
KEØY 60,588- 204- 99- C
NRØE 25,134- 118- 71- C
WBØB 714- 17- 14- B

Kansas

KAØSIX 3,105- 45- 23- B
KBØG 35,526- 181- 62- C -80

Minnesota

NØAT 457,200- 635-240- C
KEØUI 81,420- 230-118- B
WØBF 48,222- 171- 94- C
KFØT 39,897- 143- 93- B
WBØGGM 33,264- 132- 84- B
WØML 26,496- 128- 69- C
WØNGB 13,050- 75- 58- A
KØII 15,450- 103- 50- C -80
KJØB 35,280- 195- 60- C -40
WJØM 36,360- 202- 60- C -15

Missouri

KIØW 100,215- 255-131- C
NDØF 86,580- 260-111- B
KAØGGI 86,184- 216-133- C
KMØL 85,806- 227-126- C
WAØOUI 76,320- 212-120- B
WDØAVV 18,000- 125- 48- C
WØPKO 14,760- 82- 60- C
KAØP 3,876- 38- 34- B
WCØY 14,241- 101- 47- C -80
WCØG 229,890- 790- 97- C -40
K4VX (W9WI,op)
335,400- 1075-104- C -20

North Dakota

NMØN 30,096- 132- 76- B

Nebraska

AJØI 23,400- 130- 60- B
WZØL 816- 17- 16- B

South Dakota

KDØEE 140,430- 310-151- C
WUØL 105,651- 273-129- C
KØERM 11,880- 88- 45- C

VE

Quebec

VE2AYU 483,720- 695-232- C
VE2AWR 20,808- 102- 68- B

Ontario

VE3KP 543,048- 748-242- C
VE3BZR 105,128- 268-132- B
VE3TEE 13,746- 79- 58- B
VE3DO 2,688- 32- 28- C-160
VE3HI 9,600- 80- 40- C -80
VE3CUI 7,128- 72- 33- C -40
VE3NYT 8,190- 65- 42- B -15
VE3HX 23,364- 132- 59- C -10

Manitoba

VE4JB 133,419- 311-143- B

Saskatchewan

VE5ZX 125,280- 290-144- B

Alberta

VE6BF 144,180- 445-108- B

British Columbia

VE5RA/VE7 79,116- 347- 76- C
VE7DHV 31,494- 181- 58- C
VE7BSB 18,444- 116- 53- B

Single Operator, Assisted

1

NJ2L 889,404- 1082-274- C
K1BG 741,285- 765-323- C
K1EA 375,732- 539-198- C
AI3E 203,040- 376-180- C
NQ1K 163,350- 330-165- C
NO1I 162,750- 310-175- C
K1KP 143,370- 270-177- C
K8LT 76,950- 225-114- C
WB1GQR (WB2JSJ,op)
39,204- 198- 66- C
N1TZ 13,104- 78- 56- C
W1BK 10,368- 64- 54- C
KA1LSZ 7,200- 50- 48- B
KC8PE 4,651- 41- 37- C

2

W2GD 1,873,056- 1432-436- C
K2NJ 1,005,720- 1160-289- C
N1CC 777,876- 939-284- C
W2REH 731,775- 887-275- C
K2OWE 221,715- 378-195- C
N2AIF 186,576- 368-169- C
WK2H 120,156- 323-124- C
KN2Q 87,696- 252-116- C
KD2RE 61,944- 178-116- C
K2SB 40,128- 152- 88- C
W2GMA 31,992- 124- 86- C
W1GD 29,484- 126- 78- C

3

AA1K 2,729,022- 2026-449- C
K3WW 2,449,272- 1912-427- C
N3AD 1,939,677- 1801-359- C
K3IPK 1,926,216- 1726-372- C
NM2Y 1,298,052- 1212-357- C
K3OO 1,152,228- 1204-319- C
K3SA 914,400- 1016-300- C
NN3Q 881,310- 1013-290- C
AA3B 738,360- 879-280- C
K3UA 648,212- 686-314- C
W3USS (K9OQL,op)
558,450- 730-255- C
N3II 488,613- 601-271- C
N3NA 464,640- 704-220- C
K3ND 447,990- 545-274- C
W3AZ 429,483- 599-239- C
K3NZ 378,882- 651-194- C
N6CQ/3 344,745- 489-235- C
KD3CN 304,209- 593-171- C
AD8J 286,578- 522-183- C
W3KV 231,684- 449-172- C
N3GB 156,738- 346-151- C
K3YGU 145,350- 285-170- C
NM3W 112,608- 276-136- B
K2DOX/3 101,022- 226-149- C
KQ3F 98,298- 381- 86- C
W3MA 81,192- 199-136- C
NI3P 54,912- 176-104- C
KW3Z 44,820- 180- 83- C
W3GBG 13,377- 91- 49- B
W3QN 7,770- 70- 37- C

4

W3YY 670,752- 822-272- C
KB4GID 629,433- 721-291- C
KF4CI 265,227- 419-211- C
K4FPF 203,904- 384-177- B
N4GVF 146,853- 333-147- C
AA4GA 60,204- 173-116- B

5

N5GM 708,624- 1036-228- C
K5EWJ 204,711- 377-181- C

6

WZ6Z 776,172- 911-284- C
AA6PG 607,200- 920-220- C
W6ISQ 510,936- 698-244- C
W6BIP 407,391- 593-229- C
WA7G 292,800- 488-200- C
K6MA 267,000- 445-200- C
N6IP 141,480- 360-131- C
K6XT 109,494- 462- 79- C
K6FO 99,360- 288-115- B
W6GO 79,344- 228-116- C
AI6L 74,802- 182-137- C
WX6M 61,803- 189-109- C
W6OAT 55,188- 146-126- C
WA6LLY/6 49,608- 159-104- C
W6JD 49,104- 176- 93- C
N3AHA 45,696- 224- 68- C
WW6I 37,440- 156- 80- C
WG6P 31,347- 129- 81- C
KE6WL 17,253- 81- 71- C
KG6MY 11,859- 67- 59- C
KJ6LD 7,728- 56- 46- C
NT6G 6,824- 46- 46- C
W6MZQ 6,336- 64- 33- B

7

N7NG 1,010,259- 1207-279- C
KI3V/7 805,434- 1057-254- C
W7TS 606,777- 787-257- C
KC7V 402,210- 615-218- C
NC7K 268,785- 543-165- B
N7KZN 167,475- 385-145- B
NX7K 90,252- 436- 69- C

8

K8MR 906,444- 981-308- C
NG8D 452,979- 763-211- C
K8CX 361,692- 612-197- C
N8BC 188,502- 353-178- C
KQ8M 96,222- 203-158- B
KN8S 39,744- 144- 92- C
AF8C 960- 20- 16- B

9

W9XT 110,523- 277-133- C
KD9HT 5,796- 46- 42- B

Ø

NCØO 228,570- 401-190- C
WB8ZRL/Ø 24,102- 103- 78- C

Multioperator

Single Transmitter

1

K1VR (+AD1C)
2,508,921- 2161-387- C
NC1B (+KA1XN, DL7AEY)
1,207,140- 1180-341- C
W1GIH (+NK1Z)
773,163- 951-271- C
W1AF (KA1s SSQ,UTJ,UZF,KC1s SW,SY,N1HHN,NZ1W,WC1F,KA2MUE, W2KOY,K3UOC,WH8CGK,WA7WFZ, KCØVX,ops) 670,140- 765-292- C
K1ULI (+NO1N,WA1UXA,K2TE,K3QIO)
341,439- 497-229- C
K1NAN (KA1USJ,NX1T,WA1C,KA3UZN, KB7ECP,NF7R,ops)
312,375- 595-175- C

2

K2WI (+N2NU,WA2IUO)
2,020,545- 1663-405- C
W2HPF (+KA2RDO,KM2P,WA2EKW, K5GN) 1,898,235- 1635-387- C
N2MM (+KC3EG,NU3Y)
1,418,958- 1383-342- C
WI2N (+KB2EMB,WI2E)
454,650- 866-175- C
W2UI (+ops) 310,896- 508-204- C
K2JPM (+WB2LRU)
58,212- 198- 98- B

3

W3BGN (+K2TW)
2,695,899- 2047-439- C
K2SG (+WA2SRQ,WB2K)
1,710,456- 1672-341- C
W3GG (+K3YGU,KD3JH)
1,441,836- 1452-331- C
N3BNA (+KE2PF)
1,421,784- 1302-354- C
KE3Q (+ops) 1,227,744- 1176-348- C
NA3K (+K3IE)
792,084- 886-298- C
K3DI (+NG1W,KB3HH,NV3V)
683,046- 819-278- C
KB3MM (+N3ARK)
610,974- 746-273- C
K3ANS (+AJ3H,K3YD,NU3C)
565,785- 635-297- C
WB3HAZ (+WB3s FIZ,KAM,LFZ)
517,482- 666-259- C
K3BSY (+K3RN)
249,504- 452-184- C
K3CR (KA3RRF,KD3NN,KV3H,N3s DLJ, HPH,NT3O,AA4OO,WA7WAI,ops)
195,936- 416-157- C
N3RW (+N3HW)
117,360- 326-120- C

4

K4FW (+W9VW)
366,238- 591-206- C
W4AQL (N4CXF,WD4DWN,KØDI,ops)
135,360- 320-141- C

5

KA5W (+KS1G)
1,507,968- 1428-352- C
N5EA (+W5s ASP, PWG, VAH, VWN)
871,845- 1105-263- C

6

N6ND (+KC6CNV,KK6BB,W6TMD)
1,583,400- 1624-325- C
KG6GF (+AA6Z,WA6HAT,WC6I)
1,123,590- 1118-335- C
N6AA (+AA6CR,N6ZZ)
1,060,740- 1245-284- C
N6SUZ (+N6TIB,W6REC)
750,546- 1017-246- C
WA6IET (+N6NMH,W2KVA)
324,690- 685-158- C

8

W8FN (+NZ4K,KU8E,N9AG)
1,491,855- 1355-367- C
W8EDU (AF8A,N8ARD,ops)
196,836- 349-188- C

9

K9FN (+N9NC)
132,606- 318-139- C
K9MDO (+KA9HDN)
35,991- 129- 93- C

Ø

K8NN (+K9AY,NØCOP)
923,928- 1096-281- C
KCØD (+K9PQG,KDØY)
656,121- 851-257- C
WØNA (WØs AR,CW,CY,GI,ops)
309,600- 516-200- C
KFØAD (+KBØCRG)
115,374- 287-134- B

VE

VE2CLM (VE2s FFE,XE,ops)
2,538- 47- 18- C

Two Transmitter

N3RS (+N2AA,K3ZA,N3RD)
4,763,913- 3157-503- C
NQ4I (+K4BAI,KB4HZ,WI4R)
2,468,400- 2057-400- C
N2IC/Ø (+N5OP,K6s KR,UK,NQØI)
2,105,112- 1912-367- C
WD8LLD (+NF8R,WD8AUB)
1,506,270- 1357-370- C
KS9B (+K9LJN,NA9J,WE9S)
1,175,082- 1297-302- C
K6VI (+W6CCP)
919,632- 1127-272- C
K6ZM (+K4UVT,NP4IW,AK6T,WR6R)
318,515- 595-179- C

Unlimited

W3LPL (+K1DQV,K3RA,KC3EK,KF3P, KT3Y,W3EKT,WB3s ISB,JRU,NW5E,N8II, WA8MAZ) 6,975,414- 4197-554- C
K1ST (+K1s DG,FWE,MNS,RX,XM, NB1H,NX1s G,H,W1IHN,NI8L)
5,781,888- 3824-504- C
K5NA (+KA2YMJ,KU2Q,N2s EK,JHJ, NA2N,NG2X,W2JU,WB2Q,K5MA)
5,238,870- 3458-505- C
KY1H (+KA1CI,KB1W,KR1R,N1FJ,NJ1F, NK1I,NS1M,N2MG,NQ2D,NT2X)
5,030,928- 3472-483- C
W3GM (+AB2E,KQ2M,N2EA,K3ND, KA3PIT,N3ATQ,W3FV)
4,577,580- 3114-490- C
N6RO (+K3EST,K6TMB,N6IG,NB6G,W6s RGG,SZN,WA6VEF)
4,516,740- 3273-480- C
AD6C (+AE6E,N6s DX,IC,WK6V,WA7ZTN)
2,446,422- 2222-367- C
KI1U (+NS1I,KD2SX)
1,985,940- 1770-374- C
WØAIH/9 (+KA9FOX,NB9C,KØFVF, NØBSH,WØUC)
1,980,810- 1693-390- C
WB2P (+WM2H)
1,812,460- 1405-430- C
N3LR (+N3s FOB,GOB,NW3s B,Z)
1,148,442- 1382-277- C
KS3F (+K3WGR,NE3F)
1,117,800- 1080-345- C
KT2D (+WB2s R,YOF,NM3W)
1,075,080- 1054-340- C
NF2L (+KY2T)
937,365- 1045-299- C

DX CW

Africa

Botswana

A22AA 68,493- 269- 79- C

Morocco

CN8FC (WA4UAZ,op)
1,691,550- 2508-225- B

Madeira Islands

CT3CU 311,751- 737-141- B

Canary Islands

EA8AB 1,306,107- 1837-237- B
EA8IR 225,141- 497-151- B

Liberia

EL2CX (K3RV,op)
2,357,532- 3156-249- C

Ivory Coast

TU2UI 17,523- 99- 59- C

Burkina Faso

XT2BW 26,086- 151- 62- B

Ascension Island

ZD8Z (N6TJ,op)
4,027,452- 4694-286- B

South Africa

ZS6BCR 8,343- 103- 27- B -80

Tanzania

5H3TW (K3TW,op)
1,511,136- 2376-212- C

Zambia

9J2AL 97,020- 660- 49- C -10

Asia

Saudi Arabia

HZ1HZ 678,720- 1414-160- C

Japan

JA7FWR 994,770- 1579-210- C
JA8RWU 974,610- 1470-221- C
JA1NUT 810,852- 1379-198- C
JH4NMT 804,465- 995-169- C
JH7WKQ 422,304- 848-168- C
JA9CWJ 282,240- 735-128- C
JR3BOT 207,984- 619-112- C
JA1BNW 131,385- 461- 95- B
JA8RPU 98,325- 345- 95- A
JA1AIU 57,960- 280- 69- B
JH7AJD/1 57,084- 284- 67- B
JE0UXR 55,800- 300- 62- B
JA7ASD 50,388- 221- 76- B
JR1DTN 49,887- 241- 69- B
JP1PXB 45,384- 248- 61- A
JR4GPA 38,340- 284- 45- A
JA2KKA 35,100- 225- 52- B
JA8AJE 35,037- 229- 51- B
JA1OLT 33,384- 214- 52- B
JA1RKI 30,744- 168- 61- B
JH3JYS 28,778- 181- 53- C
JA2OJ 26,380- 172- 55- B
JA5IP 27,234- 178- 51- C
JA3UWB 26,250- 175- 60- B
JI1HHX/2 25,296- 136- 62- B
JG1BPS 17,145- 127- 45- B
JA6BWH 13,875- 125- 37- B
JS1OSP/1 11,745- 135- 29- B
JG2LGM 11,172- 133- 28- A
JA1BDI 9,630- 107- 30- B
JA6HJP 7,569- 87- 29- B
JA2FNY/1 6,660- 74- 30- B
JO1OZI 5,130- 57- 30- B
JA1WYQ 4,416- 64- 23- B
JA9BM 4,350- 50- 29- B
JA3VOV/1 3,192- 56- 19- B
JR1GMJ 2,592- 54- 16- B
JR1TLA 2,538- 47- 18- B
JA2OVP 2,331- 37- 21- C
JG3EHD 1,980- 44- 15- B
JH1PXY 1,224- 34- 12- B
JA8HBU 1,134- 27- 14- B
JA3YKC 36,972- 474- 26- C -80
JE7RJS 10,260- 114- 30- C -80
JA8KSD 10,008- 139- 24- C -80
JRØXOJ 4,017- 103- 13- B -80
JJ1NNJ 378- 21- 6- B -80
JE7JDL 44,968- 326- 46- B -40
JAØUMV 44,160- 320- 46- B -40
JA1YAD (JH9AMJ,op)
29,610- 210- 47- C -40
JA1JKG 20,412- 189- 36- C -40
JHØSPE 2,280- 40- 19- B -40
JAØGZ 378- 18- 7- B -40
JH9CAJ 120- 8- 5- B -40
JF2LTH 45- 5- 3- B -40
JA4DUD 45- 5- 3- B -40
JA1YFG 149,292- 658- 58- B -20
JF1PUW 111,132- 686- 54- C -20
JA7FTR 98,748- 633- 52- C -20
JA2EJI 37,398- 271- 46- C -20
JA2DN 23,040- 192- 40- B -20
JA8NFO 100,806- 834- 53- C -15
JP1NWZ 84,815- 555- 51- B -15
JA3YBF (JA4-37631,op)
67,787- 481- 49- C -15
JH2BCN 41,715- 309- 45- C -15
JR5FHC 30,090- 295- 34- B -15
JF3BFS 25,920- 288- 30- B -15
JA7SUR 6,552- 156- 14- B -15
JA4ETH 4,560- 95- 16- B -15
JAØBJY 2,310- 70- 11- A -15
JR7MZC/1 1,377- 51- 9- B -15
JA9XBW 672- 32- 7- B -15
JH1BUB 504- 24- 7- B -15
JM1XTB 414- 23- 6- A -15
JH6NBW/6 21- 7- 1- A -15
JK1REJ 18- 3- 2- B -15
JR7HOD 12- 2- 2- A -15
JHØKHR 109,089- 713- 51- B -10
JM1LRQ 90,636- 581- 52- B -10
JH9VSF 72,720- 505- 48- B 10
JR3NZC 69,264- 481- 48- B -10
JA1KFX 62,832- 476- 44- B -10
JL1EUP 52,920- 420- 42- B -10
JH6WHN 50,652- 402- 42- B -10
JE8BKW 35,640- 297- 40- B -10
JJ1GQH 22,533- 203- 37- B -10
JA2DHL 18,624- 194- 32- B -10
JG3KIV 17,091- 211- 27- B -10
JN1VOC 16,531- 187- 31- B -10
JH4XKW 11,820- 197- 20- B -10
JR2NTC 11,571- 203- 19- B -10
JH7CJM 8,364- 164- 17- B -10
JA1OP 7,866- 138- 19- B -10
JA8RJE 5,586- 98- 19- A -10
JA5CDL 4,896- 136- 12- B -10
JR7CDL 4,686- 71- 22- B -10
JA1SJV 4,545- 101- 15- B -10
JR2IGV 768- 32- 8- B -10
JA1BUI 525- 25- 7- B -10
JG1RDV 288- 18- 6- B -10
JA6QDU 36- 6- 2- B -10

Jordan

JY9SR 73,602- 261- 94- B
JY9MO (W2IMO,op)
24,048- 167- 48- C

Asiatic RSFSR

UA9MEK 8,610- 82- 35- A
UW8CM 8,211- 119- 23- C
UW8UQ 6,336- 66- 32- C
UA9QBR 88,740- 493- 60- C -20
UA9SAU 84,000- 500- 56- C -20
RA9AAV 63,189- 413- 51- B -20
RA9OC 49,245- 335- 49- B -20
RVØAL 20,160- 160- 42- C -20
UA9MFW 2,052- 36- 19- B -20
UW9SR 2,052- 36- 19- C -20
4K4OQ 1,479- 29- 17- B -20
UZ9XWV/A (UA9-090-1053,op)
252- 12- 7- B -20
UA9XCA 72- 6- 3- B -20
UA8ZCJ 23,870- 263- 30- C -15

Azerbaijan

UD6DKW 15,120- 120- 42- B

Georgia

UF6FAL 3,306- 58- 19- B -40
UF6CX 924- 22- 14- B -20

Uzbekistan

UI9ACP 6,138- 66- 31- B
UI9ACQ 4,071- 59- 23- B

Tadzhikistan

UJ8KA 6,132- 73- 28- B -20
UJ8JA 8,256- 86- 32- C -15

Kazakhstan

UL8LWF 30,744- 244- 42- C -20

Kirghizia

UM0MO 145,209- 499- 97- C
UM8MAA 119,784- 434- 92- C

Hong Kong

VS6WO (NA9D,op)
71,565- 367- 65- C

India

AT8U (AA4U,op)
34,680- 170- 68- C
VU2TMM (W2FG,op)
4,500- 50- 30- C

Vietnam

3W3RR 122,016- 496- 82- C

Israel

4X1IF 61,320- 280- 73- A

Europe

Portugal

CT1AOZ 27,756- 250- 37- B-160
CT4DX 44,484- 337- 44- C -40

Federal Republic of Germany

DFØAT (DL4YAO,op)
443,745- 855-173- C
DL1SBR 351,390- 689-170- C
DKØSA (DJ1YJ,op)
285,768- 588-162- C
DL1JF 282,864- 664-142- C
DK3GI 185,088- 482-128- C
DL4FJ 179,214- 502-119- B
DK7ZT 158,800- 400-133- C
DL4MCF 145,590- 422-116- B
DL1TH 122,706- 401-102- B
DF4PD 74,448- 528- 47- B
DL1ZQ 62,331- 263- 79- B
DJ3XK 59,013- 249- 79- A
DL6SF 29,568- 154- 64- A
DL4GBR 28,080- 158- 60- A
DL1HCM 23,895- 177- 45- B
DK8AX 23,808- 128- 62- B
DK7FP 19,200- 128- 50- B
DA1SQ 18,921- 119- 53- B
DA1OW 16,029- 137- 39- B
DF3QN 13,287- 103- 43- B
DL1SBF 2,700- 36- 25- C
DJ6NS/P 4,290- 65- 22- C -80
DF5XN 1,209- 31- 13- B -80
DF2WV 70,932- 514- 46- C -40
DK3LM 1,116- 31- 12- B -40
DJ2YE 975- 25- 13- B -40
DL1HBT 149,640- 850- 58- C -20
DL4RX 50,100- 334- 50- C -20
DJ5GG 12,810- 122- 35- B -20
DL3HAH 144,045- 873- 55- C -15
DLØIU (DL4AAE,op)
130,086- 803- 54- C -15
DL4UL 73,800- 492- 50- C -15
DL5VS 69,768- 456- 51- C -15
DK8FD 52,380- 388- 45- C -15
DL2SDQ 19,380- 170- 38- B -15
DL1OO 15,960- 152- 35- B -15
DL5JQ 10,602- 114- 31- C -15

Spain

EA5YU 1,023,000- 1550-220- C
EA7GTF *896,994- 1582-189- B*
EA7AAW 261,072- 592-147- B
EA4DUL 177,132- 509-116- B
EA7FUR 67,599- 259- 87- C
EA3DBO 54,180- 210- 86- B
EA1GT 45,900- 204- 75- A
EA3FNT 44,019- 219- 67- B
EA3DWX 31,284- 156- 66- B
EA1CYL 4,500- 60- 25- A
EA4KR 109,956- 748- 49- C -40
EA1AK 48,048- 364- 44- B -40
EA5TX 1,998- 37- 18- B -40
EA2CR 1,125- 25- 15- B -40
EA3DCM 5,544- 64- 22- B -20
EA2IA 104,004- 642- 54- C -15
EC7DMU 21,888- 192- 38- B -15
EA3KT 3,135- 55- 19- B -15

Balearic Islands

EA6GP 28,275- 145- 65- B
EA6ZS 2,451- 43- 19- B -15

Ireland

EI9FK 322,206- 647-166- B
EI3DP 103,626- 342-101- A
EI5DI *38,520-* 321- 40- B -10

France

F2CW 1,852,422- 2431-254- C
F6BEE 1,531,152- 2058-248- C
TM6A (F6AUS,op)
1,153,614- 1694-227- C
F6CEL 621,708- 1006-206- C
F6EQV 35,259- 161- 73- B
F1JDG 34,155- 207- 65- B
F6GKQ 32,391- 177- 61- B
F9BB 28,356- 139- 68- B
F8TM 8,307- 71- 39- B
F8CNI 13,224- 116- 38- C-160
F6EPO 27,405- 261- 35- B -80
F6EPO 40,278- 274- 49- C -20
F8TQ 459- 17- 9- B -20
FD1NLX 180- 12- 5- B -20
FE1JNA 14,070- 134- 35- B -15

England

G3MXJ 1,175,499- 1773-221- C
G2QT 349,530- 610-191- B
G3NKS 200,430- 510-131- B
G3ESF 180,810- 490-123- B
GØMFO 151,632- 486-104- B
G3DFV 79,110- 293- 90- B
G4ZME 23,256- 152- 51- B
G6NK 19,296- 134- 48- B
GØIDE 2,832- 59- 16- B -40
G4OTY 2,610- 58- 15- B -40
G3FXB 184,338- 1078- 57- B -15
G4BKI 33,024- 256- 43- B -15
G4BUO 93,639- 637- 49- B -10
G3SXW 78,678- 558- 47- C -10

Scotland

GM3ZAS 43,416- 216- 67- B
GM4HQF 8,262- 81- 34- A
GM4OBK 264- 11- 8- B-160

Guernsey and Dependents

GU4ARI 68,667- 487- 47- B -10

Wales

GW3JI 183,138- 466-131- B

Hungary

HA1XR 1,407,375- 2085-225- C
HA5AWH 464,688- 922-168- B
HA6NW 130,728- 419-104- B
HA8XX 35,100- 195- 60- B
HA7JB 15,222- 118- 43- B
HA9PB 1,980- 30- 22- B
HA4XR 19,866- 154- 43- B -20
HA8DT 11,904- 124- 32- B -20
HA6LM 107,415- 681- 55- C -15
HA3RD 75,411- 513- 49- B -15
HA3GJ 8,730- 97- 30- B -15
HA3FL 8,343- 103- 27- B -15
HA3GQ 4,524- 58- 26- B -15
HA3KY 3,591- 57- 21- B -15
HA3LD 432- 16- 9- B -15
HAØNAR 57,684- 437- 44- C -10
HA3GI 3,321- 41- 27- B -10

Switzerland

HB9ADD 937,050- 749-150- A
HB9AGH 73,644- 323- 76- B
HB9DX 46,389- 329- 47- C -15

Italy

I2SVA 504,525- 961-175- B
IKØNWE 264,960- 640-138- B
IK2AHB 199,962- 529-126- B
IØZUT 160,428- 461-116- B
IØKHP 63,336- 232- 91- A
I4XQG 49,896- 216- 77- B
I8QOO 29,801- 143- 69- B
I1OLM 5,040- 60- 28- B
I3VHO 6,552- 91- 24- C-160
I2UIY 52,890- 410- 43- C -80
I5MPN 49,068- 348- 47- C -40
IA8A (IK8DOI,op)
174,735- 1059- 55- C -20
IKØADY 1,056- 32- 11- B -20
IK4DCS 33,417- 237- 47- C -15
IK4JQQ 18,585- 177- 35- C -15
IO4IKW 87,906- 637- 46- C -10
IO3VJW 63,600- 424- 50- C -10

Sardinia

ISØOMH 96,768- 336- 96- B

Norway

LA1T (LA9UX,op)
306,306- 663-154- C
LA6FC 92,100- 307-100- C
LAØCX 48,108- 211- 76- C
LA7MFA 7,326- 66- 37- C
LA4YW 4,650- 50- 31- B
LA6PB 3,240- 54- 20- B
LA9HFA 8,910- 98- 30- C -40
LA9DFA 2,214- 41- 18- B -20
LA9HW 15,435- 147- 35- B -10

Bulgaria

LZ1KNP 46,209- 211- 73- C
LZ1RN 41,280- 172- 80- C
LZ2TU 10,140- 130- 26- C -80
LZ6C (LZ2TF,op)
47,355- 385- 41- C -40
LZ1NJ 1,035- 23- 15- B -40
LZ5W (LZ1BP,op)
133,896- 797- 56- C -15
LZ1KKR 8,400- 100- 28- B -15
LZ1EP 5,427- 67- 27- C -15
LZ3YY 4,422- 67- 22- A -15

Austria

OE2XEL (OE2VEL,op)
295,089- 589-167- C
OE6IMD 165,648- 464-119- B
OE3JOS 120,213- 361-111- C

Finland

OH6YF 752,184- 1348-186- C
OH2PM 620,256- 1136-182- C
OH3JF 62,716- 244-113- B
OH3NM 47,040- 198- 80- C
OH8BQT 40,602- 202- 67- B
OH7NW 8,364- 68- 41- B
OH5AD 6,771- 61- 37- C
OH3TR (OH8LI,op)
152,772- 878- 58- C -20
OH1AA (OH1SY,op)
122,949- 719- 57- C -20
OH2BAH 5,133- 59- 29- C -20
OH8NYO 264- 11- 8- B -20
OH6NIO 56,448- 384- 49- C -15
OH1HD 36,666- 291- 42- C -10
OH2BCI 20,706- 203- 34- C -10
OH1MDR 2,310- 55- 14- B -10

Czechoslovakia

OK1OAZ (OK1FUA,op)
1,235,334- 1814-227- C
OK2PDT 189,378- 501-126- B
OK2BDI 159,029- 383-121- B
OK2PO 131,625- 375-117- B
OK3PQ 126,360- 405-104- B
OK2HI 121,410- 355-114- B
OK2BGR 117,218- 352-111- B
OK1KZ 85,272- 329- 88- B
OK2BVG 81,450- 181-150- B
OK1KT 76,176- 276- 92- B
OK3BA 68,388- 278- 82- B
OK3CEL 68,256- 288- 79- B
OK1GS 63,666- 262- 81- B
OK3FON 59,784- 212- 94- B
OK2ABU 57,768- 232- 83- C
OK1ONA 52,500- 250- 70- B
OK1OFM 51,516- 212- 81- B
OK3CUG 50,358- 218- 77- A
OK1DMS 47,376- 188- 84- B
OK1MNV 33,264- 168- 66- C
OK2KJU 22,101- 139- 53- B
OK3KFO (OK1PC,op)
20,700- 138- 50- C
OK1MKI 14,157- 121- 39- B
OK1JDJ 12,960- 103- 40- B
OK2ZU 11,475- 85- 45- B
OK1DKR 10,413- 89- 39- A
OK3KXR 9,828- 79- 42- B
OK2BHQ 6,786- 78- 29- C
OK1HR 5,301- 57- 31- A
OK2PAW 4,092- 62- 22- A
OK2BBQ 3,078- 54- 19- B
OK1FGS 2,574- 39- 22- B
OK3CWF 1,035- 23- 15- B
OK1DZD 450- 15- 10- A
OK5TOP 9,900- 132- 25- C-160
OK1JDX 1,053- 27- 13- C-160
OK2BQU 858- 22- 13- B-160
OL8CVU 459- 17- 9- B-160
OK1DWJ 450- 15- 10- B-160
OK3CBU 63,855- 473- 45- C -80
OK2FD 19,320- 184- 35- C -80
OK3TDO 7,128- 98- 24- C -80
OK1DOP 120- 8- 5- B -80
OK3CQR 105,264- 688- 51- C -40
OK3KAG (OK3WDX,op)
83,202- 566- 49- C -40
OK3CDZ 16,170- 154- 35- B -20
OK1FPQ 10,368- 108- 32- B -20
OK1DZJ 4,650- 62- 25- B -20
OK3CXS 3,168- 66- 16- B -20
OK3CVI 1,728- 36- 16- B -20
OK3CAB 1,440- 32- 15- B -20
OK1FTX 273- 13- 7- B -20
OK2SWD 12,000- 125- 32- B -15
OK1JJF 5,976- 83- 24- A -15
OK1JST 5,100- 68- 25- B -15
OK2VX 4,688- 71- 22- B -15
OK3TCF 1,332- 37- 12- B -15
OK1OPT (OK1DOL,op)
1,170- 30- 13- B -15
OK2PAY 41,151- 319- 43- B -10
OK3CCC 10,508- 113- 31- B -10
OK2PBG 3,300- 50- 22- A -10

Belgium

ON4KFM 14,766- 107- 46- B
ON5MT 3,312- 48- 23- B
ON5EU 2,772- 44- 21- B
ON4XG 44,748- 339- 44- B -15

Denmark

OZ1LO 912,870- 1470-207- C
OZ1FGS 124,146- 383-114- C
OZ4UN 120,744- 387-104- C
OZ3PE 35,154- 189- 62- A
OZ5UR 7,452- 54- 46- B
OZ1FFG 546- 14- 13- B
OZ6PI 897- 23- 13- B -40
OZ7YL 5,913- 73- 27- C -20
OZ2E 3,885- 37- 35- B -20
OZ7GF 1,200- 25- 16- B -20
OZ1KWG 5,328- 74- 24- B -15
OZ1IOC 52,890- 410- 43- C -10
OZ8AE 13,392- 124- 36- B -10

Netherlands

PAØERA 87,756- 284-103- C
PAØCF 47,163- 199- 79- B
PA2CHM 42,021- 203- 69- B
PA3ELD 37,758- 217- 58- A
PAØDXK 31,635- 185- 57- B
PAØLOU 29,700- 150- 66- C
PA6JPA 28,161- 149- 63- B
PA3ACC 20,976- 132- 48- B
PAØKHM 13,572- 97- 52- B
PA3BTH 11,817- 101- 39- B
PA3BZC 9,702- 98- 33- B
PA3BNT 8,880- 74- 40- B
PA2REH 66,564- 412- 49- B -15
PA2JCG 16,877- 109- 51- B -10
PA3EZL 13,950- 150- 31- B -10
PAØADT 6,336- 96- 22- A -10
PAØYN 1,680- 40- 14- B -10

Sweden

SM5IMO 126,060- 382-110- C
SKØLM (SMØDRD,op)
66,528- 264- 84- C
SMØBDS 55,632- 244- 76- B
SM3CER 50,547- 203- 83- C
SM5DAC 31,968- 144- 74- C
SM5RE 24,882- 143- 58- B
SM6BSK 24,021- 157- 51- A
SM1CNS 19,470- 110- 59- A
SM5CLE 17,787- 121- 49- A
SK3AH (SM3COL,op)
13,482- 107- 42- C
SM6HVR 10,962- 126- 29- B
SM4BW 2,775- 37- 25- B
SM7LAZ 1,275- 25- 17- B
SM4KL 243- 9- 9- A
SM6CPY 10,800- 175- 32- C -80
SM3CVM 5,658- 82- 23- B -20
SM7TV 5,256- 73- 24- B -20

Poland

SP5TT 65,688- 238- 92- C
SP3BYZ 43,874- 251- 58- C
SP3HC 27,531- 181- 57- B
SP1AEN 12,835- 117- 36- B
SP3HLM 59,985- 485- 43- C -80
SP9DGO 105- 7- 5- C -80
SP4GFG 13,098- 118- 37- B -20
SP6CPF 11,220- 110- 34- B -20
SP8BAB 10,098- 102- 33- B -20
SP2JGK 7,812- 93- 28- C -20
SP2FAP 3,240- 54- 20- B -20
SP5GIQ/7 70,500- 470- 50- C -15
SP3RBI 16,524- 162- 34- B -15

Greece

SV1RP/SV2 48,845- 347- 45- B -20

Franz Josef Land

4K2BDU 84,975- 515- 55- B -20
4K2OT 65,520- 420- 52- C -15

Kaliningrad

UA2EC 6,842- 82- 27- B -40

European Russian RSFSR

UA1DZ 382,635- 773-185- B
UA6LTI 203,091- 508-133- B
UA3GM 98,100- 327-100- C
RA3DX 81,504- 283- 88- C
UZ1AWO (UA1-169-900,op)
53,874- 219- 82- B
UZ1AWJ (UA1-169-848,op)
45,675- 203- 75- B
UA1AAU 39,150- 174- 75- B
UW6MA 28,215- 171- 55- B
UA6LLT 24,624- 152- 54- C
UV3DRU 20,412- 108- 63- B
UA3RLZ *15,848-* 139- 38- B
UZ4AXO 12,768- 112- 38- C
RA4AI 7,812- 62- 42- C
RW3DC 5,880- 56- 35- B
UA3DPX 3,528- 42- 28- C
UA4ANZ 2,730- 35- 26- C
RV6AGG 3,519- 69- 17- B -80
RA6LW 792- 24- 11- C -80
UZ6LWB (UA6-150-1443,op)
540- 18- 10- C -80
UZ6LZL (UA6-150-820,op)
48,600- 360- 45- B -40
RW6AC 16,830- 170- 33- C -40
UA6BJQ 4,740- 79- 20- B -40
UV3DFL 1,488- 31- 16- B -40
RA6HF 294- 14- 7- C -40
UA6HRZ 62,205- 377- 55- C -20
UA1AJA 12,987- 111- 39- B -20
UA3LAR 12,321- 111- 37- C -20
UA1CE 6,100- 90- 30- C -20
UA3RNI 432- 12- 12- B -20
UA3YAO 1,470- 35- 14- C -10
RA6LA 780- 20- 13- C -10

Ukraine

UT4UZ 171,648- 447-128- C
UB4JFV 132,042- 373-118- B
UB5PAG 115,020- 355-108- B
RBØGG 90,300- 301-100- B
UY5TE 34,155- 207- 55- C
UB4JFN 26,208- 156- 56- B
RB5VL 2,967- 43- 23- B
RB5QW 1,530- 30- 17- C
R1SUO 2,394- 42- 19- C -80
UB7VA 31,920- 266- 40- C -40

UB5IFN 18,690- 178- 35- C -40
UB5ZBG 6,486- 94- 23- C -40
UI5RW 3,591- 53- 19- B -40
UT5UGR 61,422- 353- 58- B -20
UB4AR 1,887- 37- 17- B -20
UB5IJG 35,466- 257- 46- C -15
UB5LCV 10,560- 110- 32- C -15
RB5VW 6,316- 81- 26- B -15
UB5VNF 4,914- 76- 21- B -15
UB5IFC 4,554- 69- 22- B -15
UB2VA 38,499- 313- 41- C -10

Byelorussia

UC2LB 798- 19- 14- C -80
UC2WJ 360- 15- 8- B -80
UC2ADX 40,770- 302- 45- C -40
UC2AB 8,856- 123- 24- B -10

Moldavia

RC4OA 510,300- 945-180- C
UO5ON 92,910- 326- 95- B
UO5OJM 576- 24- 8- B -20
UO5OLC 2,064- 43- 16- B -15

Lithuania

LY3BP 906,003- 1533-197- C
LY2BO 21,033- 123- 57- C
LY2BLF 30,492- 231- 44- B -20
LY2BB 6,636- 79- 28- B -20

Latvia

YL1WW (UQ2-038-83,op)
1,161,378- 1809-214- C
UQ2GKL 1,011,003- 1553-217- C
YL2LW 3,675- 49- 25- C -20
YL2EC 27- 3- 3- B -20
UQ2GN 12,192- 127- 32- B -15
YL2PP 1,680- 40- 14- B -15

Estonia

UR2RER 238,944- 608-131- C
ES5MC 129,960- 380-114- B
ES5RY 4,032- 48- 28- B -20

German Democratic Republic

Y32WF 135,774- 397-114- C
Y49RF 87,840- 305- 96- B
Y54TO 67,032- 266- 84- B
Y55TJ 43,512- 196- 74- C
Y31EM 43,200- 200- 72- B
Y22HF 34,272- 168- 68- B
Y37ZM 32,040- 178- 60- B
Y62SD/P 19,881- 141- 47- B
Y61ZM 17,010- 135- 42- B
Y26DM 16,632- 128- 44- B
Y25NA 16,141- 103- 49- A
Y21XC 5,655- 65- 29- A
Y77YH 5,643- 57- 33- B
Y56ZA 4,028- 61- 22- C
Y51ZE/P 3,864- 56- 23- B
Y67UL 3,822- 49- 26- B
Y23HJ 2,280- 40- 19- B
Y92ZL 1,350- 25- 18- B
Y33UL 1,404- 36- 13- B-160
Y43GO 12,717- 157- 27- C -80
Y42MK 160,875- 975- 55- C -40
Y21KF/A 18,600- 155- 40- B -20
Y23CM 13,260- 130- 34- B -20
Y32NL 7,209- 89- 27- B -20
Y51YJ 4,554- 69- 22- B -20
Y22WF 4,260- 71- 20- B -20
Y42WB 1,734- 34- 17- B -20
Y44QN 14,454- 146- 33- B -15
Y63QM 4,464- 62- 24- B -15
Y23TL 2,106- 39- 18- A -15
Y23KF 1,440- 30- 16- B -15

Romania

YO8KOS 67,479- 271- 83- B
YO3BWK 4,320- 72- 20- C -40
YO9HP 5,670- 70- 27- C -20
YO4ATW 576- 16- 12- B -15

Yugoslavia

YT3AA 1,808,487- 2421-249- C
YU2TY 160,083- 441-121- A
YU6JA 93,786- 319- 98- B
YU7RU 80,127- 307- 87- B
YU5GX 72,534- 314- 77- B
YU7FT 29,295- 155- 63- C
YU1PJ 18,000- 120- 50- B
YU3TW 14,040- 120- 39- B
YU3QI 1,938- 38- 17- C
4N1A (YU1EA,op)
54,288- 377- 48- C -80
YT2D 20,088- 216- 31- C -80
4N4A (YU4EU,op)
143,856- 888- 54- C -40
YU3RO 78,819- 559- 47- C -40
YT2IO 75,504- 572- 44- C -40
4N3E (YT3NA,op)
133,728- 796- 56- C -15
4N1W (YU1SV,op)
129,528- 771- 56- C -15
YT7OO 7,020- 78- 30- B -15
YU4XA 6,336- 88- 24- B -15
YU7KM 5,589- 69- 27- C -15
YT4D 34,572- 268- 43- C -10
YU7SF 10,266- 118- 29- B -10

North America

Bahamas

C6A/K1TN 2,664,723- 3161-281- B
(@GVB/C6A 189,000- 1125- 56- B -40

Dominican Republic

HI3JH 188,000- 775- 80- B

San Andreas and Providencia

HK0/N3JT 5,231,100- 5300-329- C

Panama

HP1AC 19,530- 186- 35- C -10

St Lucia

J6LSN (KJ8G,op)
1,715,859- 2297-249- C

Alaska

AL7CQ 1,167,798- 1819-214- C
KL7RA 66,003- 449- 49- C -40
KL7Y 135,744- 808- 56- C -20
NL7GP 119,295- 723- 55- C -15
WL7E 57,312- 398- 48- C -10

Virgin Islands

N8OP/NP2 360,475- 2225- 57- C -10

Guatemala

TG@AA (OH2BH,op)
5,654,115- 5835-323- C

Antigua and Barbuda

V2/KA3PMK 63,756- 253- 84- B
V2/G6QQ 38,688- 208- 62- B

Anguilla

VP2EXX 28,842- 253- 38- B-160

British Virgin Islands

VP2V/W2GUP 695,826- 1247-186- B
VP2V/W8KIC 94,743- 363- 87- A

Turks and Caicos Islands

VP5M 1,629,090- 2361-230- B

Bermuda

W@SKI/VP9 171,000- 500-114- B

Mexico

XF1C 852,768- 1269-224- A

Oceania

Philippines

KE9A/DU3 615,330- 1290-159- C
N7ET/DU7 48,165- 247- 65- A

Guam

KG6DX 1,209,552- 1809-223- C
N7DF/NH2 11,160- 155- 24- C -80
KH2D 146,772- 908- 54- C -10

Johnston Island

AH3C 3,051,594- 3726-273- C

Hawaiian Islands

K7SS/KH6 1,394,271- 1961-237- A
AH6KE 166,530- 485-122- B
NH6T 158,592- 472-112- A
AH6JF 80,478- 263-102- C
KH6CP 23,970- 170- 47- A
KH6WT 37,083- 263- 47- C -15
AH6IM 10,914- 107- 34- B -15
KH6XT 89,046- 582- 51- B -10

Federal States of Micronesia

V63AA (KB3R,op)
25,380- 188- 45- B

Australia

VK2APK 835,752- 1436-194- B
VK4XA 77,127- 547- 47- B -10

Indonesia

YB3ASQ 177,210- 537-110- C
YB2FEA 16,920- 141- 40- B
YB2CTW 999- 37- 9- C -10

New Zealand

ZL3QQ 2,375,586- 2922-271- B

South America

Chile

OH6VR/CE3 13,675- 125- 37- B -15

Argentina

LU6UO 1,284,192- 2058-208- C
K3JXO/LU 677,652- 1516-149- C
LU1EWL 332,046- 858-129- B
L73GADX (LU2DX,op)
240,120- 696-115- B
LQ21DX (LU1CX,op)
75,366- 474- 53- B -15
LO5E (LU5EIC,op)
190,245- 1153- 55- B -10

Peru

OA4ZV 1,468,698- 2023-242- B

Brazil

PY1AJK 19,488- 116- 56- B
PY7FNE 6,195- 59- 35- A
PY2RN 170,115- 1031- 55- B -15
PU1LIA 63,495- 415- 51- B -15
PY6WT 27,930- 245- 38- B -10

Venezuela

YV4ABR 11,811- 127- 31- C
YV1OB 59,535- 405- 49- C-160
4M7A (YV7QP,op)
81,249- 511- 53- B -40
YV1ELM 7,500- 100- 25- B -10

Paraguay

ZP6XDW 32,292- 234- 46- C -10

Trinidad and Tobago

9Y4SU 28,659- 233- 41- B -15

Single Operator, Assisted

Asia

JA7YAB (JA1-36363,op)
816,672- 1448-188- C
JG1TSF 565,326- 1102-171- C
JE7WBI/1 418,572- 924-151- B

Multioperator

Single Transmitter

Asia

HL0B (+ops)
76,680- 356- 72- B

HZ1AB (N4KT,SM6CXU,ops)
203,904- 576-118- C

JA7YAA (JJ3CNL,JE7s HLZ,JZC,JE0AWL,JH0ORW,ops)
1,121,175- 1661-225- C

JA8YBY (JO1DFG,JH8s PNE,WBR,JR8DHA,ops)
991,272- 1604-205- C

JA0YAK (JS1PTU,JK2PVL,JI7OED,ops)
255,525- 676-126- C

RX0C (RW6CA,UA0s CCD,CDX,CZ,UW0s CJ,CM,CN,ops)
1,072,260- 1702-210- C

UZ0QWA (UA0s QBB,QDL,QN,ops)
570,423- 1181-161- B

R0Z (UA0s ZAS,ZAW,ZC,ops)
141,723- 543- 87- B

UZ0SXF (UA0SLT,UW0SN,ops)
97,200- 450- 72- B

UZ9YXI (+ops)
90,531- 479- 63- B

UZ9CZO (+ops)
18,774- 149- 42- C

UI9AWX (RI8s AK,AP,ops)
9,000- 75- 40- C

Europe

DL5XX (+DJ2YA,DJ8RR)
2,126,649- 2737-259- C

DF0RR (DL4EBY,DL7s AKC,ALM,APU,ON,UX,ops)
872,712- 1426-204- C

EA2CKP (+4 ops)
103,428- 338-102- B

F5IN (+F6ARC)
2,447,856- 3056-267- C

HG1S (HA1s AH,DAC,DAE,TJ,TW,ops)
2,303,769- 3109-247- C

HA5KDQ 2,167,794- 2902-249- C

HA6KNX (+ops)
6,696- 72- 31- B

HA3KHC (+ops)
3,021- 53- 19- B

HB0/DF5UL/P (DL1s GGT,GSB,DL2MEH)
1,601,100- 2372-225- C

OH1AD (OH1s BOI,MMA,WZ,ops)
851,160- 1384-205- C

OK1ALW (+OK2RZ)
1,949,670- 2610-249- C

OK3KFF (+ops)
883,176- 1502-196- C

OK1KSL (OK1s AHG,DPL,FAK,FEL,FIL,-23544,OL1s BQU,BSP,BUE,ops)
777,756- 1316-197- C

OK2KMR (OK2s BQZ,PSM,31097,ops)
260,208- 624-139- B

OK2KYC (+ops)
131,220- 405-108- B

OK3KUN (+ops)
31,104- 162- 64- B

OK1KCF (+ops)
20,580- 140- 49- B

OK2KVI (+ops)
17,700- 118- 50- B

OK3RRC (+ops)
2,907- 57- 17- B

UZ2FWA (UA2s FC,FF,FJ,FM,FZ,UL7FZ,ops)
1,365,492- 2014-226- C

UZ1AWT (UA1s ALZ,-169-823,-169-2475,ops) 824,040- 1526-180- C

UZ1TWB (RA1TE,UA1s-144-380,-144-386,ops) 241,488- 624-129- C

RZ6AXO (RA6AX,UA6AHS,ops)
190,512- 567-112- C

UZ4HWE (+ops)
170,274- 962- 58- C

UZ3AWR (UA3ABJ,UV3AEV,ops)
109,872- 436- 84- B

RW4LYL (RA4LW,UA4LY,ops)
53,463- 251- 71- C

UZ3AXH (+ops)
37,368- 173- 72- C

UZ4YWY (UA4s YGM,YGT,-097-185,-097-271,-097-273,ops)
34,161- 193- 59- C

UZ3AXX (RA3DUU,UA3s-170-79,-170-126,-170-210,ops) 21,783- 137- 53- C

UB3JWA (+ops)
202,368- 527-128- C

UB4QWW (RB5QW,UB4QW,UB5-064-866,ops) 167,760- 466-120- C

UB4PXA (+ops)
60,507- 249- 81- C

UB4TWL (RB5TN,UB5s TBS,-078-2,ops)
23,016- 137- 56- C

UT4UXW (+ops)
9,000- 75- 40- C

UC1LWN (+ops)
8,415- 85- 33- B

ES2WX (ES2s DJ,RD,RR,ops)
1,083,024- 1656-218- C

Y41CM (Y21RM,Y41s YM,ZM,ops)
1,744,155- 2373-245- C

Y71CA (Y71s IA,KA,ops)
19,431- 127- 51- B

YT7A (YU7s BJ,GO,GW,OA,ops)
1,389,825- 2175-213- C

YT3T (YT3EW,YU3s BQ,HR,ops)
1,362,768- 1958-232- C

YZ7V (YU7s AV,ECD,ops)
1,317,900- 1910-230- C

4N2D (YT2DU,YU2FK,ops)
1,068,984- 1818-196- C

4N2N (YT2JB, 13 ops)
804,420- 1308-205- C

YZ2S (+ops)
452,700- 1006-150- C

YU7AJR (2ops)
188,005- 465-119- B

North America

J34A (K4s LTA,PJ,WE5P,ops)
4,465,884- 4756-313- C

XE2UZL (NI6W,K9VV,ops)
3,849,408- 3936-326- C

XE2EBE (AA6DP,N6PE,ops)
1,906,323- 1933-277- C

ZF2KE (K9s DX,HMB,RS,ops)
5,980,590- 6041-330- C

Oceania

V73AQ (+V73AT,KX6WSI
1,873,920- 2560-244- C

ZL0AKH (W6s KG,QL,ops)
360,714- 761-158- C

South America

PJ2I (K1RM,W1s BIH,WEF)
5,241,753- 5247-333- C

Two Transmitter

Asia

JA1YDU (JH0s LFE,NZN,JJ3OLZ,JO1s BMV,RUR,JP1JFG,JR0BQD,ops)
1,579,905- 2241-235- B

JA1YXP (JG1TNX,JI1UTP,JO1JOZ,JO1UXN,JS1INN,JG2QHQ,ops)
1,034,892- 1681-204- C

JA7YCQ (JF7HYZ,JH7IMX,JI7s GSI,LZL,JA7-30336,ops)
874,350- 1450-201- C

Europe

LZ5M (LZ1s NS,PM,RU,C-80,C-77,ops)
995,220- 1710-194- C

Unlimited

Asia

JE2YRD (JE1JKL,JE7BIZ,JF2s DQJ,EOC,JH2BNL,JI2s CZL,KVW,JR7OMD,ops)
2,475,264- 3223-256- C

Europe

YT2R (YT2s FI,GW,YU2s DQ,HO,LJ,MM,MP,MY,NJ,OG,QS,ops)
3,325,608- 3876-286- C

North America

JP1OMX/HI8 (+ops)
2,931,390- 3290-297- B

W/VE Phone

1

Connecticut

K1RU 3,436,614- 2767-414- C
K1YR (K2SS,op)
2,981,664- 2436-408- C
KA1ION 1,492,608- 1352-368- C
NO1Y 535,482- 838-213- B
WE6G 466,119- 773-201- C
NS1T 234,384- 514-152- B
K1IN 190,530- 438-145- C
K1CC 149,328- 366-136- C
K1BV 60,630- 215- 94- C
K1TN 49,500- 132-125- B
N4XR 46,200- 154-100- C
NF1J 37,800- 150- 84- B
W1DO 36,300- 110-110- C
WA1LOU 21,267- 139- 51- C
W1VH 12,012- 77- 52- C
KA1OCZ 9,585- 71- 45- B
NJ1Q 7,320- 61- 40- B
KH6CP/1 330- 11- 10- A
KM1R 5,916- 58- 34- C -80
N8RA 46,920- 230- 68- C -40
KS1L 427,635- 1105-129- C -20
K2SX/1 10,500- 100- 35- B -20
KB1WH 604,992- 1472-137- C -15
KG1D 254,205- 807-105- C -10
KB1BE 18,666- 122- 51- C -10
KA1MIS (N/T) 14,112- 96- 49- B -10
WB1EPO (N/T) 13,800- 92- 50- B -10

Eastern Massachusetts

N6BV/1 3,358,080- 2640-424- C
W1GIH 1,400,424- 1357-344- C
K1CLN 463,386- 649-238- C
W1KRS 443,961- 609-243- C
N1FIO 323,800- 373-200- B
NU1C 180,492- 356-169- C
W1MK 150,720- 320-157- C
WA1IML 149,640- 344-145- C
WB2UMF 104,670- 291-120- C
W1IHN 100,800- 210-160- C
KB1RB 83,898- 237-118- B
W1FM 80,385- 233-115- B
W1AX 69,660- 215-108- B
W1FV 35,802- 153- 78- C
N1FYZ 28,272- 152- 62- B
K1ZZI 27,375- 125- 75- C
KB1GN 18,816- 98- 64- B
KB1HC 28,365- 155- 61- C -40
AB1A 289,800- 840-115- C -20
NK1F 571,356- 1614-118- C -10
N1EDM 35,046- 198- 59- B -10
KQ1V 24,660- 137- 60- B -10
AA1M 14,364- 76- 63- C -10
N1GOE 8,190- 78- 35- B -10
KA1VBR (N/T) 6,138- 62- 33- B -10
KA1PES (N/T) 588- 14- 14- B -10

Maine

KN1M 20,394- 103- 66- A
AD1G 14,352- 92- 52- C
K1JB 92,565- 363- 85- C -20

New Hampshire

W1PH 1,151,124- 1222-314- B
KE1E 119,808- 312-128- B
KC1SG 87,360- 208-140- C
NE1K 10,323- 93- 27- B -10

Rhode Island

K1MMO 595,170- 776-255- C
W1OP (K1PLX,op)
263,554- 534-177- C
K1VSJ 182,952- 396-154- B
K2MN 130,464- 302-144- B
N1EHX 20,916- 84- 83- C
W1RFQ 17,160- 88- 65- C
KA1NDY 10,944- 96- 38- A
K1NG (KB1EM,op)
419,628- 1156-121- C -10

Vermont

W3SOH 278,703- 537-173- B
WA1QGC 118,779- 289-137- B
KA1RRX 6,960- 58- 40- C -10

Western Massachusetts

K1EA 816,714- 867-314- C
K1DPB 264,480- 464-190- C
KA1XN 41,724- 183- 76- C -80

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Eastern New York

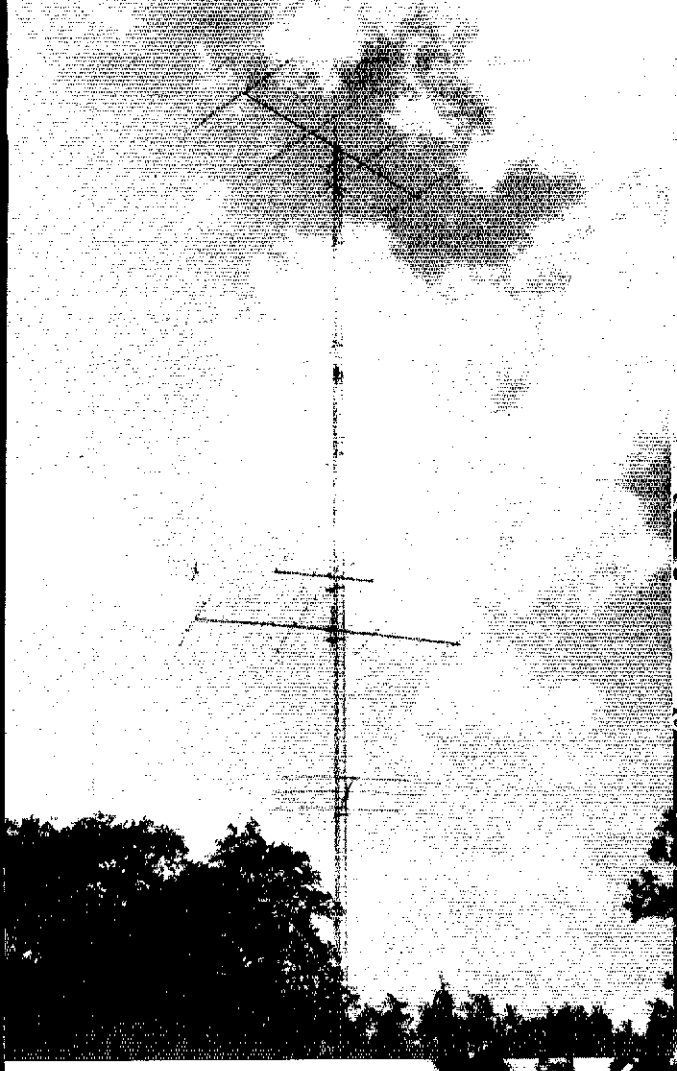
W2KHQ 171,912- 377-152- B
K2MR 140,160- 365-128- C
NW2J 83,385- 255-109- C
WB2MRX 58,302- 207- 82- B
N2AAK 45,612- 181- 84- C
N2IWT 34,611- 139- 83- B
WM2U 21,306- 106- 67- B
WT2F 13,200- 80- 55- B
K2ONP 8,424- 78- 36- C
K1ZM 5,508- 54- 34- C-160
K2XA 4,050- 50- 27- C -40
KB2EEU 20,961- 137- 51- B -15
N2AZS 338,625- 1075-105- C -10
N2JOH 14,196- 91- 52- B -10
WF2B 126- 7- 6- B -10

NYC-Long Island

KD2TT 575,985- 817-235- C
KD2LL 356,178- 574-208- C
W2MOY 236,988- 454-174- C
KD2BW 132,594- 287-154- C
K2KTT 88,425- 225-131- B
W2GKZ 52,671- 181- 97- B
N2KW 32,625- 125- 87- B
WB2D 31,752- 147- 72- C
KD2HE 28,566- 138- 69- B
N2KA 18,018- 91- 66- C
WB2AMU 1,080- 20- 18- B -40
WA2OVG 2,205- 35- 21- B -20
N2DTW 130,566- 463- 94- C -15
NN2C 57,708- 229- 84- B -15
K2MFY 149,646- 509- 98- B -10
W2KZE 45,768- 254- 64- C -10
WA2SVT 34,371- 201- 57- B -10
KA2RSJ (N/T) 30,276- 174- 58- B -10
KB2IKW 10,191- 79- 43- B -10

Northern New Jersey

W2RQ 2,577,744- 2106-408- C
K2DM 2,427,126- 2146-377- C
N2LT 1,816,558- 1698-357- C
W1GD 1,385,022- 1286-359- C
K2PH 508,344- 716-236- C
WA2UDT 307,260- 569-180- C
K3FNW 188,187- 421-149- B
WA8QOA 108,598- 282-126- B
KZ2S 97,875- 281-125- C
KT2D 96,348- 259-124- C
W2HAJ 55,880- 232- 80- B
W9NTU 32,340- 140- 77- B



Here's the record-breaking 40-meter antenna system used by Bill, K4XS—two four-element beams stacked at 85 and 176 feet.



Dieter, TL8WD, works another one of his 2007 contacts from the Central African Republic.



Jim, N3JT, enjoyed a DXpedition to San Andres that netted him second-place World CW.



Hector, XE1BEF, outscored all the Mexican 10-meter ops with 62k points on phone.



In French Guiana, the husband and wife team of Jay, FY/N4QDX, and Beth, FY/KD3FK, scored more than 616k points, finishing as the top Multi-Single entry from South America.

4BNC	29,403-	99-	99-	C
/A2ASQ	12,324-	79-	52-	B
/2AOY	1,848-	28-	22-	C
/2FCR	1,071-	21-	17-	C-160
/O2M	81,786-	317-	86-	C -40
A2R	21,000-	126-	58-	C -40
3RWW	11,592-	84-	46-	C -40
2OLG	37,488-	142-	88-	B -10

outhern New Jersey

2PS	2,191,536-	2052-356-	C	
2FL	576,045-	765-251-	C	
2MR	468,000-	660-240-	C	
B2BF	360,612-	636-189-	C	
/2PAU	223,470-	382-195-	C	
/2FGY	199,716-	374-178-	C	
2JLA	174,276-	309-188-	C	
2LOO	145,485-	305-159-	B	
/2QKJ	91,392-	272-112-	B	
/A2VSQ	66,126-	206-107-	B	
/2CN	43,497-	179- 81-	C	
2OSV	42,273-	183- 77-	C	
/2OHA	38,640-	161- 80-	B	
2ZSY	26,670-	127- 70-	B	
/A2DVU	25,620-	140- 61-	C	
2DJY	18,924-	168- 36-	B	
A2KFO	15,600-	100- 52-	C	
2GUW	13,818-	98- 47-	B	
A2YKN	11,250-	75- 50-	B	
A2KFL	9,804-	76- 43-	C	
2AWC	8,640-	64- 45-	C	
B2X	1,008-	24- 14-	B	
Z2I	28,086-	151- 62-	C -40	
/J2D	163,053-	549- 99-	C -15	
2JSB (N/T)	14,364-	84- 57-	B -10	
A2BEW	1,311-	23- 19-	B -10	

/estern New York

/2HPF	2,158,136-	2016-357-	C	
/F2W	697,680-	855-272-	C	
D2YP	576,798-	766-251-	C	
/2TZ	544,050-	806-225-	A	
1JUL	536,130-	851-210-	C	
B2WN	471,825-	675-233-	C	
E2JO	309,408-	586-176-	B	
/2LU	303,912-	536-189-	C	
/J2O	288,585-	605-159-	C	
B2EMU	270,630-	582-155-	C	
/N2R	172,368-	378-152-	B	
G2P	138,996-	351-132-	C	
M2P	85,779-	353- 81-	C	
B2SE	76,320-	212-120-	C	
/2QIP	74,256-	221-112-	C	
K2B	68,694-	214-107-	B	
/E2T	54,648-	198- 92-	C	
/B2ABD	38,250-	150- 85-	C	
S2I	29,184-	128- 76-	C	
2NV	27,432-	127- 72-	C	
2ITR	21,624-	106- 68-	B	
B2IOA	16,356-	94- 58-	B	
S2X	6,190-	70- 39-	B	
B2FRA	4,092-	62- 22-	C	
2GDD	1,392-	29- 16-	B	
2WK	13,113-	93- 47-	C -80	
/2FR	6,438-	58- 37-	C -80	
M2P	85,779-	353- 81-	C -40	
/B2YQH	154,350-	525- 98-	C -15	
/2HG	153,216-	532- 96-	C -10	
2IZJ	45,144-	228- 66-	B -10	
2JNZ (N/T)	24,864-	148- 56-	B -10	

elaware

X3A	310,248-	556-186-	C	
/3NX	136,950-	275-166-	C	
3WUW	15,408-	107- 48-	C -80	

astern Pennsylvania

3OO	3,269,025-	2505-435-	C	
I3P	1,002,375-	1215-275-	C	
M3E	499,059-	781-213-	B	
Q3V	455,880-	655-232-	B	
B3TS	415,224-	632-219-	C	
/3EVW	386,568-	546-236-	C	
D3Z	232,845-	361-215-	C	
3OV	150,213-	311-161-	C	
3II	141,345-	349-135-	C	
/3EHL	121,176-	306-132-	B	
D3LC	84,750-	260-113-	B	
/3NTD	77,970-	226-115-	B	
/3QIR	76,560-	220-118-	B	
A4MD/3	61,215-	265- 77-	C	
A3VEL (N/T)	49,284-	222- 74-	B	
C3ZG	38,052-	151- 84-	B	
/A1MKE	36,792-	146- 84-	B	
/1VY/3	30,810-	130- 79-	C	
A3B	30,261-	131- 77-	C	
A3LCF	22,260-	106- 70-	B	
/3AP	16,380-	78- 70-	C	
3GLZ	4,836-	52- 31-	B	
A3NJA	1,377-	27- 17-	B	
/A3LFY	351,390-	1105-106-	C -10	
3CHL	64,056-	314- 68-	B -10	
A3TLE (N/T)	18,408-	118- 52-	B -10	

aryland-DC

3ZO	2,633,550-	2425-362-	C	
3NA	2,088,828-	1842-378-	C	
3AV	357,840-	568-210-	C	
3SKE	169,533-	299-189-	C	
3EE	37,674-	138- 91-	B	
3COB	26,251-	129- 73-	C	
3TFA	27,255-	115- 79-	C	
A3LKQ	8,280-	60- 46-	C	
N3T	330-	11- 10-	B	
/3EWL	11,610-	86- 45-	C -80	
/3TUX	2,160-	36- 20-	B -20	

KE3Q	506,496-	1319-128-	C -10	
WA3EEE	161,568-	561- 96-	C -10	
W3CPB	13,770-	102- 45-	B -10	
WB2BZR (N/T)	8,550-	75- 38-	B -10	
WI2T	4,725-	45- 35-	B -10	

Western Pennsylvania

K3TUP (KC1F, op)	3,078,543-	2508-409-	C	
K5ZD/3	1,153,551-	1141-337-	C	
WN3VAW	201,465-	407-165-	B	
N3GSC	108,900-	275-132-	B	
KA3RRF	57,873-	191-101-	B	
WB3EKO	48,951-	259- 63-	B	
W3FGS	34,953-	191- 61-	B -20	
N3GLK	2,790-	35- 26-	B -15	
KA3SDP (N/T)	7,560-	60- 42-	A -10	

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Alabama

WZ4F	1,885,800-	1796-350-	C	
N4KG	564,186-	707-266-	A	
KE4BM	351,780-	572-205-	C	
W4NKI	72,237-	199-121-	C	
W4CYC	84,380-	290- 74-	C	
AA4XM	12,654-	74- 57-	B	

Georgia

KM9P/4	751,308-	923-274-	B	
AB4RU	274,200-	457-200-	C	
WA2FTC	107,880-	290-124-	B	
K4EZ	105,534-	286-123-	C	
AA4GA	72,600-	200-121-	B	
KB4GID	55,257-	163-113-	A	
KM4GW	31,500-	125- 84-	B	
W4OYC	28,314-	121- 78-	C	
AB4LX	3,906-	42- 31-	B -80	
W4CEB	45,066-	203- 74-	C -20	

Kentucky

WB4FOT	513,372-	716-239-	C	
WA4QMQ	361,563-	631-191-	C	
N4XM	354,594-	523-226-	C	
AA4VL	248,124-	667-124-	C	
KD4PN	23,058-	126- 61-	B	
KC4DWT	50,610-	241- 70-	B -10	
KB4YJG (N/T)	11,844-	84- 47-	B -10	

North Carolina

N4UH	634,032-	816-259-	B	
W4CVX	444,768-	656-226-	C	
W8NGO	280,962-	473-198-	C	
KJ4TI	233,244-	418-186-	B	
KB3MP	200,232-	412-162-	C	
W2HTI	181,272-	332-182-	C	
WB2LEI/4	124,122-	274-151-	C	
KB4MIL	75,192-	241-104-	B	
WD4OHD	57,330-	210- 91-	A	
KC4DO	51,408-	168-102-	B	
KA2CDJ/4	23,643-	99- 79-	B	
N4QVM	19,872-	96- 69-	B	
W4HVU	10,266-	59- 58-	C	
K5LZT	7,872-	64- 41-	B	
K4HJJ	29,547-	147- 67-	C -80	
NX9T	182,103-	601-101-	C -15	
KC4NKR (N/T)	26,730-	162- 55-	B -10	
N4XHH	1,440-	30- 16-	B -10	

Northern Florida

KC4CSD	320,016-	427-225-	B	
W4WKQ	312,465-	663-185-	C	
K4JDY	217,008-	411-176-	C	
W9LSD	82,824-	232-119-	B	
K0LIJZ/4	4,092-	44- 31-	C -80	
K4XS	129,774-	503- 86-	C -40	
AA4JI	12,384-	96- 43-	B -15	
N4EEB	7,221-	53- 29-	C -10	
KC4NNZ (N/T)	1,140-	38- 10-	B -10	

South Carolina

K4YYL	1,291,251-	1469-293-	C	
W3VT	695,838-	811-286-	C	
K4WJV	186,045-	395-157-	C	
WB4IUX	63,891-	229- 93-	B	
WA4HIW	40,656-	154- 88-	C	
W8CNL/4	37,050-	130- 95-	B	
AB4MG	2,088-	29- 24-	B -80	

Southern Florida

WA5DTK	239,760-	432-185-	B	
WK4F	107,640-	260-138-	C	
KJ4WH	67,980-	206-110-	B	
WA4EMU	66,465-	211-105-	B	
KF4MA	63,879-	199-107-	B	
WB4CKY	44,847-	151- 99-	B	
KM4KJ	41,676-	151- 92-	B	
KN4BP	31,746-	143- 74-	C	
WA4SVO	5,247-	53- 33-	B -80	
W2SDB/4	216-	9- 8-	C -20	
K5OT/4	19,215-	105- 61-	C -15	
N4WPG (N/T)	13,287-	103- 43-	B -10	

Tennessee

AA4XU	459,774-	623-246-	C	
W4AY (WA4ZZU,op)	24,522-	134- 61-	B	
K4JHT	23,100-	100- 77-	B	
K4LGW	4,851-	49- 33-	B	
N4TK	4,050-	50- 27-	C	
WA4SBK	1,680-	28- 20-	C	
W4ZWZ	51,756-	227- 76-	C -15	
N4ZZ	370,656-	1144-108-	C -10	

Virginia

KX3Q	2,053,080-	1901-360-	C	
AA4UJ	850,770-	1035-274-	C	
W4TMN	222,288-	421-176-	C	
W4LMJ	188,271-	367-171-	C	
AA4XU	163,863-	357-153-	C	
N4MM	110,505-	265-139-	C	
N3JT	100,467-	183-183-	C	
KM4YY	63,963-	207-103-	B	
W3FTG	45,978-	158- 97-	B	
NI4Y	38,376-	156- 82-	C	
AA4KD	38,052-	151- 84-	B	
W4KMS	24,480-	136- 60-	C	
WA4MKL	21,576-	116- 62-	C	
N4XAZ	15,912-	104- 51-	C	
W1LUG/4	1,368-	24- 19-	B -15	
N4PUV (N/T)	19,344-	124- 52-	B -10	
KB4VIR (N/T)	6,360-	53- 40-	B -10	
NO4K	6,045-	65- 31-	B -10	

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Arkansas

K5GOE	486,720-	624-260-	C	
KC5TA	411,840-	704-195-	C	
AA5GY	99,603-	279-119-	A	
N5HSF	43,200-	120-120-	C	
NJ1V	32,250-	125- 86-	C	
W5EIJ	31,365-	123- 85-	C	
WA5KQU	7,011-	57- 41-	B	
K5UR	4,002-	46- 29-	C-160	

Louisiana

K5KLA	15,840-	88- 80-	B	
W5WMU (KE5FI,op)	581,910-	1630-119-	C -10	

Mississippi

WA5OYU	465,528-	652-238-	C	

New Mexico

AA5PA	80,784-	272- 98-	B	
KN5S	2,850-	38- 25-	C -80	
W3JQS/5	17,907-	127- 47-	C -10	

North Texas

N5AU (WB5VZL,op)	2,283,270-	2035-374-	C	
N5AW	798,795-	918-291-	B	
NI5M	779,064-	908-286-	C	
KD5GD	509,571-	729-233-	B	
KC5NQ	322,287-	1043-103-	C	
N5EIT	240,318-	474-169-	B	
KG5OA	124,974-	318-131-	C	
WB5KLY	72,281-	217-111-	B	
W5AE	58,515-	235- 83-	C	
WK5K	50,562-	159-106-	B	
NZ5M	4,320-	40- 36-	B	
K5WXZ	855-	19- 15-	C-160	
KA5W	64,449-	279- 77-	C -40	
W5FO	117,459-	421- 93-	C -20	
KB5KTY (N/T)	5,487-	59- 31-	B -10	

Oklahoma

N5CG	697,680-	1224-190-	C	
N5MSO	64,974-	221- 98-	B	
N5IRJ	30,561-	167- 61-	B -10	

South Texas

WN4KKN/5	393,759-	653-201-	C	
WA5IYX	251,073-	547-153-	B	
N5HB	171,114-	361-158-	B	
W5QZ	81,000-	250-108-	B	
K5DB	55,478-	201- 92-	B	
N5KAE	54,351-	183- 99-	C	
K8SWC/5	10,098-	66- 51-	B	
KA5PVB	7,614-	54- 47-	A	
W5HRF	7,200-	50- 48-	B	
WA5JDU	4,059-	41- 33-	C	
KC5AC	45,780-	218- 70-	C -10	
N5CIA	27,216-	162- 56-	B -10	
AA5LF	20,670-	130- 53-	C -10	
AK5E	2,079-	33- 21-	A -10	

West Texas

KD5IA	405,480-	620-218-	B	
WF5E	85,320-	316- 90-	C -20	
WB5UDX	234,990-	746-105-	C -15	
K5RF	34,905-	179- 65-	C -15	

6

East Bay

W6FSJ	447,237-	687-217-	C	
NB6L	169,092-	367-154-	C	
K6HIH	118,989-	339-117-	P	
N4DLA/6	36,135-	165- 73-	B	
N6SRT	31,680-	132- 80-	C	

Los Angeles

N6AA	419,292-	613-228-	C	
N6IBP	123,966-	291-142-	B	
N6LL	10,920-	70- 52-	C	
W6FA	8,640-	80- 36-	B	
W2LF	147-	7- 7-	B	
K5KT/6	19,668-	149- 44-	C -40	
KI6BN	7,749-	123- 21-	C -40	
W6OK	45,627-	227- 67-	C -20	
K6SVL	332,235-	1035-107-	C -10	
AI6Z	64,605-	295- 73-	C -10	
WB6NFO	42,228-	204- 69-	B -10	

Orange

KK6BB	792,267-	1217-217-	C	
WA6FIT	111,012-	319-116-	B	
K6VI	4,536-	54- 28-	C -80	

NW6S	27,105-	139- 65-	B -20	
WA6WPG	7,920-	88- 30-	C -15	
N6AW	162,000-	600- 90-	C -10	
KC6IHT	23,496-	178- 44-	B -10	

Santa Barbara

W6UM	432,351-	603-239-	C	
W6UJX	402,825-	655-205-	C	
WA6FGV	150,348-	374-134-	B	
WA6AJB	125,730-	330-127-	C	
AA6EQ	93,288-	299-104-	B	
W6MUS	76,545-	243-105-	C	
N6HK	13,726-	88- 52-	C -15	
WB6L	166,803-	611- 91-	C -10	
W9GIL/6	31,356-	201- 52-	C -10	

Santa Clara Valley

K6HNZ	1,136,850-	1378-275-	C	
KG6GF	1,099,674-	1194-307-	C	
KB6GV	385,842-	601-214-	C	
K6ITL	378,750-	625-202-	C	
K6CXT	325,422-	537-202-	C	
W6ERS	166,263-	353-157-	C	
KE6OT	61,650-	150-137-	C	
W6FGD	58,916-	204- 93-	C	
WE6F	48,600-	200- 81-	C	
N6RUX	48,573-	257- 63-	A	
KG6XF	46,665-	183- 85-	C	
W6RVS	46,002-	187- 82-	C	
KG6WU	30,256-	142- 71-	C	
WA6HRK	22,512-	134- 56-	B	
KI6CK	14,259-	97- 49-	C	
K6SMH	10,815-	103- 35-	B	
W6PLJ	8,556-	62- 46-	B	
WD6EKR	55,677-	277- 67-	B -10	
N6WLF (N/T)	16,470-	122- 45-	B -10	

San Diego

K6XT (KI6ZH,op)	1,314,768-	1456-301-	C	
N6ADK	302,445-	517-195-	B	
W6JVA	80,028-	247-108-	C	
W6LUN	34,320-	143- 80-	C	
AA6EE	6,510-	62- 35-	B	
N6UUW	2,295-	45- 17-	B	
K6NA	1,914-	29- 22-	C -80	
W6UQF	112,299-	451- 83-	B -10	
W6MVW	1,392-	29- 16-	B -10	

San Francisco

K6AUD	179,655-	413-145-	C	
W6WB	80,873-	197-103-	C	
KI6EZ	29,160-	270- 36-	C	
K6ZUR	25,620-	122- 70-	B	
N6NF	15,708-	119- 44-	A	
WA6CTA	7,182-	57- 42-	B	
W6PM	67,710-	305- 74-	C -15	

San Joaquin Valley

KA6BIM	560,268-	788-237-	C	
K6DT	423,192-	616-229-	C	
WW6O	304,440-	590-172-	C	
KB8YC	50,343-	173- 97-	C	
W6YWH	47,100-	157-100-	C	
WB6ITM	17,199-	117- 49-	A	
W6DPD	13,356-	105- 42-	B	
W6IFC	3,570-	35- 34-	C	
W6ZZB	2,772-	44- 21-	C	
W6BVM	2,580-	43- 20-	C -20	
WB6VIN	2,520-	35- 24-	B -10	

Sacramento Valley

N6GG	296,334-	489-202-	C	
K6DR	197,001-	413-159-	C	
N6JM	120,780-	305-132-	B	
KD6VM	83,790-	245-114-	B	
K6SG	83,160-	231-120-	C	
WG6O/6	38,184-	148- 86-	B	
KV6H	34,365-	145- 79-	C	
KF6A	15,288-	98- 52-	C	
K6PU	253,998-	822-103-	C -10	
N6QBZ	32,595-	205- 53-	C -10	
KB6RMN (N/T)	18,252-	156- 39-	B -10	
W6NKR	210-	10- 7-	C -10	

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Arizona

K7WK	555,282-	791-234-	C	
WN7J	103,788-	279-124-	B	
W7ZMD	19,998-	101- 66-	B	
ND7A	2,961-	47- 21-	B	
W7AYY	84,774-	398- 71-	C -10	
KB7JEC	18,876-	121- 52-	C -10	
WA7UHK	11,712-	122- 32-	B -10	

Eastern Washington

N7ER	74,250-	250- 99-	C	
K7EFB	48,867-	179- 91-	B	
W7LGG	28,665-	147- 65-	C -10	

Idaho

WZ7J	1,297,272-	1628-283-	C	
WO7Y	398,748-	707-188-	B	
KE7RT	16,317-	111- 49-	B	
W7EYR	3,072-	32- 32-	B -20	
KE7TZ	33,660-	220- 51-	C -15	

Montana

KC7UO	574,488-	808-237-	C	
KS7T	454,596-	881-172-	C	
KC7UP	235,209-	481-163-	C	
K7LUH	213,120-	480-148-	B	
KC7UT	21,063-	119- 59-	B	
W6ALQ	51,870-	247- 70-	C -20	

Nevada

WA7CWM	223,617-	568-131-	B	
KF7RO	126,999-	411-103-	B	
KB7IRF (N/T)	52,632-	258- 68-	B -10	

Oregon

W7YAQ	621,756-	909-228-	B	
WR7E	278,055-	501-185-	B	
WR7F	139,695-	335-139-	B	
N7RY	52,668-	228- 77-	C	
W6YVK/7	28,998-	179- 54-	A	
WB7VKD	24,603-	139- 59-	C	
N7MMQ	7,296-	64- 38-	C	
W7FP	235,431-	777-101-	C -15	
NO7F	146,250-	625- 78-	C -10	
KA7FEF	6,480-	108- 20-	B -10	
N7LTM (N/T)	840-	40- 7-	B -10	

Utah

W7CFL	1,284,050-	1590-265-	C	
WE7B	658,682-	1084-201-	C	
K6XO	58,535-	248- 81-	C -20	

Western Washington

N7TT	1,718,556-	1896-287-	C	
K7RI	998,460-	1548-215-	B	
NN7L	310,800-	740-140-	C	
W7QN	141,141-	539-143-	C	
WA7BAY	140,580-	355-132-	C	
N7LOX	132,396-	374-118-	B	
N7KRW	88,446-	248- 82-	C	
KR7L	20,034-	126- 53-	A	
KF7WR	17,784-	114- 52-	B	
W7VIH	12,144-	88- 48-	B	
N7LXQ	1,452-	22- 22-	B	
K7UR	23,493-	191- 41-	C -40	
W7WA	745,173-	2123-117-	C -15	
K7GEX	118,680-	430- 92-	A 10	
WB7VUB (N/T)	51,333-	241- 71-	B -10	

Wyoming

K7MM	705,293-	908-259-	C	
KD7RX	113,850-	330-115-	B	
KB7M	63,504-	218- 98-	C	
N7GVV	46,872-	168- 93-	B	
N7MSK	1,980-	44- 18-	C	

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Michigan

NA8V	3,002,790-	2534-395-	C	
K8CV	173,712-	376-154-	C	
N8ASM	171,390-	394-145-	C	
W8URM	80,520-	220-122-	B	
KE8KG	70,941-	221-107-	B	
W8FEM	51,993-	159-109-	B	
W8KZM	39,270-	154- 85-	C	
W8TJQ	35,520-	160- 74-	B	
KE8FO	28,080-	130- 72-	B	
KS8D	21,645-	111- 65-	B	
K8QLK	10,530-	85- 54-	B	
WX8S	6,720-	56- 40-	B	
K8BVA	4,872-	58- 28-	B	
W8TWA	221,862-	718-103-	C -20	
N8CXX	631,158-	1606-131-	C -10	
K8LJG	74,382-	322- 77-	B -10	
K8AJK	70,176-	272- 86-	B -10	
KE8NH	28,373-	149- 59-	B -10	
N8CEO	14,784-	112- 44-	B -10	
AC8W	3,600-	80- 20-	C -10	

Ohio

WB3KKX	1,869,252-	1668-374-	C	
K8NZ	1,050,516-	1233-284-	B	
WD8EOL	392,346-	614-213-	C	
KA8D	280,148-	532-163-	C	
W8UPH	217,350-	450-161-	C	
KA8WAS	151,179-	313-161-	B	
KB8CPT	146,730-	335-146-	C	
W8BE	145,992-	316-154-	B	
W8YGR	131,211-	239-163-	B	
W8NPF	130,524-	298-146-	C	
K8EF	104,538-	262-133-	C	
WZ8D	83,916-	333-126-	C	
W8DWP	54,282-	166-109-	C	
WD9FTZ	53,631-	177-101-	B	
N8LMB	51,360-	160-107-	B	
W8MHW	48,960-	170- 96-	B	
W8IMF	46,455-	163- 95-	C	
W8IDM	43,650-	150- 97-	B	
K8KR	34,875-	155- 75-	C	
KF8K	15,120-	80- 63-	B	
KA8OUT	6,616-	53- 35-	B	
W8EAO	2,205-	35- 21-	A	
W8XT	189-	9- 7-	B	
WB8JBM (NZ4K, op)	35,916-	164- 73-	C -80	
K8DJC	15,444-	99- 52-	C -40	
W8IQ	8,385-	65- 43-	C -40	
KE8YE	1,311-	23- 19-	B -15	
KW8N (KU8E,op)	563,250-	1502-125-	C -10	
KA8WEO	126,720-	480- 88-	C -10	
N8AGU	74,151-	321- 77-	B -10	
KA8VPL (N/T)	10,716-	76- 47-	B -10	
WD8AJF	780-	20- 13-	B -10	

West Virginia

KC8FS	592,667-	813-243-	C	
W8TN	516,960-	718-240-	C	
K8OQL	89,700-	230-130-	C	
NU8K	16,848-	144- 39-	C	
K8BAOB	2,340-	30- 26-	A	
W8WVM	7,104-	64- 37-	B -15	
K3ZJ	726,516-	1922-126-	C -10	

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Illinois

WB9Z 2,061,381- 1813-379- C
K9ZO 1,115,868- 1196-311- C
N9JF 476,778- 694-229- B
KA9YMV 282,420- 523-180- B
K9UON 276,420- 542-170- C
W9LNQ 153,000- 375-136- B
KD9Q 137,760- 328-140- C
W9CA 135,680- 340-133- C
K9QVB 119,544- 293-136- B
N9BBM 111,792- 274-136- B
NM9C 101,616- 292-116- B
WB9TIY 66,300- 221-100- C
WD9FEN 53,592- 203- 88- C
KA9HDN 26,019- 147- 59- B
AD9K 20,160- 105- 64- B
W9LYN 18,414- 99- 62- B
WD9DDO 7,560- 60- 42- B
W9HQW 6,936- 68- 34- C
W9REC 5,616- 52- 36- B
WD9DYR 2,688- 32- 28- C
K9PNG 1,260- 21- 20- A
W9CH 30,720- 160- 64- C -40
KK9L 73,458- 318- 77- C -20
K9RHY 50,481- 213- 79- C -20
WB9MLY 14,229- 93- 51- C -20
WB9WQG 5,100- 50- 34- C -20
WD9GGY 663- 17- 13- B -20
K9MDO 236,532- 857- 92- C -10
K9HMB 88,917- 277-107- C -10
K9EG 45,198- 279- 54- C -10
KB9CRJ (N/T) 15,851- 47- 47- C -10
KB9DAF (N/T) 8,550- 75- 38- B -10
KE9UJ 5,046- 58- 29- B -10
KB9CRY (N/T) 4,590- 51- 30- B -10
N9IUA (N/T) 3,726- 46- 27- C -10
N9GXW (N/T) 1,740- 29- 20- B -10
KA9WUR (N/T) 792- 22- 12- B -10
KB9CEQ (N/T) 702- 18- 13- B -10
N9IQV (N/T) 300- 20- 5- B -10

Indiana

W9RE 3,196,620- 2478-430- C
WO9Z 758,016- 987-256- B
W9NSZ 639,600- 1040-205- C
KB9C 318,432- 496-214- C
KD9HT 310,170- 490-211- C
AG9S 125,070- 379-110- C
NT9O 110,856- 298-124- B
W9JOO 27,492- 158- 58- B -20
KJ9D (KK9V,op) 353,199- 973-121- C -15
W9RKE 33,108- 178- 62- B -15
N9EHQ 80,984- 264- 77- C -10
KB9BGV (N/T) 37,170- 177- 70- C -10

Wisconsin

W9OP 845,460- 1220-231- C
W9GXR 437,805- 705-207- C
NG9L 306,627- 571-179- B
W9NA 213,528- 434-164- C
W9BCV 194,625- 375-173- C
WB9CXY 79,200- 240-110- C
W9RZW 37,575- 167- 75- B
WA9TZE 26,775- 119- 75- C
W9WI 21,255- 109- 65- B
AJ9K 6,610- 70- 41- B
N9IYO 2,553- 37- 23- C
W9YCV 192- 8- 8- C
K9CAN 99,465- 349- 95- C -20
K9YNF 51,282- 231- 74- C -20
N9ER 95,718- 371- 86- C -15
KQ9L 445,395- 1291-115- C -10
W9XT 392,223- 1157-113- C -10
K9DXO 47,322- 239- 66- B -10
W9NWY (N/T) 10,200- 85- 40- B -10
KA9NTO (N/T) 957- 29- 11- B -10

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Colorado

K0RF (W0UA,op) 2,578,950- 2605-330- C
K0CS 896,550- 1390-215- C
N0ZA 474,192- 712-222- C
K9BQL 401,835- 623-215- C
K0GAS 379,260- 645-196- C
W0UO 322,559- 563-191- A
KK0L 280,368- 531-176- C
KD0NB 118,608- 353-112- B
N0TK 100,737- 287-117- C
NY0R 47,472- 184- 86- C
N0EPF 34,692- 196- 59- B
NN0M 20,448- 142- 48- C
W0BWJ 13,416- 86- 52- B
W0ZV 544,236- 1364-133- C -20
N2IC/0 617,040- 1714-120- C -10
AC0S 73,365- 365- 67- C -10

Iowa

W0EJ 1,125,327- 1307-287- C
KC0GM 202,560- 422-160- C
W0PPF 162,864- 348-156- C
KZ0C 84,249- 253-111- B
WA0DCB 20,700- 115- 60- C
N0DGE 12,726- 101- 42- C
WB0B 6,771- 61- 37- B
K0GT 1,404- 26- 18- C -80

Kansas

WB0YJT 247,005- 499-165- B
WB0AUQ 41,850- 186- 75- B
W0WPL 28,674- 1018- 81- B
W0SPF 26,100- 145- 60- B
KA0SIX 17,712- 123- 48- B
K0IEW 16,575- 85- 65- C
N0KSC (N/T) 62,580- 298- 70- B -10
NO0Y 192- 8- 8- A -10

Minnesota

N0AT 1,184,736- 1312-301- C
AC0W 489,294- 738-221- B
WB0GGM 187,995- 416-151- B
W0ML 125,840- 302-140- C
WB0F 113,400- 315-120- C
KE0KB 99,225- 245-135- A
W0LP 42,336- 147- 96- C
WB0DXV 15,000- 100- 50- B -15

Missouri

KA0GGI 522,936- 648-269- C
KI0W 386,496- 704-183- C
WJ0I 178,875- 375-159- C
KM0L 159,273- 347-153- C
W0PKO 45,105- 155- 97- C
KA0CBX 20,790- 99- 70- B
K0GEI 3,960- 40- 33- C
KA0P 2,025- 27- 25- B
WD0G 582,636- 1428-129- C -15
K4VX 366,000- 1220-100- C -10
WB0GFV 19,716- 124- 53- B -10
W0YZZ 13,920- 116- 40- B -10

North Dakota

WB0O 92,448- 288-107- C
NM0N 74,520- 216-115- C
W0CAQ 26,532- 132- 67- C
KE9OT 1,173- 23- 17- B

Nebraska

K0SW 48,600- 200- 81- C
WZ0L 1,536- 32- 16- B
W0OLL 4,176- 58- 24- C -10

South Dakota

K0TPF 574,758- 863-222- C
KD0EE 338,976- 528-214- C
W0ACT 111,228- 299-124- C

VE

Maritime-Newfoundland

VO1MP 1,901,880- 1761-360- C
VY2ZV 123,000- 410-100- C

Quebec

VE2AWR 6,201- 53- 39- C
VE2EW 23,400- 150- 52- C -15
VE2XL 36,432- 184- 66- B -10
VE2GUZ 10,175- 185- 55- C -10

Ontario

CF2SA 792,980- 1180-224- C
VE3BXY 376,320- 560-224- C
VE3MSN 137,061- 291-157- C
VE3TJL 14,940- 83- 60- B
VE3OMU 5,775- 55- 35- B
VE3CUI 27- 3- 3- C -80
VE3NYT 13,872- 68- 68- B -15
VE3FWQ 201,300- 671-100- C -10
VE3VET 87,204- 338- 86- C -10
VE3PLC 67,068- 276- 81- C -10
VE3HX 14,076- 102- 46- C -10

Manitoba

VE4JB 150,510- 346-145- C

Saskatchewan

VE5FX 588,672- 876-224- C

Alberta

VE6SH 16,587- 97- 57- A
VE6CWW 2,242- 56- 19- C
VE6MAA 18,144- 144- 42- A -10

British Columbia

VE5RA/7 773,793- 1107-233- C
VE7HBQ 43,176- 257- 56- B
VE7XO 1,638- 42- 13- C -40
VE7EKS 1,836- 36- 17- A -10

Single Operator, Assisted

1

K1AR 3,831,828- 2639-484- C
K1DG 2,687,370- 2345-382- C
K1TO 2,555,145- 2103-405- C
N1TZ 983,382- 1054-311- C
K1KP 851,508- 868-327- C
KC8PE 655,188- 789-284- C
NO1I 394,680- 508-280- C
K1BG 372,645- 455-273- C
WA1UAR 369,018- 498-247- C
W1BK 342,504- 536-213- C
NQ1K 320,400- 445-240- C
W1WEF 200,679- 443-151- C
KA1LSZ 177,300- 300-197- B
NX1G 153,456- 368-139- C
AD1C 148,782- 274-181- B
KV1J 81,720- 227-120- C
KZ1D 81,378- 274- 99- C
AI3E 52,704- 183- 96- C
KA1ERL 20,250- 90- 75- C
N1AU 16,632- 99- 56- C
N1HFI (N/T) 7,605- 65- 39- B
WA1YUA 5,195- 59- 35- C

2

WB2P 2,221,380- 1763-420- C
WB2K 1,472,580- 1212-405- C
N2VW 897,102- 696-333- C
KD2NC 521,916- 713-244- C
N2AIF 342,108- 518-221- C
WR2G 322,503- 557-193- C
W2REH 215,460- 398-180- C
KF2U 168,856- 344-183- C
WK2H 165,816- 392-141- C
K2SB 126,684- 276-153- C
W2GMA 37,884- 154- 82- B
W2GD 30,720- 128- 80- C
KN2Q 390- 13- 10- C

3

N3AD 3,146,880- 2384-440- C
K3WW 3,101,934- 2186-473- C
K3IPK 2,398,656- 1922-416- C
W3USS (WB2EKK,op) 2,103,375- 1775-395- C
NM2Y 1,636,362- 1443-378- C
NN3Q 1,332,140- 1307-340- C
W3UM 1,204,532- 1188-338- C
N3II 910,035- 963-315- C
NW3Y 902,664- 1194-252- C
N3EC 722,742- 739-326- C
K3UA 654,048- 757-288- C
WB3FYL 647,838- 774-279- C
N3RR 610,470- 714-285- C
KD3CN 519,480- 740-234- C
K3ND 444,996- 564-263- C
K3YGU 440,880- 668-220- C
K3DI 411,570- 538-255- C
W3MA 403,596- 606-222- C
NK3U 317,730- 445-238- C
WB3CIW 300,966- 487-206- C
K2DOX/3 298,188- 396-251- C
W3KV 295,470- 490-201- C
KW3Z 273,951- 499-183- C
K6IR/3 206,280- 360-191- B
NV3V 173,799- 369-157- C
K3SA 88,500- 250-118- C
N3EYB 43,332- 157- 92- B
W3GBG 25,344- 132- 64- B
N6CQQ/3 10,350- 69- 50- C
NU3Y 3,567- 41- 29- B

4

N4GVF 405,216- 603-224- C
N4REE 329,085- 515-213- C
K1ZZI 303,030- 370-273- C
W4JVN 192,510- 345-186- C
W3YY 100,965- 265-127- C
N3RC 43,068- 154- 97- C

5

WM5G (KR8Y,op) 3,902,892- 2716-479- C
K5XI 1,296,316- 1207-358- C
N5GM 642,600- 900-238- C
AG5B 390,600- 700-186- C
K5EWJ 236,008- 422-188- C
WB0NSA 148,584- 328-151- A
KG5VK 144,111- 397-121- C
N3BB/5 114,912- 252-152- C

6

W6GO 1,509,228- 1484-339- C
WZ6Z 1,282,899- 1349-317- C
WX6M 823,007- 899-231- C
AE6E 614,127- 761-269- C
N6CCL 517,188- 858-262- C
WA7G 378,452- 814-206- C
W6ISQ 378,432- 657-192- C
K6MA 341,124- 524-217- C
W6BIP 313,152- 468-224- C
WB6GFJ 194,502- 421-154- C
N6IP 185,724- 462-134- C
WA8LLY/6 169,338- 334-169- B
WB2CHO/6 111,972- 302-124- C
W6OAT 99,066- 209-158- C
N3AHA 97,200- 270-120- B
AA6JJ 89,232- 208-143- C
WW6I 74,568- 239-104- C
KG6MY 68,736- 179-128- C
WC6I 57,420- 174-110- C
KJ6LD 55,440- 154-120- C
AI6L 53,784- 166-108- C
NT6G 8,580- 55- 52- C
KA6ING (N/T) 3,840- 40- 32- B
W6NQ/6 3,600- 40- 30- C

7

KI3V/7 1,919,151- 1833-349- C
AI7B 1,857,212- 1921-324- C
NX7K 316,173- 871-121- C
N7KZN 220,614- 443-166- B
NG7K 206,850- 394-175- B

8

K8MR 817,704- 984-277- C
NG8D 805,335- 1028-265- C
K8CX 343,824- 551-208- C
KQ8M 172,020- 244-235- B
AF8C 50,298- 166-101- B
N8BC 12,600- 75- 56- C

9

WO9DIG 370,260- 484-255- C
K9OSH 117,936- 378-104- C
K9CC 20,856- 88- 79- C

0

WB8ZRL 353,805- 515-229- C
W8OSK 334,320- 560-199- C
NC8O 21,600- 100- 72- C

Multioperator

Single Transmitter

1

KA1GG (+K1KJT,N1s AVA,ZE, W1KM,WD1N) 2,670,336- 2316-384- C
K1VR (+K1IR,N1IR,KM3T) 1,957,620- 1652-395- C
KZ1M (+KB1RI) 1,570,214- 1729-322- C
AA1V (+KS1C,NO1J,WB1S) 1,422,720- 1482-320- C
NC1B (+NR1L) 1,237,761- 1239-333- C
AK1L (+KA1s FBY,X,WB1H) 1,050,405- 1195-293- C
WB1DGV (+K8PO) 867,438- 1011-286- C
W1AF (KA1s SSQ,UTX,UZF,KC1s SW,SY, KO1O,N1HHN,NZ1W,WC1F,KA2MUE, W2KOY,K3UOC,WH8CGK,WA7WFZ, KC9VX,ops) 804,000- 800-335- C
K1SSN (KD3HN,WB7EZO,ops) 603,174- 814-247- C
W1FY (KA1s NRD,USL,UUD,W1IBN, W1/G4DZC,ops) 158,097- 349-151- C
NM1K (+KA1s VEC,VED) 12,546- 82- 51- A
KA1UCC (+WB1EAZ) 2,415- 35- 23- C

2

N2NU (+K2WI,WA2IUO) 2,499,384- 1868-448- C
N2SS (+W2GMA,NU3Y) 1,675,692- 1569-356- C
N2MM (+K2ZSY,KB2IQO) 1,529,376- 1432-358- C
WM2V (+KS2G,N2IIV,WA2SYN,WM2S) 1,179,936- 1446-272- C
W2XL (+N2s EIK,GQS) 1,015,164- 1038-326- C
W2UI (+N3KR) 361,674- 566-213- C
K2OWE (+W2GSN) 350,280- 556-210- C
N2UN (+AA6RX) 254,736- 484-183- C
K2CC (KA1PNE,N1HET,NK1W,KA2UTY, KB2IYE,N2s HHV,KIQ,ops) 126,250- 375-114- C

3

W3BGN (+N2NT) 3,650,832- 2504-486- C
AA1K (+K3WJV) 3,648,231- 2661-457- C
W3XU (+N3FDL) 3,184,214- 2677-394- C
N3BNA (+KE2PF,N3GOA) 1,855,920- 1628-380- C
K3NZ (+KA3MND,KU3X) 1,779,248- 1569-378- C
N3ARK (+KB3MM,WB3s FIZ,HAZ, KAM,LFZ) 1,008,960- 1051-320- C
K3ANS (+K2BPP,K3YD,KU3K,NU3L, W3TB) 961,272- 1014-316- C
NA3K (+K3IE,NM3W) 860,220- 972-295- C
N3RW (+N3HW) 470,112- 664-236- C

4

N4PMQ (+KA3FOX,N4SLR,WB8YZU) 866,040- 1031-280- C
W4AQL (NS2O,KC4JAY,N4CXF,WD4DWN, ops) 149,298- 334-149- C

5

WB2ULI (+N2BOW) 2,693,655- 2217-405- C
N5RZ (+AA5DX,K5s JRT,LHO,MR, KM5X,N5OAO,W5FO,KN6M) 1,395,360- 1368-340- C
WQ5Y (+KE5OX,NZ5V) 338,031- 529-213- C
N0IDR (+W6VX) 28,080- 120- 78- B

6

N6RO (+K3EST,K6TMB,W6SZN) 2,590,191- 2231-387- C
K6JYO (+N6LHZ,WA6DBC,WB6OKK, K9VV) 1,871,181- 1777-351- C
WA6IET (+N6MB,W2KVA/6) 1,137,342- 1447-262- C
WG6P (+ops) 906,360- 1079-280- C
KE6WL (+KD6NT) 878,280- 1126-260- C
W6PUW (+W6CN) 358,250- 825-190- C
K6ELX (+N6IFR) 338,328- 762-148- C
K6ZM (+NP4IW) 260,097- 479-181- B
N6ITY (+ops) 1,800- 25- 24- C

7

W7ZR (+AA7CM,N7s BSB,ZZ,W7GJS) 1,476,180- 1668-295- C
N7BD (+K8APO,KB7DUF,KA8S R,RDL, ND0M) 30,927- 169- 61- C

8

K8MJZ (+AI8D,WD8DSV,WJ8J) 2,062,156- 2078-334- C
WB8K (+K8MR,N8s ATR,DCJ,DMM,W8s CZN,JGU,XD,WA8s BIN,VPA) 1,967,427- 1837-357- C
KD8B (+KB8DLH,KC8EK,N8s AW,CC, WD8EEQ) 1,686,300- 1606-350- C

9

WI9L (+KC9s JP,LM,NB9C,NG9V) 1,427,250- 1375-348- C
WE9R (+KB9BJM) 1,269,585- 1335-317- C
K9FN (+N9NC) 703,164- 761-308- C

0

KR0B (+AF9T,K0II,KJ0B,KS0T) 2,157,840- 2160-333- C
W0CP (+WY9J) 1,476,711- 1593-309- C
KF0GV (+N0LIW) 700,096- 1106-211- C
KC0LX (+K0QNS) 330,372- 532-207- C
W0CEM (+AB0S,KeWa) 294,792- 568-173- C
WK5M (+KA0ZAF,N0KYT,WB0s AUQ,LKA) 42,600- 200- 71- B

VE

VE7SZ (+VE7JN,VE7ON) 1,821,125- 1965-275- C
VE6AO (VE6s AMR,AUZ,AXB,BLI,CIZ, CJZ,CSD,EY,JX,KC,KZ,LES,PY,TFM,ops) 499,590- 915-182- C

Two Transmitters

K2TR (+N1CC,K2XA,WA2SPL,WB2KMY) 5,020,253- 3837-523- C
KS9K (+K9s CJK,EL,GS,N9s AW,GNQ, NI9s C,U,NK9I,NC9F,WE9V) 5,950,206- 3951-502- C
N3RS (+K3ZA,N3RD,WB3KTX) 5,549,334- 3571-518- C
KQ2O (+K2s BK,NJ,KB2HZ,KD2RE) 4,370,790- 3274-445- C
W0AIH/9 (KA9FOX,K9FVF,N0BSH,W9HH) 3,904,992- 2912-447- C
NK7U (+ops) 3,500,256- 3232-361- C
K9UWA (+K9S JS,VFE,KR9U,NB9F, NO9H,W9JSM,WQ9H) 1,680,588- 1638-342- C

Unlimited

W3LPL (+K3RA,KF3P,N3GB,NM3U, W3EKT,WB3JRU,KN5H,NW5E,KD9J) 11,002,497- 5651-649- C
N2RM (+KA2AEV,KQ2M,KZ2S,WM2H) 9,158,136- 5122-596- C
NB1H (+K1s FWE,MNS,RX,ST,XM, KQ1F,NX1H,WB1HBB,NI8L) 8,741,952- 5059-576- C
KY1H (+KA1CI,KB1W,KM1P,KR1R,NJ1F, NS1M,WA1ZAM,KD2RD,N2MG,NO2D) 6,469,621- 4777-591- C
K5NA (+KA2VQY,KU2O,KY2J,NG2X, W2JU,WB2O) 7,852,464- 4482-584- C
KQ2N (+WA2TMP,N7DBV,W7IL,WJ7s R,S,K9JF,N0XX) 5,990,226- 4477-446- C
K8CC (+ops) 5,102,448- 3536-481- C
NE3F (+K3s NW,WGR,KS3F,W3AP) 4,152,240- 2920-474- C
K7GS (K7DSR,N7s BFJ,KJE,KRG,NQ7M, W7TJ,WA7EGA,WB7RBJ,WS7I,ops) 3,853,796- 3139-388- C
W3GM (+AB2E,K3s ND,RL,KA3s PIT,PLS, KY3N,N3ATQ,WJFV) 2,994,264- 2184-457- C
NJ3A (+N3s GOB,LR,NW3s B,Z) 2,214,108- 2158-342- C
K2SG (+N2EA) 1,916,640- 1760-393- C
K2TD (K3GYS,WB2s R,YUF) 1,855,940- 1430-386- C
NF2L (+KY2T,N2ASC) 1,589,262- 1534-341- C
WA6AHF (+W6BSY) 903,202- 1018-263- C

DX Phone

Africa

Botswana

A22AA 530,007- 1271-139- C

Morocco

CN8FC 1,253,298- 2347-178- B

Canary Islands

EA8BSI 1,514,691- 2759-183- B
EA8AXN 14,445- 107- 45- C

Liberia

EL2CX (K3RV,op) 395,181- 2311- 57- C -10

Central African Republic

TL8WD 1,306,557- 2007-217- C

ory Coast

U2UI	34,224-	184-	62-	B	

urkina Faso

T2BW	43,065-	261-	55-	B	

outh Africa

S6HO	33,696-	158-	72-	C	

anzania

H3TW (K3TW,op)					
	1,624,656-	3077-	176-	C	

enya

Z4FO	388,332-	966-	134-	B	

esotho

P8EB	189,840-	560-	113-	B	

ambia

J2AL	107,952-	692-	52-	C	-10

sia

audi Arabia

Z1HZ	195,264-	576-	113-	C	

apan

A8RWU	1,903,824-	3051-	208-	C	
H1AEP	1,512,414-	2302-	219-	C	
7WKQ	1,190,925-	1976-	201-	C	
A7SGV	1,118,496-	1952-	191-	C	
R1GSE	650,934-	1247-	174-	C	
R3BOT	606,825-	1305-	195-	C	
H4NMT	583,680-	1280-	152-	C	
A3LDH	301,875-	805-	125-	B	
E7DOT	202,950-	550-	123-	B	
H1UUT	133,278-	458-	97-	B	
A2JSF	108,888-	349-	104-	A	
A2ESR	84,600-	300-	94-	B	
1HHX/2	79,443-	291-	91-	B	
A1OLT	75,858-	269-	94-	B	
A7VSO	62,886-	223-	94-	B	
A5IP	58,050-	225-	86-	C	
A2OJ	52,122-	238-	73-	C	
A3UWB	48,906-	247-	66-	B	
H6FTJ	43,740-	243-	60-	B	
H7AJD/1	36,504-	169-	72-	B	
P1SRG	34,404-	188-	61-	B	
A2ONH	24,339-	133-	61-	B	
A4DUD	19,320-	115-	56-	B	
A1ASO	19,080-	106-	60-	B	
R8FLY	18,018-	154-	39-	B	
R7LVK	12,810-	122-	35-	B	
F1NZW	11,808-	96-	41-	C	
R1TLA	10,080-	84-	40-	B	
A6CM	7,548-	74-	34-	B	
R1MRG	7,482-	86-	29-	B	
L2RQH	7,098-	91-	26-	B	
A1BUI	6,438-	58-	37-	B	
R1GGB	6,324-	68-	31-	B	
A1BBA	5,664-	59-	32-	B	
R1GMJ	5,208-	62-	28-	B	
R1GMJ	5,208-	62-	28-	B	
E6BTL	5,082-	77-	22-	B	
A2FNY/1	4,941-	61-	27-	B	
H1RMH	4,455-	55-	27-	B	
A3MXP	3,135-	55-	19-	B	
A3MXP	3,135-	55-	19-	B	
G1RDV	2,808-	36-	26-	B	
R1TFR	2,109-	37-	19-	B	
A6BWH	1,998-	37-	18-	B	
A2OVP	1,539-	27-	19-	C	
A9DXO	600-	20-	10-	B	
H6NBW	312-	13-	8-	A	
R7HOD	120-	8-	5-	A	
A3YKC	4,692-	92-	17-	C	-80
A2BAY	62,550-	417-	50-	B	-40
J1NGT	24-	4-	2-	B	-40
A9NFO	147,168-	876-	56-	C	-20
H1NBN	129,690-	786-	55-	C	-20
H9QNJ	82,620-	510-	54-	C	-20
A1BAX	27,972-	222-	42-	C	-20
A3KIV	5,160-	86-	32-	B	-20
J2EJI	3,024-	42-	24-	C	-20
J7MY	1,458-	27-	18-	B	-20
H3GZB	1,122-	22-	17-	B	-20
J1YXP (JO1JOZ,op)					
	226,746-	1326-	57-	C	-15
H7AFR	179,280-	1245-	48-	C	-15
A3CZY	158,166-	909-	58-	C	-15
H2BCN	74,358-	459-	54-	C	-15
J7NVF	37,224-	282-	44-	B	-15
2KKY	27,192-	206-	44-	C	-15
H5FHC	23,256-	204-	38-	B	-15
3BFS	17,568-	183-	32-	B	-15
8UJY	15,768-	146-	36-	B	-15
1MYG (JK1QNH,op)					
	4,692-	46-	34-	B	-15
1KUH	2,580-	43-	20-	B	-15
I9AMJ/1	510-	17-	10-	B	-15
I3KAH	48-	4-	4-	B	-15
9GZ	24-	4-	2-	A	-15
8JHA	376,362-	2163-	58-	B	-10
7PKU	299,592-	1752-	57-	B	-10
8NFV	277,536-	1652-	56-	B	-10
1AGU	273,180-	1570-	58-	B	-10
3NZC	236,115-	1431-	55-	B	-10
9VSF	212,211-	1241-	57-	B	-10
I1LRQ	194,712-	1159-	56-	B	-10
1SEK	159,264-	948-	56-	B	-10
3YDS	140,112-	834-	56-	B	-10
3GAD	121,275-	735-	55-	B	-10
1VOC	100,647-	633-	53-	B	-10
6BIF	95,625-	625-	51-	B	-10
I1OYB	77,844-	499-	52-	B	-10
I4XKW	73,152-	508-	48-	B	-10
JM1SMY	66,600-	444-	50-	B	-10
JA1QZC	52,380-	388-	45-	B	-10
JA8RJE	42,018-	298-	47-	B	-10
JA5CDL	35,772-	271-	44-	B	-10
JA1KFX	33,516-	266-	42-	B	-10
JR4GPA	32,766-	254-	43-	B	-10
JF2GYH	24,108-	196-	41-	B	-10
JA6EFT	21,360-	178-	40-	B	-10
JR7CDL	17,958-	146-	41-	B	-10
JA1PUK	16,125-	125-	43-	B	-10
JA2DHL	13,764-	124-	37-	B	-10
JH8DHV	13,632-	142-	32-	B	-10
JA1SJV	12,360-	103-	40-	B	-10
JF2KUU	8,928-	96-	31-	B	-10
JH8UQJ	7,830-	90-	29-	B	-10
JE2IFM	6,045-	65-	31-	B	-10
JA6ODU	5,544-	66-	28-	B	-10
JA5EO	5,490-	61-	30-	B	-10
JE8PHS	4,899-	71-	23-	B	-10
JA3GLU	4,131-	81-	17-	B	-10
JJ1RBF/7	2,295-	45-	17-	A	-10
JH1PXY	1,392-	29-	16-	B	-10
JO1MCC	756-	18-	14-	B	-10
JR7BKB	432-	16-	9-	B	-10
JA1IVW	324-	18-	6-	B	-10

Ogasawara

JL1BYZ/JD1	38,640-	184-	70-	B	

Jordan

JY9SR	70,080-	320-	73-	B	

Asiatic RSFSR

RX9J	297,432-	918-	108-	C	
UA9OS	46,230-	230-	67-	C	
UW6CW	23,814-	147-	54-	B	
UZ9CYP	23,055-	145-	53-	C	
UA9LFI	15,840-	110-	48-	B	
UA9SN	2,346-	34-	23-	C	
UW9LA	176,643-	1033-	57-	B	-20
UA9FM	105,336-	627-	56-	C	-20
UW0CV	24,045-	229-	35-	C	-20
UW9CD	171,360-	1020-	56-	C	-15
UA0XAK	110,376-	657-	56-	B	-15
UA0ZDD	98,838-	646-	51-	C	-15
UA9LCB	23,598-	171-	48-	B	-15
UW0SR	20,064-	152-	44-	B	-15
UA9CUA	1,995-	35-	19-	B	-15
UA0FF	189,378-	1169-	54-	C	-10
UA9MEK	15-	5-	1-	B	-10

Armenia

UG6JJ	17,010-	105-	54-	B	

Tadzhikistan

UJ8KA	40,572-	294-	46-	C	-20

Kazakhstan

UL7CC	4,002-	46-	29-	C	
UL7OB	20,094-	197-	34-	C	-10
UL8LWF	5,313-	77-	23-	C	-10
RL7RL	1,326-	34-	13-	B	-10
UL8GDN	672-	28-	8-	B	-10

Kirghizia

UM0MO	113,712-	412-	92-	C	
UM9TWA	58,506-	398-	49-	C	
UM8MTA	288-	12-	8-	C	-15
UM8MGM	2,064-	43-	16-	B	-10

Hong Kong

VS6WO (NA9P,op)					
	77,724-	381-	68-	C	

India

VU2NBT (AA4U,op)					
	10,824-	88-	41-	C	
VU2GDG	43,824-	332-	44-	B	-10
VU2UR	2,280-	40-	19-	B	-10

Europe

Portugal

CT1QF	58,316-	247-	76-	B	
CT1BWW	15,840-	132-	40-	B	
CT1AOZ	8,004-	92-	29-	C	-160
CT1DGK	8,925-	119-	25-	B	-80
CT1CQK	215,412-	1238-	58-	C	-20
CT1BOP	438,828-	2522-	58-	C	-15
CQ5T (CT1DTH,op)					
	446,823-	2613-	57-	C	-10
CT1AHU	133,320-	808-	55-	B	-10
CT1DIZ	54,144-	384-	47-	B	-10
GB4EV/CT1	31,860-	236-	45-	B	-10
CT4HA	11,025-	105-	35-	B	-10

Azores

CU2AF	69,690-	505-	46-	C	-80
CU2CE	12,096-	126-	32-	B	-40

Federal Republic of Germany

DL6FBL	3,158,802-	4658-	226-	C	
DL8PC	1,623,504-	2384-	227-	C	
DL7ON	768,000-	1600-	160-	C	
DK7ZT	533,820-	1085-	164-	C	
DL8SDC	124,800-	400-	104-	B	
DK4ID	74,160-	309-	80-	B	
DJ4FJ	37,515-	205-	61-	B	
DF6XC	33,390-	159-	70-	B	
DF3IS	19,968-	128-	52-	B	
DK7FP	15,288-	98-	52-	B	
DF5BM	12,810-	122-	35-	C	
DK8AX	1,056-	22-	16-	A	
DJ2YE	240-	10-	8-	B	-40
DF2MC	88,935-	539-	55-	C	-20
DL3YBM	89,262-	551-	54-	C	-15
DL4GBR	2,340-	39-	20-	B	-15
DF2UU	327,627-	1851-	59-	C	-10
DJ1ZU	165,000-	1000-	55-	C	-10
DJ8BX	22,140-	180-	41-	B	-10
DL1MAC	4,290-	65-	22-	C	-10

Spain

EA7GTF	1,104,300-	2048-	180-	B	
ED4KK	544,620-	1252-	145-	B	
EA1CON	331,200-	690-	160-	C	
EA7BHO	248,862-	703-	118-	B	
EA7FZH	231,852-	556-	139-	B	
EA7FUR	207,081-	519-	133-	C	
EA2IA	160,992-	516-	104-	C	
EA1CYV	91,476-	363-	84-	B	
EA5DCL	75,492-	466-	54-	B	
EA3GCJ	70,602-	287-	82-	B	
EA5CPH	51,030-	210-	81-	B	
EA3NA	45,840-	191-	80-	B	
EA5JC	35,424-	144-	82-	B	
EA5CGU	33,534-	138-	81-	B	
EA7BYM	27,972-	148-	63-	B	
EA1EVW	20,943-	179-	39-	B	
EA1AW	20,085-	103-	65-	B	
EA3EJI	17,901-	117-	51-	B	
EA5FYJ	14,178-	139-	34-	B	
EA5EFV	12,474-	77-	54-	B	
EA3DLO	7,437-	67-	37-	B	
EA3GCV	6,930-	70-	33-	C	
EA1AHA	6,888-	82-	28-	B	
EA1DFH	4,125-	55-	25-	B	
EA1AK	23,166-	234-	33-	B	-40
EA3EXW	2,160-	48-	15-	C	-40
EA7FTR	88,452-	546-	54-	B	-20
EA5GGK	5,865-	85-	23-	B	-20
EA3KT	20,202-	182-	37-	B	-15
EA1BCU	8,832-	92-	32-	B	-15
EA3GBU	136,500-	875-	52-	C	-10
EA3CZM	84,525-	575-	49-	B	-10
EA4CRU	18,468-	162-	38-	A	-10
EA1YY	7,968-	83-	32-	B	-10

Ireland

EI8AU	60,945-	239-	85-	A	

France

F2CW	2,428,596-	3582-	226-	C	
F6AOJ	1,276,128-	2016-	211-	C	
FV8NDX	315,735-	679-	156-	C	
F1BEG	122,715-	405-	101-	A	
FE6DRP	53,970-	267-	70-	B	
F8WE	36,783-	201-	61-	B	
F6ENT	33,654-	142-	79-	B	
F6CLM	3,657-	53-	23-	B	
F1HWB	5,568-	64-	29-	B	-15
FE1JND	1,125-	25-	15-	B	-15
F5IN	68,096-	432-	51-	C	-10
F1JDG	22,800-	200-	38-	B	-10
FB1OMN	3,096-	43-	24-	B	-10

England

G2QT	539,676-	1052-	171-	B	
G6MFO	108,585-	381-	95-	C	
G4XKR	90,144-	313-	96-	C	
G4XOM/P	15,180-	115-	44-	B	
G4VMM	8,856-	123-	24-	C	-40
G3FXB	376,014-	2161-	58-	C	-20
G4UDU	297,198-	1738-	57-	C	-10
G4OJH	270,522-	1582-	57-	C	-10

Scotland

GM3SCL	251,877-	743-	113-	C	
GM4HOF	138,651-	409-	113-	B	
GM4OBK	3,120-	52-	20-	B	-160
GM4CHX	64,428-	413-	52-	B	-10

Wales

GW5NF	132,867-	777-	57-	C	-15
GW4BLE	459,819-	2688-	57-	C	-10
GW8ARK	445,988-	2608-	57-	C	-10

Hungary

HA8XX	1,091,340-	1935-	188-	C	
HA6NW	89,700-	325-	92-	B	
HA4XX	17,010-	135-	42-	B	
HA6LC	136,290-	826-	55-	C	-15
HA3FL	3,000-	50-	20-	B	-15
HA1XR	278,574-	1601-	58-	C	-10
HA8DR	265,104-	1578-	56-	C	-10
HA5HO	95,040-	576-	55-	C	-10

Switzerland

HB9ADD	190,512-	504-	126-	A	
HB9DX	29,328-	208-	47-	C	-10

Liechtenstein

HB0/WB8HYL	82,656-	336-	82-	B	

Italy

I6FLD	2,153,340-	3418-	210-	C	
IK1GPG	418,275-	825-	169-	B	
IN3XUG	149,766-	458-	109-	C	
IK1HSS	139,956-	428-	109-	C	
I0KHP	116,820-	354-	110-	A	
IK8LWA	100,161-	359-	93-	B	
IK3ITX	77,988-	268-	97-	B	
IT9ZWV	31,293-	171-	61-	B	
IK3JLU	26,730-	185-	54-	A	
IK7IJP	10,044-	108-	31-	B	
IK2LCY	7,254-	78-	31-	B	
IK2IAR	5,952-	62-	32-	B	
IK2IKW	5,628-	67-	28-	C	
I5OYY	52,416-	416-	42-	C	-40
I4FYF	265,734-	1554-	57-	C	-20
IO8RS	104,496-	622-	56-	C	-20
I0YQV	16,116-	158-	34-	B	-20
IT9LPN	12,480-	130-	32-	C	-20
IK4GNH	117,264-	698-	56-	C	-15
IK8AZG	58,482-	361-	54-	C	-15
IU4K	435,366-	2546-	57-	C	-10
I4RHP	303,354-	1774-	57-	C	-10
I2PJA	299,079-	1749-	57-	C	-10
IN3QBR	270,180-	1580-	57-	C	-10
IV3TDE	265,392-	1562-	57-	C	-10
IK2AEQ	175,617-	1027-	57-	B	-10
IV3BMV	86,022-	531-	54-	C	-10
IK6FJV	42,930-	318-	45-	C	-10
IK0CNA	21,672-	172-	42-	C	-10
IK0MMI	17,784-	156-	38-	B	-10
IK0FUX	14,274-	122-	39-	B	-10
I4CSP	12,480-	104-	40-	B	-10

Sardinia

IS0LLJ	15,510-	110-	47-	B	

Norway

LA4TE	394,800-	940-	140-	C	
LA0FV	138,503-	511-	91-	C	
LA2AD	21,462-	146-	49-	B	
LA9WO	20,352-	128-	53-	C	
LA1KQ	17,940-	130-	46-	B	
LA1XDA	14,652-	111-	44-	A	
LA5KK	9,603-	97-	33-	B	
LA3YEA	149,118-	857-	58-	C	-20
LA7MFA	10,098-	102-	33-	C	-20
LA9HW	158,424-	943-	58-	B	-10
LA4YW	59,058-	386-	51-	B	-10
LA5JX	33,768-	268-	42-	A	-10
LA9DFA	30,114-	239-	42-	B	-10
LA3JT	22,920-	191-	40-	B	-10
LA1PHA	17,484-	124-	47-	B	-10

Bulgaria

LZ2WM	316,365-	805-	131-	B	
LZ1KNP	51,246-	219-	78-	B	
LZ1OR	37,881-	183-	69-	B	
LZ1KOZ	756-	21-	12-	C	-160
LZ1KXA (LZ3ZZ,op)					
	48,336-	424-	38-	C	-40
LZ5W	367,629-	2077-	59-	C	-15
LZ6G (LZ2RS,op)					
	131,328-	768-	57-	B	-10
LZ5N	74,934-	543-	46-	C	-10
LZ1V (LZ3ZZ,op)					
	2,640-	40-	22-	B	-10

Aland Island

OH0PA	12,616-	89-	46-	B	

Finland

OH1AD (OH1WZ,op)					
	1,872,276-	2876-	217-	C	
OH6YF	1,728,810-	3033-	190-	C	
OH6SU	73,158-	274-	89-	B	
OH2BLV	27,450-	150-	61-	C	
OH7NW	26,169-	143-	61-	B	
OH1MMA	5,220-	60-	29-	B	
OH1MDR	108-	6-	6-	B	
OH3TR	263,436-	1514-	58-	C	-20
OH2PM	261,696-	1504-	58-	C	-20
OH8LQ	100,485-	609-	55-	C	-20
OH5OL	4,140-	80-	23-	C	-20
OH6NIO	212,895-	1245-	57-	C	-15
OH8NYO	3,588-	52-	23-	B	-15
OH1MIE	103,350-	650-	53-	B	-10
OH6MFN	64,950-	433-	50-	B	-10
OH1MLB	45,570-	310-	49-	B	-10
OH4MCV	19,603-	161-	41-	B	-10
OH3WD	14,742-	126-	38-	C	-10
OH2MKX	12,075-	115-	35-	B	-10
OH6GD	6,960-	80-	29-	C	-10
OH4NQJ	1,680-	35-	16-	B	-10
OH2MDC	264-	11-	8-	B	-10
OH6MIL	144-	8-	6-	B	-10

Czechoslovakia

OK1ALW	2,835,294-	3971-	238-	C	
OK1KZ	80,868-	293-	92-	B	
OK1DQT	78,396-	278-	94-	B	
OK1DKS	43,260-	206-	70-	A	
OK1DXW	41,814-	202-	69-	B	
OK2BHM	34,686-	248-	47-	B	
OK2HI	5,382-	69-	26-	B	
OK2BAT	897-	19-	11-	A	
OK3CXS	1,386-	33-	14-	B	-20
OK3YDP	855-	19-	15-	B	-20
OK3KAG	185,319-	1047-	59-	B	-15
OK2HBY	141,810-	815-	58-	B	-15
OK1DIG	39,621-	281-	47-	B	-15
OK2PCL	22,113-	189-	38-	B	-15
OK3YCA	18,012-	158-	38-	B	-15
OK2SWD	11,424-	112-	34-	B	-15
OK2VX	6,468-	77-	28-	B	-15
OK3KFO (OK1PC op)					
	1,674-	31-	18-	C	-15
OK1ANS	1,248-	32-	13-	B	-15
OK1MNV	1,209-	31-	13-	B	-15
OK2PAY	122,472-	756-	54-	B	-10
OK1MGW	44,850-	299-	50-	B	-10

Belgium

ON8WN	240-	10-	8-	A	-40
ON4XG	25,110-	186-	45-	B	-15
ON5EU	1,053-	27-	13-	B	-15
ON6NL	23,124-	164-	47-	B	-10

Denmark

OZ5EV	513,120-	1069-	160-	C	
OZ1BUR	210,336-	626-	112-	B	
OZ1LRT	90,954-	326-	93-	B	
OZ7AX	35,577-	177-	67-	B	
OZ1FNX	21,546-	126-	57-	B	
OZ6PI	20,520-	120-	57-	B	
OZ3FS	6,336-	66-	32-	B	
OZ1KQP	4,437-	51-	29-	B	
OZ8T	4,257-	43-	33-	B	
OZ1DYI	330-	11-	10-	B	-15
OZ1INN	66,240-	480-	46-	B	-10
OZ1ACB	15,960-	140-	38-	B	-10
OZ1LDM	9,975-	95-	35-	B	-10
OZ1FMO	3,498-	53-	22-	B	-10

Netherlands

G4SYD/PA	651,580-	1494-	190-	C	
PA0KDM	150,177-	443-	113-	B	
PA2JCG	43,734-	197-	74-	B	
PA3ELD	31,758-	158-	67-	B	
PA0DJ	16,065-	105-	51-	B	
PA3DWA	13,635-	101-	45-	A	
PA3EXJ	12,360-	103-	40-	A	
PA0CF	12,005-	87-	46-	B	
PA0YN	9,024-	94-	32-	B	
PA0KHM	4,998-	49-	34-	B	
PA0DOM	2,442-	37-	22-	C	
PA3EPN	45,072-	313-	48-	C	-40
PA0QX	103,194-	637-	54-	C	-15
PA0BFO	10,176-	106-	32-	B	-15
PA3BZV	38,514-	262-	49-	B	-10
PA2REH	2,967-	43-	23-	B	-10

Sweden

SK0LM	814,215-	1751-	155-	C	
SM3CER	362,610-	765-	158-	C	
SM4SET	113,625-	505-	75-	B	
SM6BDS	93,888-	326-	96-	B	
SK3AH (SM3COL,op)					
	92,925-	295-	105-	C	
SM6HTO	48,600-	324-	50-	C	
SM5DAC	47,742-	218-	73-	C	
SM2TEZ	41,961-	197-	71-	B	
SM4BTF	32,736-	176-	62-	C	
SM5PPS	19,584-	128-	51-	B	
SM7BZV	14,445-	107-	45-	B	
SM6HBV	6,510-	62-	35-	C	
SM5ARB	495-	15-	11-	B	
SM6ORB	88,236-	516-	57-	C	-20
SM6BJI	144,837-	847-	57-	C	-10
SM5BDA	36,709-	253-	51-	B	-10
SM6MVL	11,400-	100-	38-	B	-10
SM3OAU	7,308-	87-	28-	C	-10
SM6HRR	4,425-	59-	25-	B	-10
SM0FM	2,646-	49-	18-	B	-10

Poland

SP9PT	133,245-	423-	105-	C	
SP4GFG	93,492-	318-	98-	B	
SP3BYZ	78,936-	299-	88-	C	
SP6DVP	21,870-	135-	54-	B	
SP9RVD	17,100-	114-	50-	B	
SP9RQU	7,752-	68-	38-	B	
SP4KEV	4,392-	61-	24-	C	
SP6LUV/A	5,037-	73-	23-	B	-20
SP2AHD	1,599-	41-	13-	B	-20
SP5GIQ/7	92,718-	608-	51-	B	-15
SP3RBI	24,231-	197-	41-	A	-15
SP8NCJ	19,656-	182-	36-	C	-15
SP2PIK	14,175-	135-	35-	B	-15
SP6TPM	240-	10-	8-	B	-15
SP5PBE (SP5JTF,op)					
	119,184-	764-	52-	B	-10
SP2JKC/A	101,475-	615-	55-	C	-10
SP2FAP	25,929-	201-	43-	B	-10
SP8BJH	3,180-	53-	20-	B	-10

Greece

SV1NA	5,973-	61-	31-	A	

Franz Josef Land

4K2OIL	78,705-	495-	53-	C	-20
4K2OT	220,077-	1287-	57-	C	-15

Kaliningrad

UA2EC	10,416-	112-	31-	B	-15

European Russian RSFSR

UV3DF	155,103-	533-	97-	C	
UA3GM	75,366-	318-	79-	C	
UA4NCI	47,088-	218-	72-	C	
UA4NC	22,875-	125-	61-	C	
UA4CM	5,856-	61-	32-	B	
UZ6LZL (UA6-150-847,op)					
	5,871-	103-	19-	B	-40
UA6LTI	30-	5-	2-	B	-40
UA3DRB	79,659-	501-	53-	C	-20
RA4LW	48,230-	335-	46-	C	-20
UA1ANA	8,700-	100-	29-	B	-20
UA3PNN	6,438-	74-	29-	B	-20
UA6LDX	101,232-	592-	57-	C	-15
UA6LLT	19,494-	171-	38-	C	-15
UV6LAP	10,368-	108-	32-	C	-15
UA3DPX	5,694-	73-	26-	C	-15
UV3DCR	264-	11-	8-	A	-15
RA3QR	95,628-	613-	52-	C	-10
RA3RQT	20,460-	155-	44-	C	-10
UA4HLD	17,316-	158-	37-	C	-10
RA3VA	15,228-	141-	36-	B	-10
RA4PR	14,964-	172-	29-	C	-10
UA3DCP	9,309-	107-	29-	A	-10
UV3AHM	5,325-	71-	25-	B	-10
UA4FBK	1,683-	33-	17-	A	-10
UA3TGO	459-	17-	9-	C	-10

Ukraine

UT5DK	1,474,902-	2574-	191-	C	
RB5WA	1,013,544-	2011-	168-	C	
RB4IRO	374,454-	879-	142-	C	
RT5UO	49,329-	203-	81-	C	
UB5QJN	29,382-	166-	59-	C	
UB4TWL	24,480-	136-	60-	C	
UB4JO	19,800-	120-	55-	A	
UB3MW	14,784-	112-	44-	B	
UT5UGR	10,680-	89-	40-	B	
UB5AFI	2,550-	34-	25-	A	
RT4UA	2,016-	48-	14-	C	-80
UB5IFN	570-	19-	10-	C	-40

UB5IJG 144,180- 801- 60- C -15
UB5PAW 124,410- 715- 58- B -15
UT4UZ 108,054- 667- 54- C -15
RB5GW 83,475- 525- 53- C -15
RB5TK 5,922- 62- 27- B -15
RB5ICY 3,060- 51- 20- B -15
RB5VA 293,664- 1748- 58- C -10
UB5IFB 23,124- 188- 41- A -10
UB4JFV 10,881- 117- 31- B -10
UB4JJR 8,217- 83- 33- B -10
RB5UO 7,704- 107- 24- C -10
UB5FBG 7,569- 97- 29- B -10
UB5VDA 5,475- 73- 25- B -10
UB5VAP 2,394- 42- 19- B -10

Byelorussia

UC2LB 210- 10- 7- C -80
RC2AZ 13,182- 169- 26- C -40
UC2AB 8,352- 96- 29- B -10

Moldavia

RO4OW 44,712- 207- 72- B
UO5ON 42,813- 219- 67- C
RO5OO 17,088- 176- 32- C -20

Lithuania

LY3BH 963,336- 1804-178- C
LY3PBG 7,623- 77- 33- A
LY2BTA 247,950- 1450- 57- B -15
LY2BPN 24,066- 191- 42- B -10

Latvia

YL1WW 2,350,881- 3679-213- C
YL2II 2,451- 43- 19- B
YL1WC 114,408- 681- 56- C -20
YL2LW 43,005- 305- 47- C -10
UQ2GTF 40,590- 330- 41- B -10

Estonia

ES1RA 260,406- 782-111- C
ES2RJ 41,310- 305- 45- C -40
ES4NG 4,320- 60- 24- B -20
UR2RER 270- 10- 9- C -20
ES2RR 315,636- 1814- 58- C -15

German Democratic Republic

Y22WF 237,363- 623-127- B
Y49LF 88,452- 324- 91- B
Y31EM 60,522- 262- 77- B
Y72SL 51,480- 195- 88- B
Y56VF 40,002- 226- 59- C
Y67UL 18,224- 104- 52- B
Y23TN 15,960- 95- 56- B
Y32WF 7,029- 71- 33- C
Y33UL 576- 16- 12- C-160
Y24XA 16,029- 137- 39- B -15
Y34XF 4,752- 66- 24- B -15
Y33VL 166,992- 994- 56- C -10
Y22JJ 133,164- 822- 54- C -10
Y24GE 71,400- 425- 56- B -10
Y32EE 31,968- 222- 48- B -10
Y21LF/P 2,460- 41- 20- B -10
Y32RD 1,440- 32- 15- B -10
Y26KL 828- 23- 12- B -10
Y25ML 594- 22- 9- B -10

Romania

YO3DIA 47,163- 199- 79- B
YO3DCO 19,710- 146- 45- C
YO9HP 9,486- 102- 31- C -20
YO9AHX 936- 24- 13- B -15
YO8ROO 2,160- 40- 18- B -10

Yugoslavia

YU3DAS 37,536- 184- 68- B
YU1EXY 62,235- 461- 45- C -80
4N1A 23,532- 212- 37- C -80
YU3QI 2,295- 51- 15- C -80
YU7AV 17,226- 174- 33- C -40
YU1KQ 357,137- 2147- 57- C -20
YZ1E 339,300- 1950- 58- C -20
YT3T 333,558- 1917- 58- C -20
YZ7V (YU7ECD,op) 262,827- 1537- 57- C -20
YU7FT 4,761- 69- 23- C -20
YZ3A (YU3WE,op) 300,060- 1667- 60- C -15
YU2MP 99,584- 386- 48- C -15
YU3FW 450,576- 2682- 56- C -10
4N4I 335,820- 1930- 58- C -10
YU2W 335,502- 1952- 57- C -10
Y14D 315,000- 1875- 56- C -10
YZ2S 295,104- 1896- 58- C -10
YT3SW 214,434- 1254- 57- C -10
YU1JW 127,518- 802- 53- C -10
YU7SF 19,920- 166- 40- C -10
YU7KM 1,890- 35- 18- C -10

North America

Guadeloupe

FG5R (W7EJ,op) 6,468,489- 6933-311- C
FG5/KA3DSW 3,181,572- 3972-267- C

Martinique

FM5CD 1,314,048- 1856-236- C

Dominican Republic

HI8LUZ 250,992- 1494- 56- B
(P1DMX/HI8 [illegible] B-160
HI8RFB 29,184- 258- 38- B -20

Panama

HP1COO 42,272- 396- 44- B -10

St Lucia

J6LSN (KJ8G,op) 1,686,000- 2248-250- C

Alaska

AL7CQ 2,481,276- 3794-218- C
NL7GP 71,370- 305- 78- C
NL7RA 41,088- 214- 64- B
WL7BIL 18,695- 115- 31- C -80
WL7E 390,735- 2285- 57- C -10

Virgin Islands

K1DQV/KP2 4,048,023- 4669-289- C

Puerto Rico

KP4FP 319,770- 1870- 57- B -20
NP4CC 497,292- 2858- 58- C -15
WP4WD 132,888- 791- 56- B 10

Guatemala

TG9AJR 81,855- 535- 51- B -40

Costa Rica

TI2DU 4,834,200- 5755-280- C

Antigua and Barbuda

V2/G6QQ 3,807- 47- 27- B

Turks and Caicos Islands

VP5JM 1,685,711- 2907-191- B

Mexico

XE2GAT 389,484- 698-166- B
XE1AVM 2,952- 41- 24- B -20
XE1BEF 82,514- 453- 46- B -10
XE2HWH 13,110- 115- 38- B -10

Cayman Islands

ZF2NE/ZF8 2,598,096- 3832-226- B
ZF2OZ 376,992- 714-176- B

Barbados

8P6SH 272,136- 1564- 68- B -16

Oceania

Philippines

KE9A/DU3 101,505- 505- 67- C

Guam

N7OF/KH2 4,335- 85- 17- C -80
KH2D 187,088- 944- 59- C -10

Johnston Island

AH3C 5,042,880- 5440-309- C

Hawaiian Islands

WH6R/KH6 4,312,122- 4682-307- C
NH6T 115,239- 359-107- A
KH6DLW 179,256- 1067- 56- B -10
NH6SR 117,450- 725- 54- C -10
KH6FQ (N/T) 78,375- 475- 55- B -10

Marshall Islands

V73AQ 764,595- 1307-185- C

Eastern Kiribati

T32AF 141,075- 855- 55- C -80

Federal States of Micronesia

V63AA (KB3R,op) 8,048- 63- 32- B

Australia

VK2AYK 59,436- 254- 78- C
VK5GN 40,803- 203- 67- B
VK2GAH 16,416- 152- 56- B -10

Indonesia

YB3ASQ 626,751- 1251-167- C
YB2FRR 273,750- 730-125- C
YC2IAB 8,112- 104- 26- B -15
YC2BKJ 6,942- 89- 26- B -15
YC2JWB 5,070- 65- 26- B -15
YC2OK 1,008- 21- 16- A -15
YC3OSE 32,736- 248- 44- B -10
YB2CTW 25,542- 198- 43- C -10
YC0RBG 25,155- 215- 39- B -10

New Zealand

ZM1IM 29,280- 160- 61- B

Western Samoa

5W1HK 2,277,516- 3581-212- C

South America

Chile

CE4MWK 807,570- 1994-135- C
CE6EZ 281,532- 1618- 58- C -20

Bolivia

CP1FF 103,095- 395- 87- B

French Guiana

FY4FC 1,124,907- 2329-161- B

Ecuador

HC1CYB 1,249,704- 2042-204- C
HC1HC 459,708- 2842- 58- C -15
HC1HT 132,000- 800- 55- B -15

Colombia

HK3JJH 1,596,456- 2334-228- C
HK7MOC 55,404- 288- 81- B
HK1LDG 46,494- 369- 42- C -80

Argentina

LU1FNH 231,492- 764-101- B
LF3GADX 85,347- 327- 87- B
LY1D 9,288- 86- 36- C
AY9F 185,535- 1085- 57- C -15
LQ21DX 182,700- 1050- 58- B -15
L3E (LU8DPY,op) 577,440- 3208- 60- C -10
LP3F 166,320- 990- 56- B -10
LU6EJP 131,175- 825- 53- C -10
LQ24DX 86,424- 554- 52- B -10

Peru

OA4ZV 1,025,727- 1889-181- B

Aruba

P40V (AI6V,op) 8,031,456- 8472-316- C

Netherlands Antilles

PJ9JT 198,680- 1204- 55- B -15
PJ9M (OH6RM,op) 689,130- 4030- 57- C -10

Brazil

PT7NK 414,963- 981-141- C
ZW5B (PY5EG,op) 367,744- 2056- 58- C -20
ZZ1NEZ 62,883- 411- 51- C -15
ZX5C (PY5CC,op) 641,250- 3750- 57- C -10
ZY3TD 56,232- 426- 44- B -10
PT2TF 23,349- 181- 43- C -10

Surinam

PZ5DX 131,175- 825- 53- C -10

Venezuela

YV1CP 395,850- 910-145- C
YV1DRK 12,852- 126- 34- C-160
4M5T (YV5JBI,op) 101,736- 628- 54- C -40
4M5Z 106,236- 681- 52- B -15
YV6BFE 85,488- 548- 52- B -15
4M5Y 361,704- 2153- 56- B -10
YV1EQW 91,434- 622- 49- B -10
YV6BXN 90,558- 559- 54- C -10
4M7A 45,504- 316- 48- B -10
YV1ELM 2,178- 33- 22- B -10

Trinidad and Tobago

9Y4BU 2,904- 44- 22- B

Single Operator, Assisted

Europe

SP2UUU 24,768- 192- 43- B

Multioperator

Single Transmitter

Asia

JE2YRD (JA2KVD,JA9SSY,JF2EOC, JI2KVW,JI3JGJ,JR7OMD,ops) 2,057,157- 2943-233- C
JA7YAA (JJ3CNL,JE7s HLZ,JZC,JE8AWL, JH8ORW,ops) 1,940,088- 2824-229- C
JA2ZZZ (JF2JUU,JH2s MYN,UVL,JO1BVI, ops) 1,180,728- 2116-186- C
JA6YBR (JF1DHS,JF6DEA,JG6GNR, JI6BRB,JR6GKT,ops) 456,715- 1235-123- B
JE3ZFS (JK3HZH,JL3MCM,JO3NZW,ops) 415,860- 956-145- C
RX6C (RW6CA,UA6CDX,UW6s CA,CJ, CK,CM,CN,CW,ops) 1,913,160- 2980-214- B
UZ0LWC (UW0s LI,LZ,UA0-103-454,ops) 1,090,410- 1913-180- C
RZ9MYA (UA6WX,UA9-146-79,ops) 332,262- 678-126- C
UZ0SXF (UA0S SRO,124-489,UW0SN,ops) 120,270- 422- 95- B
UZ9I WE (+ops) 507- 13- 13- C
UL8LWZ (RA6XA,RL7LAH,UL7-026-177, ops) 479,556- 1211-132- C
UL8CWW (UL7s 028-283,028-291,ops) 1,980- 33- 20- C
XX9KA (+KU9C) 253,008- 783-112- C

Europe

ED3QD (EA3s BOW,BOX,DGQ,EIO,ops) 1,454,640- 2320-209- B
EA5RCM (EA5s ADW,AEZ,AGB,AIF,AIE, FYA,HFM,TD,ops) 1,102,200- 1670-220- C
ED3IN (EA3S CCI,DMN,IN,EC3CLV,ops) 211,464- 534-132- B
EI7M (EI3DP,EI4s BZ,DQ,SFK,SFT,EI6BT, EI8s EI,GS,ops) 3,130,821- 4479-233- C
EI5V (EI2s CA,GB,EI3s DG,GE,EI5s DI,HD,EI6EW,EI8s CC,CE,ops) 1,978,032- 2642-232- C
F6CTT (+F6s ARC,BEE) 5,041,326- 6133-274- C
HG1S (HA1s AH,DAC,DAE,TJ,TW,ops) 2,984,976- 4364-228- C
HA3KHC (+ops) 57,750- 250- 77- C
HB9AUS (+HB9s BLQ,CFU,CXZ,SFD,ZE, HE9EEX) 2,556,720- 3551-240- C
HB9Z (HB9s BZT,EE,ops) 12,096- 126- 32- B
I2SVA (+I2FUG) 1,815,660- 2882-210- C
IK2LEW (+IK2GWH) 584,568- 1412-138- C
I4MJQ (+I4s GOC,MCN,IK4DDI) 415,656- 1004-138- C
IK0NWD (+IK0NWE) 357,000- 850-140- B
LA1T (LA6UL,LA9s JFA,PP,UX,ops) 918,873- 1587-193- C
OE2XEL (OE2s CHN,EJN,GEN,LCM, MON,SCM,VEL,ops) 1,874,316- 2961-211- C
OH1AA (OH1s CO,HD,JD,SY,ops) 689,595- 1483-155- C
OH3GZ (+ops) 1,800- 40- 15- B
OK1OAZ (OK1FUA,OK1-31506,ops) 1,855,586- 2666-207- C
OK3KFF (+ops) 1,137,405- 1985-191- C
OK2KYC (+ops) 111,744- 368- 96- B
OK2KLI (OK2s BKH,PLH,VIA,ops) 24,066- 191- 42- B
OK1KCF (+ops) 15,408- 107- 48- B
OK3KXR (+ops) 9,000- 100- 30- B
OK3KUN (+ops) 7,722- 78- 33- B
OK2KMR (OK2s BOZ,SSS,ops) 6,825- 65- 35- B
OK2KVI (+ops) 5,814- 57- 34- B
OK2KLS (+ops) 897- 23- 13- B
OZ7HVI (OZ1s AXG,IV,ops) 84,024- 389- 72- C
PI9IRC (PA3s EZL,EWN,PA0HNB,DA1s KG,KT,DA2EF,ops) 444,720- 1090-136- C
SK2QG (SM2s CFG,LIY,NOG,ODB,SM3s SXU,TOM,ops) 319,194- 771-138- C
T70A (I2s UIY,YSB,IK2BTI,ops) 3,405,636- 4979-228- C
UZ2FWA (UA2s FAW,GEA,FF,FJ,FM,FZ, ops) 2,518,278- 3527-238- C
UZ5I,WE (UV6PL,UA6s 105-1403,105-1404, ops) 417,852- 954-146- C
UZ3QYN (+ops) 374,262- 938-133- C
UZ3MWD (UA3s 168-50,168-308,168-1105, ops) 339,399- 877-129- C
UZ6HXK (UA6s 108-1838,108-1872, 108-1873,ops) 217,128- 684-109- C
UB4LWA (RB5LTG,UB5s I PZ,-079-345,ops) 233,520- 580-139- C
UB4QWW (+ops) 210,000- 700-100- C
UB4LXI (+ops) 6,000- 80- 25- B
UC1AWC (UC2s ABC,SDJ,-005-323,ops) 612,000- 1360-150- C
ES1WQ (+ops) 33,066- 167- 66- C
Y51CO (Y51s OO,XO,Y54NL,ops) 534,852- 1074-166- C
Y73CA (Y73s XA,YA,ops) 6,630- 185- 66- B
YO7KAJ (YO7s CKP,NA,ops) 144,576- 502- 96- B
YT7A (YU7s BJ,GO,GW,OA,ops) 1,906,137- 2983-213- C
YT5R (YU5s GB,GX,JA,4N5s BFC,GFX, OWY,KAW,ops) 539,520- 1124-160- B
YZ7Z (+ops) 48,240- 335- 48- B

North America

HI5B0UD (HI3s AMF,HBD,HCE,JH,JMP, LFE,LRR,JP1DMX/HI8,ops) 4,248,924- 4987-264- C
J34A (K3OMI,K4LTA,N4FKO,J6LMV,ops) 6,024,834- 6563-306- C
KL7TG (+N6IV,KL7R,NL7RE) 845,819- 1461-193- C
P,I4V (N2AWM,AA4V,W4OVU,WD4JNS, WS4E,ops) 500,490- 1005-166- C
VP2E (VP2EXX,AA4NC,JA2FZD, WB6SHD,ops) 9,764,490- 9745-334- C
2F2JR (KF6OG,N6RJ,ZF1MA,ops) 7,000,874- 6987-334- C

Oceania

FO8XXL (W6s KG,OI,ops) 144,648- 492- 98- B

South America

FY/KD3FK (+FY/N4QDX) 616,986- 1362-151- B
LT5F (LU5s FCI,FIC,ops) 543,768- 1304-139- B
PJ8B (K2NG,KR2W,ops) 8,692,464- 8888-326- C
PT2LS (+ops) 1,248- 32- 13- B

Two Transmitter

Africa

EA9IE (+EA9AM) 585,818- 934-209- B

Asia

JA8YBY(JO1DFG,JH8s PNE,WBR, JR8DHA,ops) 2,293,147- 3573-213- C
JA6YJS(JS1PWV,JF4FTK,JG4SUN,ops) 1,124,820- 2083-180- B
JR1YDT (+ops) 1,103,394- 2128-173- C
JA9ZJI(JA9XKL,JH9s CAT,EPA,IOY, JR9s GQP,HNJ,ops) 526,635- 1329-141- C

Europe

4U1ITU (IK2s BHX,GPV,GJN,JUB,MRZ, ops) 3,193,596- 4669-228- C
OH1AF (OH1NOA,OH1-200,ops) 830,208- 1504-184- C

Oceania

K6GSS/KH6 (+AH6KE,KH6XT,NH6SI) 4,481,583- 5093-277- C

Unlimited

Asia

JA1YDU (JP1JFG,JQ1BRW,JE7WBI,JH9s LFE,NZN,ops) 2,277,405- 3435-221- B
HZ1AB (DY1CSW,K1VBM,N4KT,N8AE, SM0CXU,ops) 773,415- 1685-153- C

Europe

I3MAU (+I3s EVK,JSS,KVW,ON,QJZ, IN3DYG) 5,551,902- 7173-258- C
4N2N (YU2s CCR,NK,UR,YT2JB,ops) 3,112,647- 4453-233- C

North America

4G2A (XE2s ABB,AGU,CRN,FEF,JL,JRN JSL,LF,JJE,BG,RNC,SPI,, 11,137,392- 11049-336- C

South America

2Z4Y (PY4s BA,BAB,MI,OY,VD,ops) 962,569- 1997-159- C

Checklogs:

3DA0BL, 4K2BDU, 4K4BAE, 4M3B, 4S7WP, AA4WX, C50CDP, CT1AOZ, CT1ZG, CX8AC, DJ7EE, DK8JW, EA4CP, EA5BK, EA5DIT, EA5EGT, EA5FFQ, EA5GGV, EA7XC, EA8AKN, ES2JJ, GI0CCH, G3PHI, HA1XH, HA4XO HK3MAH, IK2JEX, IK7BPV, JH1YDT, JR1XKU, K3DDD, K3PBU, K5FM, K6JQ K6VL, KA1FW, KA2POY, KC5UX, KM4WH, KO4D, LA0EM, LA1FW, LA1KHA, LA2LV, LA3RHA, LA4LG, LA6PB, LA7ZN, LA9ML, LQ12DX, LY2BAG, LZ1EO, LZ1KIA, LZ1KSZ, LZ2LE, LZ2ZA, LZ5AA, LZ5Y, LZ8O, N2EAW, N3GOF, N3HCP, N4KT, N4XRH, N7NHM, N8LBI, NL7EL, NZ9M OH2EJ, OH3HS, OH3MIG, OH5AF, OH5MMG, OH6AA, OH6ZJ, OH8MOX, OK1DMS, OK1FIM, OK2BKH, OK2BPL, OK2BWJ, OK2PGG, OK2PLH, OK3KJF ON5FV, OZ1JLX, OZ3PE, OZ4CG, OZ7BW, OZ7OP, OZ8QW, OZ9BR, PA3ECJ, PP2WV, RA3DPD, RA3ZM, RA9FI, RB5XQ, HV9CFP, RX9J, SM0BFJ, SM0CSX, SM2NTU, SM4JUV SM4JWI, SM5JI, SM6BWQ, SM6BZE, SM6CDN, SM6CIX, SM6LJP, SM7CZG SM7HEC, SP1JZR, SP2BME, SP4AVG SP6AUI, SP8HXN, SP8JMA, SP8JUX, SP9AHB, SP9NLI, SP9PT, TE1T, TK5F UA0CCD, UA0KAT, UA0ZDK, UA1CCP UA1CDX, UA3AAJ, UA3DKT, UA3DSS UA3IAK, UA3TAM, UA4NBH, UA4PKN UA4UDC, UA4YG, UA6AGE, UA6HPT, UA6LAY, UA6XGJ, UA9AKW, UA9JFR UA9KO, UA9TS, UA9XK, UB4LAT, UB4TWY, UB5EF, UB5FBG, UB5GHG UB5IJW, UB5LKW, UB5TEX, UB5ZMV UF6FFR, UL8CWW, UO5AP, UO5OET UT4UH, UV0BB, UV3DN, UV9CJ, UW3RN, UW3RR, UW9CM, UZ8QWZ, UZ1OWJ, UZ3RZZ, UZ4AXO, UZ5FZD VE1ACK, VE9RCS, VO1CA, VP5VMK, VP8ON, W0WUU, W2HAZ, W2WOE, W8LYT, W8RV, WA2HAL, WB0DXV, WB8QXH, Y21VF, Y22TD, Y23RJ, Y24MB, Y24WJ, Y25BL, Y26NL, Y33V Y39FA, Y43GO, Y51YJ, Y53SF, Y55S YO2BP, YO8CRU, YU2CAH, YU4AR, YU8KI, YV1ELM, YV5BPG

Disqualifications

CW—NR5M, WA8YVH (op at W9RE), VO1MP

57th 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, KC1J answers W1AW's call by sending W1AW NR178 A KC1J 79 CT for QSO number 178, less than 150 W, first licensed in 1979 and Connecticut Section.

5) **Scoring:**

(A) *QSO points:* Count two points for each complete two-way QSO. No cross-mode contacts. Work each station only once, regardless of the frequency band.

(B) *Multiplier:* Each ARRL Section (listed on page 8 of this issue) and CRRL Section plus VE8/VY1—a maximum of 77. KP4 is the Puerto Rico Section, KV4/KP2 and KG4 stations with two-letter suffixes are

Suggested Frequencies

CW	Novice and Slow-Speed CW	Phone	Novice Phone
1800-1810		1855-1865	
3530-3600	3690-3730	3850-3950	
7030-7080	7090-7130	7200-7250	
14,030-14,060		14,250-14,300	
21,050-21,080	21,090-21,130	21,300-21,400	
28,050-28,080	28,090-28,130	28,550-28,650	28,350-28,400

PINS—Participation in November Sweepstakes

Are you tired of operating in a contest with nothing to show for it afterward? Are you jealous of all those "big gun" stations? Take heart; this year, the ARRL will be offering a handsome pin to qualified participants in the ARRL Sweepstakes.

Anyone who makes at least 100 contacts in the November Sweepstakes, CW or phone, will qualify for an achievement pin. Separate pins for CW and phone will be available. These handsome pins are dated by year, making them possible collector's items. (The pin design was not available at press time.)

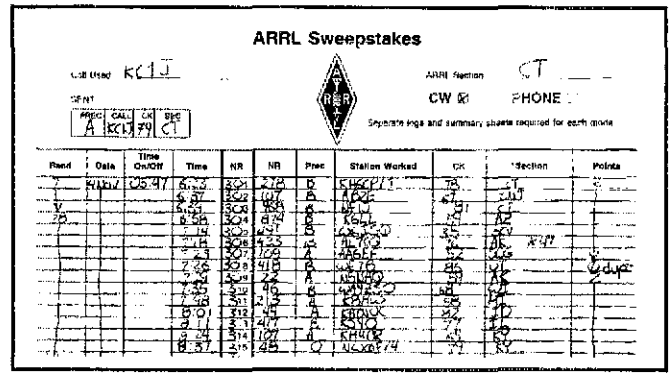
To order, include with your log entry of 100 or more QSOs: (1) An SASE with "phone" or "CW" marked in the lower left-hand corner; (2) A check or money order for $2, payable to the ARRL. Your pin will be shipped after your contacts have been verified and the results printed in *QST*.

Comfortable Code Speeds

Have you been reluctant to jump into a CW contest because the code speeds are too high? Now, there's a solution for folks to whom 35 WPM is another word for impossible. Specific band segments have been set aside for this year's Sweepstakes for slow-speed code up to 10-13 WPM (see the box above).

US Amateur Radio operators should note that operation in the Novice portions of these segments on 80, 40 and 15 meters is restricted to 200 watts output. Stations, however, should continue to use the same power designator (A, B or Q) throughout the contest.

Now you can participate at code speeds you find comfortable. CQ SS!



ARRL Sweepstakes

Call Used KC1J

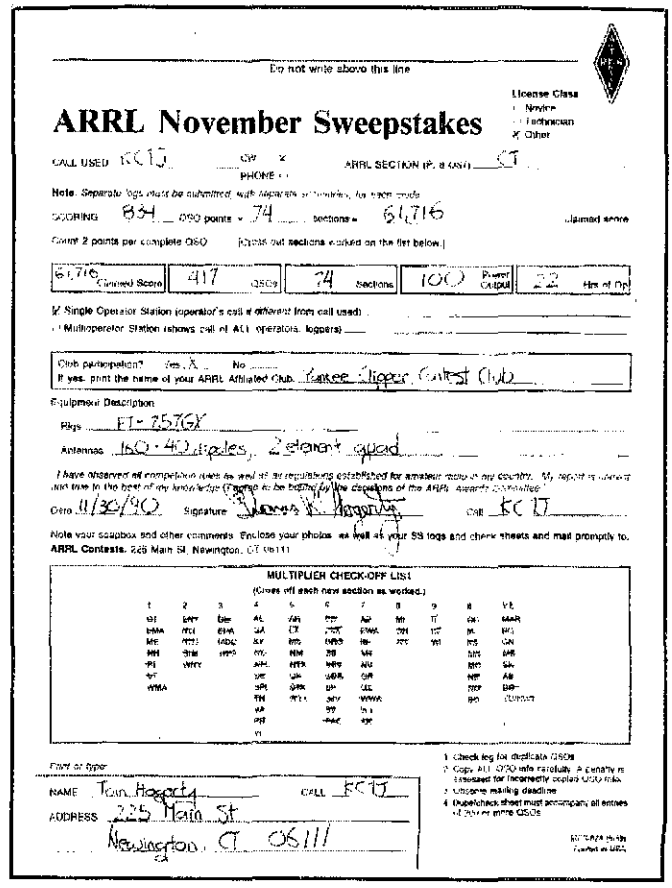
SENT: A | KC1J | 79 | CT

ARRL Section CT

CW ☒ PHONE ☐

Separate logs and summary sheets required for each mode

Band	Date	Time On/Off	Time	NR	NR	Prec	Station Worked	CK	*Section	Points
7	11 NOV	05 47	5 53	301	278	D	K4CC/1	78	CT	2
			5 57	302	107	A	AD2C	87	NJ	
			5 58	303	184	B	W1WL	81	NH	
28			6 06	304	197	B	K8CU	85	MI	
			6 14	305	421	B	K8LJ/0	85	MI	
			6 14	306	425	B	K8JQ	85	MI	
			6 23	307	169	A	AB8E	86	OH	
			7 36	308	415	B	W8TB	89	OH	Dupe
			7 38	309	24	A	N8HBP	89	OH	
			7 38	310	43	B	KB8VP	89	OH	
			7 38	311	2	A	KB8LJ	89	OH	
			8 01	312	45	A	KB8VX	89	OH	
			8 11	313	47	A	K8SO	89	OH	
			8 54	314	102	A	KH6IK	90	HI	
			8 54	315	48	D	NC6R/7	77	NV	



Do not write above this line

License Class: Novice / Technician / X Other

ARRL November Sweepstakes

CALL USED KC1J CW X PHONE ☐ ARRL SECTION (P, a DX) CT

Note: Separate logs must be submitted, with separate summaries, for each mode

SCORING 834 QSO points × 74 sections = 61,716 claimed score

Count 2 points per complete QSO (Cross out sections worked on the list below.)

61,716 Claimed Score	417 QSOs	74 Sections	100 Power Output	22 Hrs of Op

☒ 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: Yankee Clipper Contest Club

Equipment Description

Rigs: FT-757GX

Antennas: 160-40 dipoles, 2 element quad

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 11/30/90 Signature [signature] CAB KC1J

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
AL	ENT	MAR	AK	GA	NC	PR	SC	TN	VI	MAR
MAR	NLI	SVR	AZ	LA	NM	STX	TX	UT	WI	WI
ME	NTD	WCF	AR	MS	NWT	VI	WY	WI	YT	ON
MH	STH	WPO	CO	NH	NB	WI				MB
NL	WTX		CAL	NFLD	NWT	WV				SK
NT			CR	NS	QUE	WY				AB
WWA			DE	NT	SFR	YT				BC
			FL	NU	TAM					DX
			GA	PAC	VI					

Print or Type

NAME Tom Haggerty CALL KC1J

ADDRESS 225 Main St

Newington, CT 06111

1. Check log for duplicate QSOs
2. Copy ALL QSO info correctly. A penalty is assessed for incorrectly copied QSO info.
3. Observe mailing deadline
4. Dupesheet sheet must accompany all entries of 200 or more QSOs

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 be used under any other call sign during the contest period (with the exception of family stations where more than one call sign 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:**

(A) Entries must be postmarked no later than 30 days after the end of the phone contest (Dec 19, 1990). No late entries can be accepted. Entries with more than 200 QSOs must include cross-check sheets (dupe sheets). Use ARRL November Sweepstakes forms, a reasonable facsimile or submit your entry on diskette.

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	KC1J	79	CT

Contest Period

	Starts	Ends
CW	Saturday, Nov 3 2100 UTC	Monday, Nov 5 0300 UTC
Phone	Saturday, Nov 17 2100 UTC	Monday, Nov 19 0300 UTC

(1) Official entry forms are available from HQ for an SASE with two-units of first-class postage.

(2) You may submit your contest entry on diskette in lieu of paper logs. The floppy diskette must be IBM compatible, MS-DOS formatted, either 3.5 or 5.25 inch (40 or 80 track). The log information must be in an ASCII file, following the ARRL Suggested Standard File Format, and contain all log exchange information (band, date, time in UTC, call sign of station worked, complete exchange sent, complete exchange received, multipliers [marked the first time worked] and QSO points). One entry per diskette. An official summary sheet or reasonable facsimile with a signed contest participation disclaimer is required with all entries.

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 multioperator 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*.

Strays

THIRTY-YEAR DREAM COME TRUE

My dad, W9NU, brought me to the world of ham radio back in the 1960s. I remember my first contact with the rig he and I built: a breadboard 6L6 and 25 watts to a dipole. I've never lost the magic and romance of Amateur Radio. I'm still amazed at how I can communicate over great distances in such a short time.

My world expanded with the passing of the General exam—DX! Those faraway places with exotic calls. I wanted to be there. My dad and I talked of DXpeditions to rare tropical islands, of massive pileups, tents, dipoles and sun—a fabulous dream.

Years went by and the responsibilities of college, marriage and a career put the dream aside, but it was never forgotten. Would I someday do a mini-DXpedition? Where? How? I couldn't afford a sophisticated jaunt to parts unknown. Some isolated atoll in the Pacific? Hardly. Hawaii? Yes, a possibility. I had been to Hawaii several times, but never with ham radio on hand. Yes—that's it. I would live my dream in KH6-Land.

Finally, the time was right—the summer of 1990. My heart quickened and I began to organize. Ten meters would be the band; there's always DX on 10. Get a small lightweight rig, a battery and a dipole between two palms. Paradise found!

June was the time to go. I bought tickets to fly to Kauai four months in advance and I packed one month before departure. The rig was my Radio Shack HTX-100: small, rugged and powerful enough for 10 meters. I made a dipole and bought a 12-volt battery in Kapaa, Hawaii. I was set for my DXpedition!

I could hardly wait to say, "CQ CQ this is W7KPL/KH6." The big day arrived on June 28, 1990. The dipole was erected with ease, just 15 feet over my head. I used a rock tied to each end of the dipole to hurl it up into an east-west pattern—just right for Pacific DX. I was ready! All connections made, battery full power, antenna placed—all was ready and my anticipation was frantic. I turned on the rig and *Wow*! I heard stations from all over: VKs, ZLs, Texas, Florida, Oregon, California—unbelievable!

My first contact was W4WKD (ironic, as my very first contact was a "4" 30 years earlier). We exchanged signal reports and John gave me a five-by-five. I was in heaven. On to the next QSO. Steve, KB7FNN, gave me a five-by-six. My dream was playing a beautiful song of reality. I worked Texas, California and Australia in quick succession. I was elated, filled with a sense of accomplishment and grandeur.

I worked a total of 56 stations in four countries. My mini-DXpedition was an unqualified success. I thank the stations that helped me fulfill my 30-year dream. The special QSL cards are in the mail!—*Jerry Page, W7KPL*

DON'T I KNOW YOU?

Until three years ago, I ran a marine radio repair service near the harbor in Halesite, New York, for 25 years. For some time, I've been joining in with a roundtable known as "El Groupo" on 14.247 MHz. One of the group, Cam, WB2CAQ, a former Long Islander who has lived in Miami, Florida, for many years, often remarked that hearing me made him feel homesick.

One day, he asked me if I knew a guy named Ed Cantrell. After a moment of surprise, I told him that he was talking to him! He sounded startled himself when he told me his name, reminding me that he had worked for me installing radios on boats back in the 1960s.—*Ed Cantrell, W2HHS, Huntington, New York*

COMMUNICATIONS MUSEUM

The National Museum of Communications in Irving, Texas, features displays of antique broadcast studios and transmitters, phonographs, documents, cameras and a complete Amateur Radio station. The museum is open Tuesday through Sunday from 10-4. The museum's official "voice" is the Yesterday USA Satellite Superstation, carried on Satcom IV, transponders 15 and 21, wideband audio subcarrier; and Galaxy III, transponder 7, narrowband audio subcarrier 5.76. Contact founder Bill Bragg, KA5PIP, at 4 Dallas Communications Complex, 6305 W O'Connor, Suite 123, Irving, TX 75039, tel 214-556-1234.

AMATEUR RADIO MARCHES ON

Based on current FCC statistics, a new ham is licensed in the US once every 11 minutes. Also, hams upgrade at the rate of one every 10½ minutes.

CLOSING ON HALF A MILLION

As of June 1990, there were 488,391 US Amateur Radio operators in the FCC data base.

Contest Corral

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

SEPTEMBER 1-JANUARY 2

Indiana Annual ATV Contest, sponsored by the Indiana ATV and UHF Club, from 0500Z Sept 1 to 0500Z Jan 2. Categories: Class I, less than five watts output; Class II, 5-25 watts; Class III, 25-100 watts; Class IV, more than 100 watts. Contacts must be 10 miles or more. No repeater, balloon or airborne equipment may be utilized. Work stations once per band. All contacts must be confirmed by QSL card or photo with all pertinent information. Score one point per mile between confirmed contacts. Awards. Entries must be postmarked by Jan 8 and sent to WB9IHS, 6455 Madison Ave, Indianapolis, IN 46227.

OCTOBER

2

West Coast Qualifying Run, 10-40 WPM, Oct 3 0400Z (9 PM PDT Oct 2). 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.

4-5

CRRL Fall VHF/UHF Sprint, 432 MHz, see Sep *QST*, p 78.

6-7

California QSO Party, see Sep *QST*, p 80.

Columbus Contest, see Sep *QST*, p 80.

VK/ZL/Oceania Contest, phone, see Sep *QST*, p 80.

6-14

Wyoming QSO Roundup, sponsored by the University of Wyoming ARC, from 0000Z Oct 6 until 2400Z Oct 14. 160, 80, 40, 20, 15 and 10 meters 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.

7

OMARC Midnight Special, sponsored by the Overlook Mountain ARC, 0300Z-0500Z Oct 7. First hour, 20 phone, second hour, 40 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. Mail entries by Nov 1 to W2XL, 133 Clifton Ave, Kingston, NY 12401.

9-10

CRRL Fall VHF/UHF Sprint, 220 MHz, see Sep *QST*, p 78.

12

W1AW Qualifying Run, 10-40 WPM Oct 13 0200Z (10 PM EDT, Oct 13). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0775 28.0775 50.08 147.555 MHz. See Oct 2 listing for more details.

13-14

ARRL International EME Competition, see Sep *QST*, P 78.

Pennsylvania QSO Party, see Sep *QST*, p 80.

VK/ZL/Oceania Contest, CW, see Sep *QST*, p 80.

14

RSGB 21/28 MHz SSB Contest, see Sep *QST*, p 80.

14-15

Illinois QSO Party, see Sep *QST*, p 81.

15-16

CRRL Fall VHF/UHF Sprint, 144 MHz, see Sep *QST*, p 78.

20-21

ARCI QRP Fall CW QSO Party, sponsored by QRP ARC International, from 1200Z Oct 20 until 2400Z Oct 21. Operate a maximum of 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 five points for QSO with ARCI member. Others count two points for same continent and four 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 two; if 100% battery, by 1.5. Bonus points: Add 2000 points for each band a home-brew TX is used; add 3000 points for each band a home-brew RX is used; add 5000 points for each band a home-brew XCVR is used (5000 bonus points max per band). Team competition: Teams consisting of two to five 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 20 through 2400 local Oct 21, with some activity continuing over from Fri-Mon. Scouts exchange name, QTH, scout rank and other interests. Look for K2BSA, 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. Logs aren't necessary, but activity reports that include Scout unit number, number of participants and interesting occurences are appreciated. Send reports to ARRL HQ. For more information, see "JOTA Needs You," Sep *QST*, p 52.

Simulated Emergency Test (SET), sponsored the ARRL Amateur Radio Emergency Service and the National Traffic System (NTS), Oct 21-22. The SET gives radio amateurs the opportunity to exercise emergency plans and test their NTS traffic-handling capabilities under simulated emergency conditions. Involvement with served agencies is encouraged. The event is conducted by Emergency Coordinators and Net Managers, so be sure to contact them for further details. If you don't know who to call, contact your ARRL Section Manager (see this issue, p 8, or call the ARRL Field Services Department at HQ for direction). SET guidelines were published in the July issue of *Field Forum* and mailed to all ARRL Field Organization officials, station appointees and affiliated clubs. For more information, see "Are You Ready for SET," Sep *QST*, p 45.

21

RSGB 21 MHz Contest, see Sep *QST*, p 80.

27-28

***CQ* World-Wide DX Contest** phone, see Sep *QST*, p 81.

CRRL Fall VHF/UHF Sprint, 50 MHz, see Sep *QST*, p 78.

28

W1AW Qualifying Run, 10-35 WPM, Oct 28 2400Z (7 PM EST Oct 28). See Oct 12 listing for more details.

31

West Coast Qualifying Run, Nov 1 0500Z (9 PM PST Oct 31). See Oct 2 listing for more details.

NOVEMBER

3-4

International EME Competition, see Sep *QST*, p 78.

3-5

ARRL November Sweepstakes, CW, this issue, p 93.

10

W1AW Qualifying Run, 10-35 WPM, Nov 11 0300Z (10 PM EST Nov 10). See Oct 12 listing for more details.

10-11

European DX Contest, RTTY, see Jul *QST*, p 81.

17-19

ARRL November Sweepstakes, phone, this issue, p 93.

24-25

***CQ* World-Wide DX Contest**, CW, see Sep *QST*, p 81.

27

W1AW Qualifying Run, 10-35 WPM, Nov 27 2100Z (4 PM EST Nov 27). See Oct 12 listing for more details.

Contest Announcements: Items for this column can be sent on a 5¼- or 3 ½-inch MS-DOS floppy diskettes in ASCII format to ARRL HQ, via modem (ARRL HQ BBS, 203-665-0090, 2400-8-N-1), or in written form. 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 the contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Strays

I would like to get in touch with...

☐ anyone who knows of any kind of Drake users net or club. I plan to publish a book on Drake modifications, comments, reviews, etc, and I'd like to hear from anyone who has information or articles on modifications to all kinds of Drake ham and professional equipment. Please mention your source; all contributors will be credited. Sindre Torp, LA6OP, N-8040 Helligvaer, Norway.

Special Events

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

Russellville, Arkansas: The Arkansas River Valley Amateur Radio Foundation will operate K5PXP 1400Z-2100Z **Oct 5-6** to celebrate Global Fest. 14.290 21.305 28.350. For certificate, send a 9- × 12-inch SASE to Karl Goebel, KB8DM, 1903 W 3rd St, Russellville, AR 72801.

Painesville, Ohio: The Lake County, Ohio, ARA will operate WT8F from 1700Z **Oct 6**-1900Z **Oct 7** to celebrate the 150th birthday of the county. 7.278 14.265 21.320 28.440. For QSL, send SASE to Kenneth A. Blasor, WT8F, 9583 Omega Ct, Mentor, OH 44060.

Three Mile Island, Pennsylvania: The Harrisburg ARC will operate W3UU 1400Z **Oct 6**-0200Z **Oct 7** from the Three Mile Island Visitor's Center. 7.240 14.240 28.340 146.58 146.76/16. For certificate, send QSL and 9- × 12-inch SASE to W3UU, c/o Jeff Kisner, N3HCZ, 202 W Green St, Shiremanstown, PA 17011.

Muskogee, Oklahoma: Eastern Oklahoma Area hams will operate KE5TC 1400Z-2200Z **Oct 6-7** from the WWII submarine *USS Batfish*. 7.250 14.250 21.350 28.450. For QSL, send QSL and SASE to KE5TC, PO Box 436, Keota, OK 74941.

Red Springs, North Carolina: The Radio Amateur Group will operate W4MZP 1300Z-2100Z **Oct 6-7** at the annual Flora MacDonald Highland Games. 14.270 21.370. For certificate, send QSL and SASE to *RAG, PO Box 73, Red Springs, NC 28377.*

Williamsburg, Virginia: N4RTQ will operate 1600Z-2400Z **Oct 7** from the Eastern State Hospital. Operation is in the General portions of 40, 20 and 15 meters and the Novice portion of 10 meters. For certificate, send QSL and SASE to Robert Flanary, N4RTQ, 4067 Ironbound Rd, Williamsburg, VA 23188.

Cleburne, Texas: The Johnson County ARC will operate NG5A 1400Z **Oct 12**-0100Z **Oct 14** during the annual Pioneer Day Celebration. Operation is in the General portions of 80, 40, 20 and 15 meters and the Novice portion of 10 meters. For certificate, send QSL, contact no. and SASE to Peggy Gill, N5NWX, PO Box 510, Joshua, TX 76058.

Gettysburg, Pennsylvania: The Adams County ARS will operate **Oct 13-14** to celebrate the 100th anniversary of General Dwight D. Eisenhower's Birthday. 3.875 7.250 14.250 21.375 28.450. For certificate, send QSL and a 9- × 12-inch SASE to ACARS, 34 York St, Gettysburg, PA 17325.

Great Lakes, Illinois: The Great Lakes ARC will operate WV7T/9 0000Z **Oct 13**-2400Z **Oct 14** to celebrate the US Navy's 214th birthday. Operation is in the General bands and the Novice portion of 10 meters. For certificate, send SASE to Mike Anderson, W7VT/9, 2381-C Delaware Ave, Great Lakes, IL 60088-2510.

Harlingen, Texas: The South Texas ARS will sponsor N5CAF 1400Z **Oct 13**-0100Z **Oct 14** and 1400Z **Oct 14**-0100Z **Oct 15** to celebrate the Confederate Air Force Annual Air Show. 14.260 21.260 28.460. For QSL, send QSL and SASE to Dr David Woolweaver, K5RAV, 2210 S 77 Sunshine Strip, Harlingen, TX 78550.

Orlando, Florida: The Central Florida Repeater Assn will operate N4MHV 1300Z-2200Z **Oct 13-14** to commemorate 115 years of progress by the City of Orlando. Operation is in the General portions of 20, 15 and 10 meters. For certificate, send QSL and a 9- × 12-inch SASE to Rod Davis, KC4NEQ, c/o City of Orlando, 400 S Orange Ave, Orlando, FL 32801.

New York, New York: The Radio Club of Junior High School 22 will operate WB2JKJ 1100Z-1900Z **Oct 17-19** to commemorate the 10th anniversary of the club and Education Through Communication. 7.238 21.395. For QSL, send QSL to The 22 Crew, PO Box 1052, New York, NY 10002.

St Louis, Missouri: The Monsanto ARC will operate AAØA **Oct 27-28** during the Silver Anniversary celebration of the St Louis Gateway Arch. Operation is in the lower portions of the General 40, 20 and 15-meter phone bands and the Novice portion of 10 meters. For QSL, send QSL to KAØIAR, 12 W Glendale Rd, St Louis, MO 63119.

Denton, Texas: The Denton County ARA will operate N5NT **Oct 19-21** from the 100th anniversary celebration of the founding of the University of North Texas. Operation is in the General 40, 20 and 15-meter phone bands and 28.350. For QSL, send QSL and SASE to Denton Co ARA, PO Box 50433, Denton, TX 76206.

Union, Kentucky: The Northern Kentucky ARC will operate K4CG 1400Z-2100Z **Oct 19-21** in conjunction with the annual Salt Festival at Big Bone Lick State Park. Operation is on 40, 20 and 15 meters. For certificate, send QSL, contact no. and SASE to NKARC, PO Box 1062, Covington, KY 41012.

West Lafayette, Indiana: The Purdue ARC will operate W9YB **Oct 20** to celebrate Homecoming Weekend. 7.270 14.330 146.76/.16. QSL to Bob Cromwell, Box 507 PMU, Purdue University, West Lafayette, IN 47907.

Onward, Mississippi: The South Delta ARC will operate W5KAK 1300Z-1800Z **Oct 20** in conjunction with the annual Teddy Bear Festival. Operation is in the General portions of 80, 40 and 20 meters. For certificate, send QSL and 9- × 12-inch SASE to Bob Golitz, N5OYY, Box 486, Anguilla, MS 38721.

Joliet, Illinois: The Joliet ARS will operate W9OFR 1400Z **Oct 20**-2400Z **Oct 21** to celebrate its 50th anniversary. CW—3.555 7.055 14.055 21.055 28.055; phone—3.955 7.255 14.255 21.355 28.455 146.55. For certificate, send QSL and SASE to W9OFR/W9DE, 602 Manhattan Rd, Joliet, IL 60433.

Addington, Oklahoma: The Chisolm Trail ARC will operate KB5LJQ 1300Z-2200Z **Oct 20-21** to commemorate the great cattle drives and the heritage of the Chisholm Trail. Operation is in the Novice and General portions of 80, 40, 20, 15, 10 and 2 meters. For QSL, send SASE to CTARC, PO Box 400, Duncan, OK 73534.

Knokke, Belgium: ON4CLM will operate **Oct 29-Nov 4** as part of the Canadian Liberation Celebration. CW—3.515 7.012 14.020 21.020 28.020; phone—28.545. For QSL contact ON4CLM, PO Box 110, 8300 B-Knokke Heist, Belgium.

Frankenstein, Missouri: The Mid-MO ARC will operate WOØO 2100Z **Oct 31**-1400Z **Nov 1** in celebration of Halloween. Operation is 35 kHz up from the bottom of the CW, Novice and General phone subbands. For certificate, send QSL and SASE to Jeff Kunce, NØJUH, 1213 E Dunklin, Jefferson City, MO 65101.

Special Event Announcements: Items for this column can be sent on an MS-DOS floppy disk in ASCII format to ARRL HQ, via modem (ARRL HQ BBS, 203-665-0090, 2400-8-N-1), or in letter form. 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 the name of the sponsoring organization, the call sign of the special-event station, the city location, dates and times (Z), suggested frequencies and QSL information. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines: (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-inch envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order. QST

VHF/UHF Century Club Awards

Compiled By Lisa Kustosik, KA1UFZ

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid-square locators (indicated in italics) for each band listing. Numbers listed after call signs refer to endorsements. The totals shown are current as of August 8, 1990. An SASE to ARRL HQ will bring you the rules and application forms.

50 MHz

	100
446	WA4PGM
447	KA8TBW
448	N4GBK
449	KZ3X
450	WD4Q
451	KK4NO
452	AA5IB
453	WA6VGS
454	WB2RFV
455	GM8MBP
456	GJ4ICD
457	GM1ZCD
458	G4MKF
459	N2DKP
460	N8IQX
461	KAØJJK
462	VE3JJX
463	WD9ERO
464	NØKSC
465	WA7HCE
K1TOL	800
KA2TVA	150
W3OTC	325
KB4CSE	275
VE4CW	225
W4CYC	*300*
GJ4ICD	300
N4MM	475
N4MW	325
KB4OLM	200
W5FF	650
WA5JCI	375
W5QZI	500
WA6BYA	575
W7IDZ	250
KC7IJ	350
KC7MJ	150
WA7OEU	300
WA8LLY	325
KA9LDS	300
KD9OT	200
KMØA	425
WBØCQO	250
KØCS	300
WAØDYU	300
KAØJGH	450
WØJRP	425
WØKEA	425
WBØKEK	150
NØKSC	175
NØLL	525
WAØTKJ	150
WBØWAO/8	300

144 MHz

	100
342	AA5DS
343	AA5IB
344	G4VXE
345	N2JS
346	WA5JCI
347	WB4RUA
348	W3EP/1
349	K7TM
350	WR8B
351	WØKEA
WA3HMK	225
G4VXE	125
W42D	375
KB5RF	175
WB5ROR	175
W5UGO	175
WØKEA	125
WQ8P	125
WBØWAO/8	125

432 MHz

	50
180	WA8EUU
181	AA5IB
182	WW4T
N4WM	80
KC5SH	70
W98K	70
WAØTKJ	130

902 MHz

	25
KD5RO	35

1296 MHz

	25
WØRAP	70

QST

NCJ NATIONAL CONTEST JOURNAL

NCJ features articles by top contesters, letters, hints, statistics, scores and much more. Big gun or small, *NCJ* provides you with a valuable source of information on the exciting world of competitive radio.

The September/October issue includes

- The World Radiosport Championship Wrap-Up
- Results of the Annual TDXS Receiver Clinic
- Computers and Ham Radio Contesting—Part 2
- *NCJ* Reader Survey—Part 1
- *CT* Update
- *NCJ* Profiles: OH4RH and WØØG

Other features include columns on Contest Tips, VHF/UHF Contesting, DX Contests, CAC News and antennas.

National Contest Journal is edited by Tom Taormina, K5RC, PO Box 1956, Sugar Land, TX 77487, and is published by the ARRL. Letters, articles, club newsletters and other editorial material should be submitted directly to the *NCJ* editor.

The subscription rate for 6 issues (one year) is $10. There are additional postal surcharges for mailing outside the US; write to ARRL HQ for details. *NCJ* subscription orders and changes of address should be sent to *NCJ* Circulation, ARRL 225 Main St, Newington, CT 06111.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Bob Pegritz, KC3TI—Things were hectic last month, as no column was done! New digs mean lots of things to do. Thanks to our dedicated DE hams & neighbors in the nearby states for making the DE Hamfest a success. AWARE's new officers: prez WB3DPJ, vp KA3VSP, secy N3DXV & treas N3DNX. Attn newsletter eds: Please put my address on your mailing list for activities to be included in this column. Classes are springing up all over the section for all license grades, so tell a nonham friend how you can talk to Poland using a clothesline! Nets: DTN QNI 262, QTC 35 in 22 sess; DEPN QNI 36, QTC 52 in 4 sess. SEN QNI 60 QTC 3 in 5 sess. DTN dy M-F at 6:30 Eastern on 3905 kHz—be there! Tfc: WB3DUG 32, K3JL 21, WA3WIY 21, KD3OJ 19, K3YBW 15, W3FEG 7, N3FLD 2.

EASTERN PENNSYLVANIA: SM, Bob Stanhope, KB3YS—ASM: N3ECL, WA3PZO. ACC: KC3QB. BM: KB3UD. OOC: W3IS. PIC: W3ZXV. SGL: WA3IAO. SEC: WB3FPL. STM: KD3AO. TC: W3FAF. Last month was busy. I gave my 1st SKYWARN training sess for the fine people of the DE Lehigh ARC. Okay, I was nervous. I had a good time anyway & was pleased at the vast interest in the program. I also attended my 1st ARRL night with the Warminster ARC. With the Atl Div Dir & Vice Dir in attendance, there was a lively discussion about the topic of the day, the proposed Communicator-class license. Happy to have the opportunity to speak with these fine people. The York hamfest is history. It's in my backyard & it's always especially nice to see old friends. At the end of Sat's sess at the hamfest, a staff mtg was held at my home. In attendance were most of the fine people listed at the top of this article. We discussed the topics of interest to the ARRL & the effects on EPA's members. We also talked about the services provided to the amateur community & where we go from here. Of major interest is improved relations with the PA Emergency Mgmt Agency. A RACES/ARES identification card is in the works that can be quickly identified by emergency personnel statewide. A special welcome is extended to the newest ARRL Affiliated Club—the Columbia Area ARC: their 36 members have a fine rptr on 146.715 MHz. They purchased the equipment by selling submarine sandwiches! They will sponsor their 1st hamfest in Jan 1991. Their president, Scott, KA3LUW, welcomes you to use their rptr when in the area. The Amateur Aux is actively seeking OOs; we wish to "voluntarily educate" hams in FCC Part 97 compliance. All that's required is having held a Technician or higher-class license for at least 4 yrs & passing an open-book study guide & test. Anyone interested can contact me or the OOC, W3IS, for more info: it's a great opportunity to help your fellow operators. ARRL VE schedules in EPA & the Atl Div are updated every month on the pkt BBSs—please check for an exam near you. Because of the lead time being shortened to 2 wks by HQ in some cases, you may have to check in more often. We will make an effort to keep the info current. Also, sponsoring clubs & groups, please keep HQ & me informed of exam dates so we can update the PBBS. PIC, W3ZXV, has a public info handbook about to be printed by the League! He has also written to the PIOs on how to have club news & bulletins published in local newspapers. If your club is interested in public relations or club-related news items, have your newsletter ed contact Gene for help & more info on the PIO program. The Susquehanna Valley ARC & 2 York-area hams, Mary Ann Crider, WA3HUP & Ruth Ann Pearson, WB3CQN, have had front-page news coverage in the local newspapers.

Nets	QNI	QTC	Sess	Freq	UTC	Coverage
PFN	163	187	31	3.958	2200	Statewide
EPAEPTN	440	156	31	3.917	2300	EPA
EPA	323	109	41	3.610	0000	EPA
PTTN	227	100	31	3.610	2330	EPA
O6ARES	76	12	9	147.7/00	0100	NE EPA
MARCTN	113	9	13	147.66/06	0130	SE EPA
SEPATN	53	6		145.31/144.71	0030	SE EPA
D8ARES	89	1	4	147.90/30	0000	C EPA
MARCNET	66	1	6	147.66/06	0130	SE EPA

July tfc: Congratulations to NM3K & N3DRM for making PSHR! @ BBS: WA3TSW 247, K3RLI 206, WB3JOE 166, KA3PLC 130, WB3AFL 13, N3ET. July tfc: N3DRM 297, W3IVS 194, W3JKX 190, N3CD 186, KD3AO 99, W3DP 85, W3IPX 70, N3EFW 65, WA3MVW 61, WA3EHD 56, W3KOD 52, W3KAG 49, N3FLE 44, WB8KPE 34, KA3VTC 30, N3CSE, WA3JKB 25, W3NNL 24, W3ADE 24, W3ADE 18, W3FAF 16, WA3CKA, AA3B 15, W3CL KU3R 12. K3ARR 7, W3BNR W3VR 6, NZ3G 5, N3AT 4, KA3ROF 3, WB3X 2. Nice to see W3VA active again. Carter, KD3AO, STM/EPA. 73 'til next month, Bob, KB3YS SM/EPA.

MARYLAND-DC: SM, Ken Cohen, NI3F (@WA3ZNW)—ASM/Pkt: KJ3E. ASM/ACC: WA3YLO. OOC: NB3P. SEC: WA1QAA. TC: W3VVN. STM: N3EGF. SGL: KW3X PIO/BM: WA3SCW. By the time you read this, the revived MD QSO Pty will be history...hope you operated & sent your log in. I'm still getting reports from FD. The joint Hopkins/U of MD station gets the prize for publicity with extensive coverage on radio, TV & in print. They also did a 1st-rate job in the contest itself. Please consider having your FD setup in a conspicuous spot, like near a shopping mall. We bid a fond farewell to W3WPY as EC for Queen Annes & welcome N4ITE as Charles Co EC. MSN continues training CW tfc handlers for MD...and the world! MDD achieved 98% liaison with 3rd cycle! They welcome all to join them. We welcome N3GPR as ORS. Solo sailor AG3L has left for the Virgin Is, keeping in touch with KJ3E & K3NNI via CW. As fall approaches, it's time to do that antenna work, folks—don't save it until Jan—it's hard to use a wrench when wearing mittens! 73 es 88 'til next month!

Net	Days	Time	Freq
MEPN	Dy	2300Z	3920 kHz
MDD	Dy	0000Z	3643 kHz
MDD	Dy	0300Z	3643 kHz
MSN	Dy	0030Z	3717 kHz
MPTN	Dy	24 hrs	N2GTE-6

via nodes *Net reports (NM/QND/QTC/QNI):* MSN/KC3Y 31/36/247 PO'/WB3BFK 26/6/148 MDD/K3GHH 62/217/358 (Top Brass, K3GHH/198, W3QQ/124, KC3Y/114) MEPN/K3RXK 30/126/601 MPTN/KJ3E 31/850/529. /s2 Tfc: W3IWI 893 (BPL), N2GTE 863 (BPL), KJ3E 560 (BPL), N4QQ 474, KA3T 378, K3GHH 310, KC3Y 188, NR3Q 150, WA3YLO 134, K3RXK 128, N3GPR 112, KD0M 78, N3EGF 76, W3YVQ 67, N3GIY 62, NB3P 56, K3NNI 42, W3FZV 40, WB3V 38. NC3V 38, K3USO 30, KC3ZJ 25, W3DQI 20, WB3BFK 18, K2EB 14, KK3F 11, WA3VAT 8, W3ZNW 6, WA1QAA 6, KX3U 6, WD8LAQ 4, NC3Z 4, KA3DXX 2, KN1K 0, WA2WDT 0, N3DE 0, PSHR: KJ3E 147, W3YVQ 98, WA3YLO 93, KC3Y 88, K3RXK 68, NR3Q 67, K3GHH 67.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: W2HOB. STM: WB2UVB. ACC: K2IXE. TC: N2BQT. PIO, SGL, BM: Vacant. OOC: WA2HEB. ATCs: K2JF, KA2RJA & WB2MNF. Although the annual Simulated Emergency Test (SET) is scheduled for the wknd of Oct 20-22, our SEC, W2HOB, informs me that he has received a request from the Nat'l Disaster Medical System (NDMS) to help with comms on Oct 20 & 27. Boyd would like this to be SNJ's 1990 SET. In our section, comms are needed Oct 20 for the following cos: Burlington, Mercer & Ocean (Lakewood, Brick & Pt Pleasant); on Oct 27; Salem, Cape May, Atlantic, Cumberland, Camden, Gloucester & what NDMS is calling "Southern Ocean Co." Toms River. Exactly what is expected of us at this point is unclear, but comms will be needed at area hospitals in the co & towns mentioned—please contact your co EC for further info. If you live in Ocean Co, you may contact me. Thanks in advance for your help. VE testing by the Cape May Co ARC Oct 27. See April *QST* for info. Until next month, 73. Tfc: WB2UVB 144, N2FET 63, KC2PB 31, KA2COX 20, N2JXG 17, KB2CDB 12, WB2SYJ 11, W2FFE 10, KA2YKN 6, WA3EMY 4, N2HQL 4, K4FFM 4, N2EHP 2, NG2R 2, KB2HJJ 2 W2AZ 1, N2GJJ 1, K2OG 1, N2IPH 1.

WESTERN NEW YORK: SM: William W. Thompson, W2MTA—Chemung Co ARES EC WA2OVT reports that the "short notice" NDMS exercise of July 14 had good support in Steuben & Chemung Cos, with lessons learned; especially those involved with voice comms near C-130 aircraft with turboprops cranked up! Pkt link from the Southern Tier to Niagara Falls AFB via the "Western District Net" rptr at Wethersfield, successfully moved casually manifest info. Initial "traditional" pkt paths using digipeater links were not successful! This demonstrated the need to preplan pkt point-to-point connections for disaster comms. "It may be more advantageous to avoid standard pkt pathways in such events." A special voice link from Chemung to Buffalo, Batavia & Niagara Falls AFB via the Wethersfield rptr & the KA3EVQ 444-MHz link in Chemung proved valuable in setting up the other comms paths—WA2OVT Club officers: WN1YDXA KD2YP WA2DSC WB2YQH. "A true-blue DXer always remembers: Take from no man his dream!" All things are relative...some more so. WNYDXA. After observing some of the shenanigans that go on the bands, the following thought comes bubbling up—"Ignorance is a terrible thing...the need continues to teach & reteach the Amateur Radio facts of life." On top of that, it does us all good to occasionally read over the Amateur's Code (make a copy of p 9 in the May issue of *QST* for 1990). Congrats to KD2XN as top Atl Div Single-Op winner in the RTTY Roundup. Appointment: WB2GHH, Broome Co EC. Recent count of League members in WNY shows 3539. There are 163 appointments made in the section; 128 stations hold these appointments. If you are interested in a station appointment (OBS, OES, ORS, OO, ATC or PIO) let SM W2MTA know. Hamfest: Syracuse Oct 13. No BPL this month.

Net Name	NM	Mode	Time Day	Freq	QNI-QSP-QNO
NYSEMO	N2AGO	SSB	0900 Sun	3993.5	056-010-05
NYSR	W2MTA	CW	0930 Sun	3530	020-005-05
NYS/M*	N2EIA	CW	1000 Dy	3677	305-189-31
WDN/M*	N2EVG	FM	1100 Dy	04/64	362-098-31
NY Phone*	W2MTA	SSB	1300 Dy	3962	111-053-30
NYPON*	WB2MNA	SSB	1700 Dy	3913	416-240-31
NYSPTEN	WB2IIV	SSB	1800 Dy	3925	427-053-31
Empire SS	W2WSS	CW	1800 Dy	3590	366-117-31
LCARES	WA2OEP	FM	1800 Sun	147.015	069-000-05
OCTEN/E*	WB2HLY	FM	1830 Dy	34/94	925-127-31
Q Net	WA2RXO	FM	1830 Dy	01/61	329-000-31
STAR*	KA3SDB	FM	1830 Dy	13/73	264-035-28
WDN/E*	N2EVG	FM	1830 Dy	04/64	418-119-31
NYS/E*	WI2G	CW	1900 Dy	3677	405-182-31
JCRAC Net	N2IOA	FM	2000 Dy	10/70	433-017-29
Blue Line	WA2SEF	FM	2000 Dy	93/33	280-022-29
OARC Net	KB2CRQ	FM	2000 Wed	25/85	053-002-03
TIGARDS	W2MTA	FM	2000 Sun	16/76	027-003-04
VHF THIN	WB2OWO	FM	2000 Tues	04/64	027-000-04
BRVSN	WB2OFU	FM	2100 Dy	146/655	312-000-31
CNYTN	WA2PUU	FM	2115 Dy	90/30	169-052-31
ORTN	KB2CRQ	SSB	2100 Wed	28375	024-000-03
OCTEN/L*	WB2HLY	FM	2130 Dy	28/28	265-071-31
WDN/L*	N2EVG	FM	2130 Dy	04/64	353-130-31
NYS/L*	W2YGW	CW	2200 Dy	3677	330-126-31
Earlybird	WB2IJZ	FM	0530 M-S	13/73	183-000-22

*NTS Net. NYS/E managership transferred to WI2G from N5MEA at the end of July. Late June reports: BSN 90-14-25, Q Net 383-000-29. Tfc (July): NA2B 370, N2JAW 358, W2MTA 268, NJ3V 258, W2FR 240, ND2S 215, K2YAI 205, WA2FJJ 163, N2EIA 146, KA2QOO 128, WB2OEV 116, KA2ZNZ 116, N2EVG 110, KB2HYT 98, N2JRS 93, AF2K 90, KG2D 85, WB2OWO 81, KD2WP 64, KA2GJV 63, KC2HJ 62, WA2UKX 60, NN2H 44, W2PPS 40, WB2QIX 38, N2DLN 37, WB2IJH 33, W2UYE 24, KA2DBD 28, KA2ZKM 20, WB3CUF 8, KA2TWY 6. (June): NA2B 311, KD2WP 99. PSHR: N2EIA, N2EVG, WA2FJJ, W2FR, KA2GJV, KB2HYT, N2JAW, N2JRS, W2MTA, WB2OEV, KA2OOO, ND2S, WA2UKX, NJ3V, KD2WP, K2YAI, KA2ZNZ. Happy Halloween!

WESTERN PENNSYLVANIA: SM, Bernard E. Fuller, N3EFN (@ K3ASI)—ASM: KA3OEM (@ NM3G). SEC: WA3UFN (@ W3YA). STM: WA2QXA (@ KA3NVP). BM: KC3ET (@ KA3NVP). OOC: KX3V ACC: AK3J. This month, after a couple of months of active WX emergency ops, each co should take a look at the emergency comms organization to make sure we're providing a service to the public & agencies with whom we have support agreements. I'm asking each club to take a long look at the local (co) organization for emergencies & to (1) make sure qualified, dedicated hams are occupying EC & Asst EC positions & (2) coordinate your activities closely with SEC WA3UFN. Recent changes in the division of areas of responsibility for the co in WPA have made closer coordination with Nat'l WX Service vital. Although the new system of NWS areas will not come into being for some time yet, it's imperative that our SKYWARN procedure be changed in anticipation of these area alterations. 1994 may appear a long way down the road; nevertheless, planning & test implementation should have already commenced. ECs in cos other than Erie & Crawford (where they are already involved with the new system) who have questions can contact local NWS offices for info. A close working relationship between ARES groups & NWS is essential if the SKYWARN system is to work efficiently. ECs in WPA have received a letter from WA3UFN outlining the desired reporting procedures & emphasizing the importance of the EC functions; your cooperation is solicited. My schedule is settled down enough to make club visits; let me know when you have an open mtg night & I'll be glad to meet with you. My congratulations to Jim, WB3M & the crew for an outstanding job providing comms support for the Pittsburgh Vintage Sports Car Race & to the Triple "A" ARA for officially renewing as a Special Service Club. I plan to be at the Tri-State Hamfest & Computer Fair at the Meadows (Washington, PA) Nov 18. We've scheduled an info sess & look forward to mtg you.

Net	QNI	QTC	Sess	KHz	Time/Day	NM
WPACW	199	102	31	3585	7 P Dy	WA3UNX
WPAPTN	243	87	31	3983	6 P Dy	WA3HLN
KFN	No activity					
PFN	163	187	31	3958	5 P Dy	WA3IHT
WPA2MTN	351	71	31	14688	8 P Dy	KA3BGC
NWPA2MTN	731	37	29	14513	9 P Dy	WA3ZSC

Tfc: N3EMD 429, W3EGK 315, N3FM 216, W3OKN 112, WA3UNX 100, KA3OEM 83, NO3M 81, N3AES 66, W3RUL 33, W3NGO 31, KA3VBY21, KC3YE 13, WA3DBW 7, W3SN 6, N3FQQ 5. (June) N3FQQ 7.

CENTRAL DIVISION

ILLINOIS: SM, Sharon Harlon, WB9SFT—SEC: W9QBH. BM: K9EUI. ACC: WB9SFT. STM: K9CNP. SGL: K9IDQ. TC: N9RF. OOC: W9TT. PIC: N9EWA. DEC: WD9EBQ. Memorial Day was a perfect parade day & the amateurs in Sterling area took advantage of the WX & provided comms for the annual parade. KD9YK, KB9APW, KE9TY, WA9NXE, WB9MCZ, WA9BSO, KB9DBG, K9STP & KA9GNR did a great job of keeping everything in order. On Wed, July 4, the Run for Glory 5K race was covered by 6 amateurs from the Streator ARC. W9OLF, KC9NL, WD9CLX, KA9NJB, K9MPU & WB9SCR reported the race was run without incident. For the past couple of months, numerous members of the Rockford ARA have donated time & equipment to a hands-on display for kids at the Discovery Ctr Museum. Sess are well-staffed by adults & dozens of kids who are there to see what's going on. What better way to expose young people to the hobby of Amateur Radio than to take it to them & let them turn some dials & tune CW or SSB signals? There are videos on satellites & fully operational antennas in the gym for the kids to see & ask about. The 50th anniversary of the air celebration was a great success for members of the W IL ARC, more than 1000 contacts were made by the members from their home stations & from a demo station set up at a park at Germanfests. This is my 1st column as IL SM. I'd like to include as much news from individual clubs as possible, but I need newsletters. I also plan to use the KD9JK PBBS.

Net	Freq	Time/Day
ISN	3905	1800 Dy
ILN	3690	1830 & 2200 Dy
ITN	3705	1900 Dy
CTN	147.69/09	2100 Dy
ILARES	3905	1630 1st & 3rd Sun
IEN	3940	0900 Sun
ILPN	3855	1645 M-F; 0830 Sun
NCPN	3915	0700 M-Sat
NCPN	7270	1215 M-Sat

Tfc: W9HLK 135, NS9F 126, W9LWH 84, W9HOT 68, KA9JNE 38, W9KR 12, WA9RUM 7.

INDIANA: SM, Peggy Coulter, W9JUU—SEC: WB9ZQE. STM: KJ9J. OOC: N9INN. SGL: WA9VOO. BM: W9OCL. PIC: N9IPA. I regret to report Silent Keys: Alvey F. Pittman, W9EL, of Indianapolis; Kenneth E. Johnson, W9KFO, of Eaton; Alex Niedbalski, W9MAM & Galen Miller, W9ZIB, both of S Bend & Walter F. Stone, WB9JJW, of W Lafayette. The Nat'l WX Service presented an award thanking all amateurs from their help during the tornado outbreak. *State Emergency Mgmt Dir* Jerome Hauser said Amateur Radio operators are indispensible during severe WX, providing info to local sheriffs' depts or state police they might not have. Congratulations goes to Michael J. Wetzel, W9RE, of Indianapolis, for his great ac-

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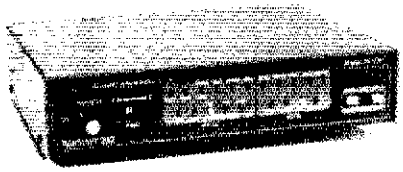

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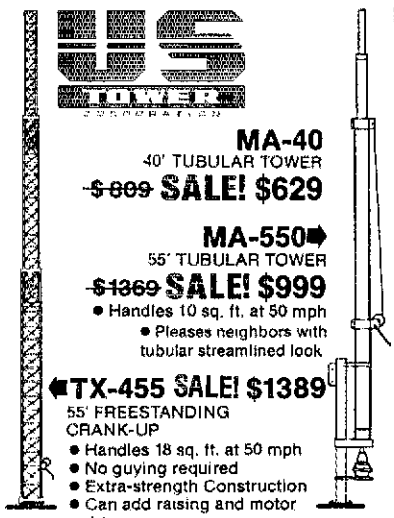

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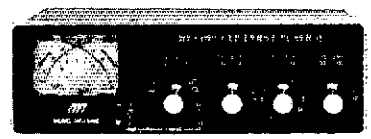

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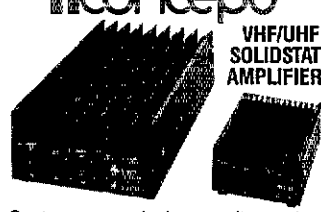

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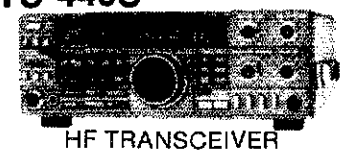

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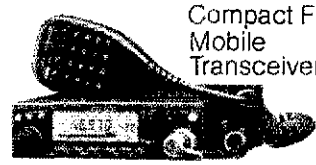

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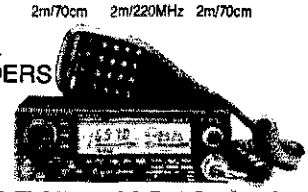

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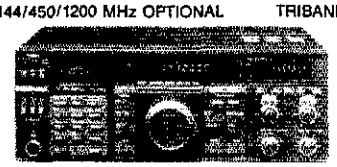
144/450/1200 MHz OPTIONAL — ALL MODE TRIBANDER



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Super Compact HT
700 MAH Battery

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2 MTR/2.5 W DTSS

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41 Memories

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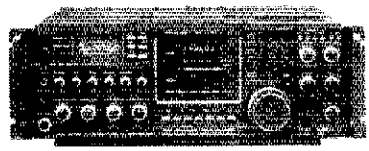

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FIBER OPTIC
MULTI-BAND
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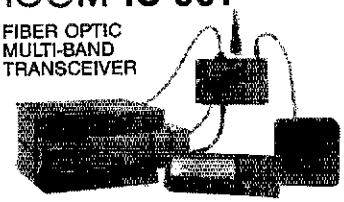

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EXTRA-LARGE MULTI COLOR LCD
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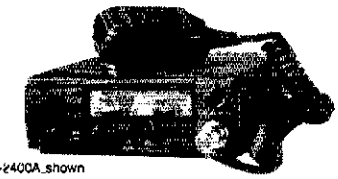
IC-3SAT, 220 MHz
IC-4SAT, 440 MHz
IC-24AT, Duo-Band

ICOM IC-2400A/3220

2m/440 MHz / 2m/440 MHz



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VHF/UHF DUAL BAND
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2 METER MOBILE

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50 W/20 Memories/Small Size
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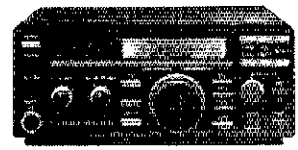

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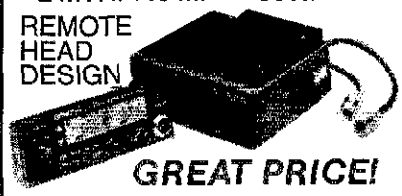

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FT-1000
200 WATTS RF power output
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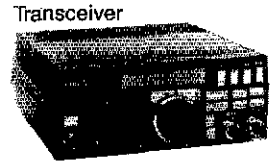

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- Pair 3CX800A7 • External Power Supply
- Performance at legal limit
- 3 MS QSK, 1.6 to 22 MHz • Assures "Loaf Along"
- With authorized modification through 29.999 MHz

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HF Linear Amplifier

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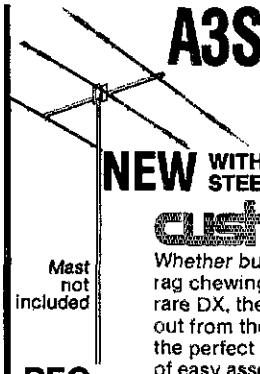

A3S

DX THAT STANDS OUT FROM THE CROWD

10, 15, 20 Meters

NEW WITH STAINLESS STEEL HARDWARE

cushcraft

Mast not included

Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

- Boom Length 14 ft., Weight 27 lbs.
- Wind Surface Area 4.36 ft.

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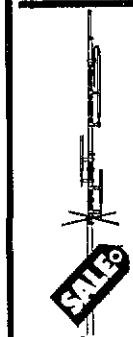
SALE 299.95

SALE



R5

14, 18, 21, 24, 28 MHz Half Wave Vertical

cushcraft

The new R5 has a broadband solid state impedance matching network for full coverage of all 5 bands. Frequency selection is completely automatic. There are no moving parts or remote tuner. The only connection required to the antenna is your 50 Ohm coax.

- The unique counterpoise has four 48" long .100" diameter stainless steel rods for excellent ground isolation
- No radials required

SALE

REG. 340.00

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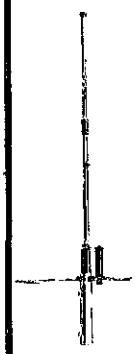

AR-270

NEW DUAL BAND RINGO

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The AR-270 has Ringo Ranger technology in a *durable all aluminum antenna* with stainless steel hardware. Instant assembly and 3 short radials make it easy to install anywhere. AR-270 features sealed phasing coil and base matching network with single 50 Ohm cable connection.

- 2 Meters (144-148 MHz) 70 CM (435-450 MHz)
- Height: 3.75 feet

REG. 80.00

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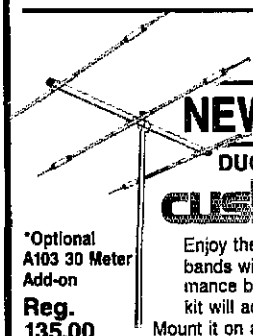

A3WS

NEW 12 & 17 METERS

DUO-BANDER

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Enjoy the 12 and 17 meter bands with a full performance beam. Easy to use kit will add 30 meters. Mount it on a lightweight tower and rotator or with your existing tribander. A3WS features all aluminum construction with stainless hardware.

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- Weight: 22 lbs.
- Turning Radius: 14.4 ft.
- Wind Area: 4.1 ft²

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- 2M/70CM FM Transceiver
- 45 watts 2 meters
- 35 watts on 70 centimeters
- High Power/User Friendly

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2M, 45W
2M Mobile



Backlit LCD Readout
Wide Range RX

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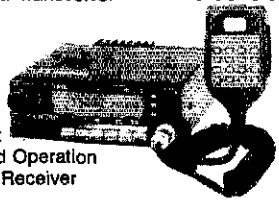

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35W 70cm
Full Duplex
Cross Band Operation
Twin Band Receiver

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- 2.5 watts (Standard Battery)
- 6.5 watts (Optional Battery)
- Easy to use

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FM Transceiver
Dual Bander H.T.

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2.5W 2M/2W 70cm
CAP + MARS MODIFIABLE
Promotional Item, Limited Invt.
SPECIAL
30 Day Warranty Std.
Alinco 2 Year Warranty Available

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Most Features Built In



- *2 Watts* (Standard Battery)
- 5 Watts (Optional Battery)

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ALINCO DJ-560T Duo-Band H.T.

NEW

2M/440 MHz
Built In PL Encode



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45 Watts
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MA-550	55'	22'1"	3	435	3" sq.	6"	$1369.00
MA-550MDP*	55'	22'1"	3	620	3" sq.	6"	$2909.00
MA-770	71'	22'10"	4	645	3" sq.	8"	$2609.00
MA-770MDP*	71'	22'10"	4	830	3" sq.	8"	$3969.00
MA-850MDP*	85'	23'6"	5	1128	3" sq.	10"	$5349.00

*MDP models complete with heavy-duty motor drive with positive pull down.

FREE STANDING CRANK-UP TOWERS

Will handle 18 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TX-438	38'	21'6"	2	355	12½"	15"	$1019.00
TX-455	55'	22'	3	570	12½"	18"	$1539.00
TX-472	70'	22'8"	4	1040	12½"	21¾"	$2529.00
TX-472MDP*	72'	22'8"	4	1210	12½"	21¾"	$4069.00
TX-489	89'	23'4"	5	1590	12½"	25¾"	$4399.00
TX-489MDPL*	89'	23'4"	5	1800	12½"	25¾"	$6599.00

*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets).

FREE STANDING HEAVY-DUTY CRANK-UP TOWERS.

Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
HDX-538	38'	21'6"	2	600	15"	18"	$1319.00
HDX-555	55'	22'	3	870	15"	21¾"	$2309.00
HDX-572	72'	22'8"	4	1420	15"	25¾"	$3959.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25¾"	$6049.00
HDX-589MDPL*	89'	23'8"	5	2440	15"	30¾"	$7919.00

*Includes heavy-duty motor drives with dual level wind and positive pull down. HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit switches and limit switch brackets.

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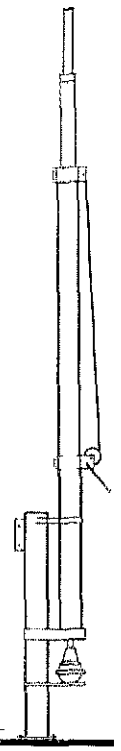
Will handle 18 sq. ft. antennas at 50 MPH winds. (TMM-433HD handles 24 sq. ft.)

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TMM-433SS*	33'	11'4"	4	315	10"	18"	$1089.00
TMM-433HD*	33'	11'4"	4	400	12½"	20¾"	$1319.00
TMM-541SS*	41'	12'	5	430	10"	20¾"	$1429.00

*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24". Most Kenpro models allow full retraction.



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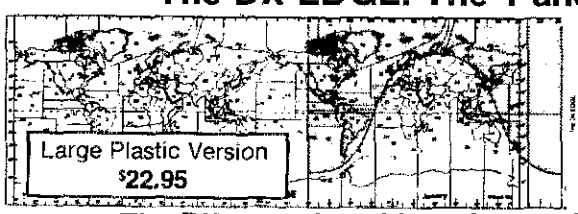

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complishment with K7JA, being no. 2 overall team in the World Radiosport Team Championship contest & they received the top SSB award. Jim Sellers, K9ABM, has been named NE IN Regional RACES Coord & Roger Cupka, K9BBZ, SEMA Comms Officer. Congratulations to Richard Terpstra, WN9Z, receiving his EC certification & to Mary Aker, KS9N, newly appointed Putnam Co EC. Congratulations to Lucy Schendera, N9DTG, for receiving the Ham of the Yr award from Lake Co ARC. Best wishes to the Ft Wayne RC celebrating their 70th anniversary. Again, the IRCC has been successful in obtaining a Governor's Proclamation for the State of IN to set aside the wk of Oct 14-20 to coincide with the ARRL SET, as "Amateur Radio Appreciation Week." Thanks to Damon Duree, W9PEV, for his work in getting this accomplished. Congrats to NR9K, NM QIN & KE9GM, NM ICN. July net reports:

Net	Freq	Time UTC	QNI	QTC	QTR	Sess
ITN	3910	1330/2130/2300	2930	352	1980	93
QIN	3656	1430/0000/0300	359	181	927	61
ICN	3705	2315	117	105	674	29
IWN	3910	1310	1731		338	31
IWN	VHF	Bloomington	760		465	31
IWN	VHF	Kokomo	921		165	31
IWN	VHF	Northeast	648		630	31
Hoosier VHF nets (9 nets)			832	37	698	51

D9RN total tfc 204 in 62 sess, IN participation 95% by WA9OHX, K9ZLS, K9CGS, W9IJEM, K9GBR, N9DWU, K9GBA & WB3HWU. Pkt BBS reports received: KD9WH 3785, N5AAA 2252, N9BAC 2071, KA9LQM 1877, KD9LP 1792, WA9UXP 1786, KK9G1630, WA9IVB 1587, KB9AVO 1558. 47 EC reports received. Tfc: NR9K 382, KD9WH 333, WA9OHX 299, W9JUJ 215, KK9G 199, KJ9J 171, KA9LQM 109, W9UMH 104, W9ZGC 104, WA9QCF 103, N5AAA 93, W9IJEM 81, K9GBR 75, N9BAC 71, KD9LP 46, WA9UXP 37, W9PPO 37, K9ZLS 34, WA9IVB 28, KE9GM 28, WA5OIZ 25, W9CNE 18, N9DTG 11, WD9DWD 8, W9KMY 8, WB9IHR 7, AB9A 5, NZ9S 5, W9EHY 5, K9SBW 5, W9RTH 5, KD9ER 3, K9EDF 3, W9XD 3, K9OUP 1, KA9ZOD 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—Congratulations to Verne Teske, W9RYA, recently appointed ARRL SGL, who will watch for local ordinances that restrict tower height. Verne will be on 3.985 MHz Wed & Fri at noon & 3.967 MHz Tues-Thurs at 8:30 AM to assist you with resolving problems. W9IZQ received a 50-yr ARRL membership plaque. Rick, NI9P & his XYL earned Good Citizens awards from Stevens Point Safety Council for aiding a citizen. A new ham radio store called Radio Recyclers, run by WK9Q, has opened at 3221 W Lincoln Ave, Milwaukee, tel 414-383-9001 for hrs & info. Thanks to communicators who worked hard to provide public service comms, including WB9SMM for Milwaukee City of Festivals & K9KJT with the Circus Parade. Stan, WB9RQR, Ozaukee Co EC, writes the superb Ozaras Newsletter for his team of communicators & is working on a "telephone tree" call-up that really works. Ozares participated in practice exercise at Freeman Chical Company near Port Washington to assist Emergency Government. New officers of Sheboygan Co ARC: pres KB9AFT, vp N9IXX, secy WE9R, treas WA9SNU. The Rock River RC sponsors the Old Timers Net Sat at 11 AM on 7.277 MHz, the ARES Net Mon at 7:30 PM on 146.64 MHz & is having success with their radio classes. Green Lake Net is Sun at 8 PM on 146.955 MHz. Exams by the Milwaukee RAC at 7 PM Oct 3 in the Wauwatosa E HS, more info from KE9JJ. QCWA WI Chapter 55 meets Oct 6 with a lunch at noon, program & auction at Klemmers Williamsburg Inn, 10401 W Oklahoma Ave, Milwaukee; visitors & guests are welcome to join the QCWA fun. Fallfest opens Oct 6 at 8 AM, sponsored by Green Bay Mike & Key Club at Green Bay Community Ctr, just off Hwy 41 on Dousman, with exams on-site. Oct 14 is the date for the tall Ham & Computer Swaptest, Waukesha Co Expo, starts 7 AM, sponsored by the KMRA. Fox Cities ARC will have a club mtg program Oct 15 on the nuclear generation of power. Exams by Badger Examiners, Nicholas Church in Milwaukee Oct 20; WI9M for info. Annual W Allis RAC Dinner starts 4 PM Oct 21 at Cotton Picker Hwy 36 near E Troy. Sorry to report Silent Keys W9CAR & W9ZZM.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, KCØT—Lots of things happened during July & the month closed out awfully fast, it seems to me. The big happening was the Olympic Festival special-event station, WØAA. In two phases—(1) as a special-event station & (2) as an originator of NTS tfc. A lot of hard-working people were involved in both phases: NØJPH, NØCVI, NØBSN, WBØGDB (BBS), NØBID, NØKCM, KØTG, NFØG & a host of others. Major items of equipment were supplied by several mfrs. The whole thing went off well & congratulations to all. In addition, of course, there was the KARE-11 Bike-a-thon, RAGBRAI & other biking events—all using the good services of ham radio one way or another. All of these activities & the usual tfc nets were sandwiched in-between the WXI As I said, the month went fast. Congratulations again to Judy, WBØWNJ, our lone BPL for the month. Nonetheless, with all the steady effort by everyone else, 23 stations reported a tfc total of 2,693—pretty good for the middle of the summer. Thanks to all! Until next time, 73 es GL. Jim Swisher, KFØFI, STM.

Net	Freq	Time	QNI/QTC/Sess	NM
MSN/1	3685	6:30 P	275/94/31	KDØNH
MSN/2	3685	10 P	221/37/31	KØQBE
MSSN	3710	6 P	398/31/31	KAØSBY
MSPN/N	3860	12:05 P	337/98/30	WAØIFC
MSPN/E	3860	5:30 P	664/197/31	KCØT
PAW	3929	9 A	2314/190/115	WDØBAC

Tfc: WBØWNJ 1002, WAØTFC 304, KFØFI 298, WØGRW 219, WØAA 168, NØFOO 95, NIØA 88, KDØNH 74, KØFIZ 52, WDØGUF 52, KT9I 48, KAØKRP 47, W9DM 36, NFØG 33, KØQBE 33, KAØPDM 33, KCØT 28, KAØSBY 28, KN9U 16, KAØVON 11, NØKCM 11, KØOGI 9, KØWPK 8. Total Tfc: 2693.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—Grand Forks Hamfest Oct 13. Peace Garden Hamfest is over; had a good time with good attendance. Congratulations to WBØBZH on being named Ham of the Yr. For once it didn't rain during the fest. Grand Forks Club members WAØLPV KAØIUW WFØW KEØA KBØCTG KAØYOW WD4LYN KAØCAF & NØKGY have been busy helping provide comms for the E Grand Forks Fishing contest & the Prairie Rose games triathlon & bike races. Congratulations to WØVWJ & Fae for 50 yrs of marriage. Had coffee with the fellows at Jamestown again. They have pkt node WØFX-1 NDJAM going again after being off the air for a while. There is interest in Jamestown on setting up a

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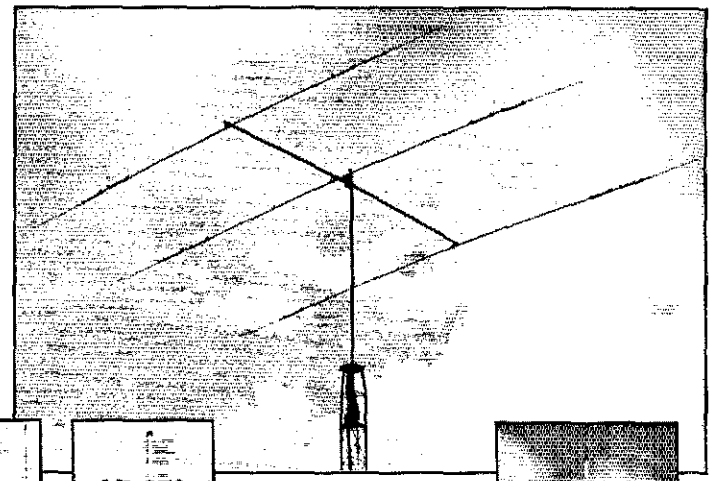

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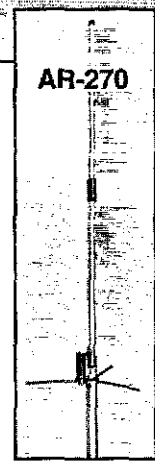

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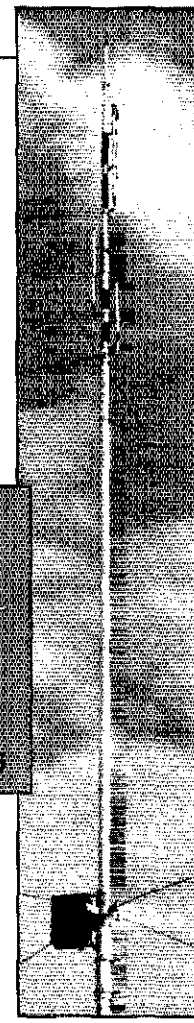



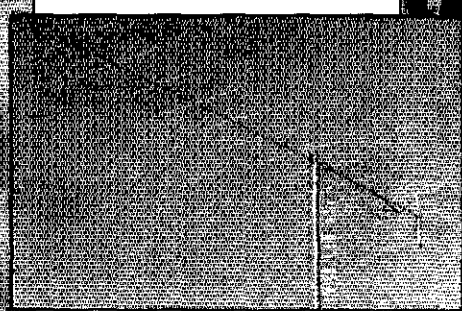

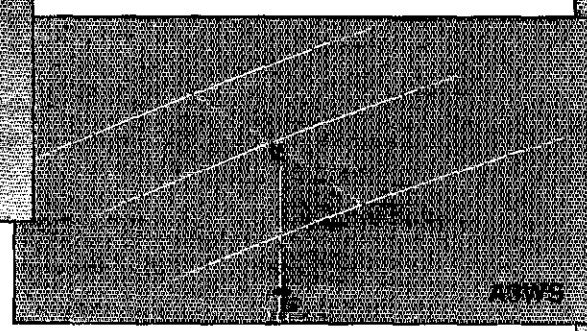

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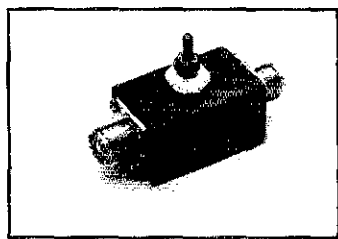

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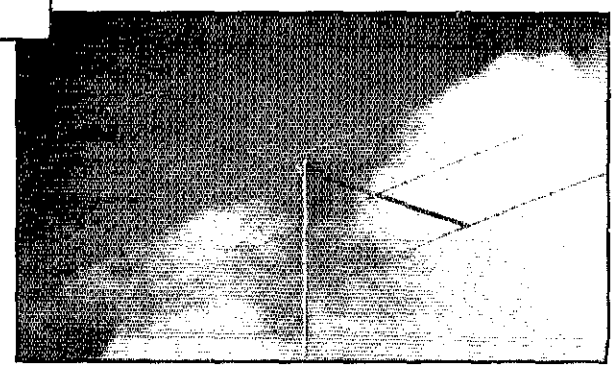

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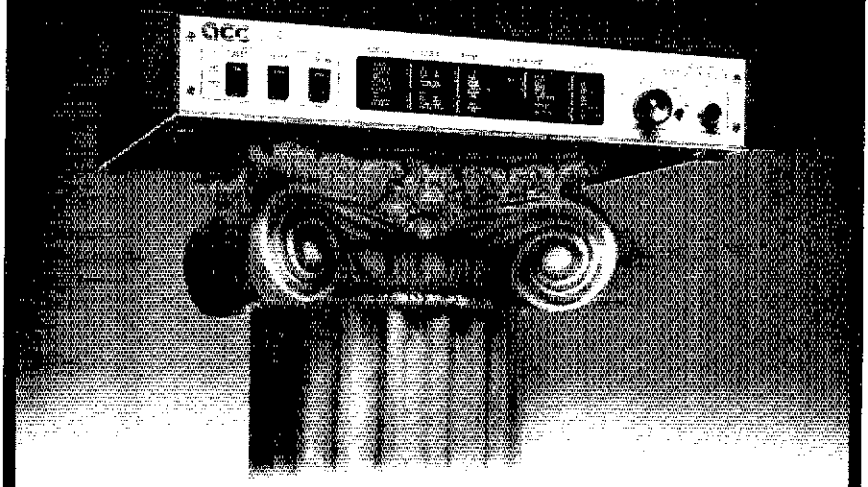

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Special Service Club for the purpose of checking QSL cards for awards. KAØSLI & I went to Austin MB to help with the Thrashermens Reunion. They plan to build a new comms, electronics & ham radio building on the grounds. The comms bldg at Bonanzaville is being built, with the concrete slab poured.

Net	Freq	Time	Sess/QNI/QTC	NM
Goose River	1895	9 A Sun	5/49/0	NTØV
DATA	3937 kHz	6:30 Dy	29/578/25	NØJR
WX Nets	3937 MHz	9 A & 12:30 A Sat Nov-Mar		WØGFE
North 40	146.64	6 P MST Sn		NØELA
Superlink	7 P Sun rptrs	All Superlink	7 PM CT	NØKMG

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—ASM: NØABE WAØFPR. SEC: KAØKPY. STM: KDØYL. Club members around the state are doing a storm WX watch with the large number of storms this season. The Pierre ARC will purchase a rptr to be installed at Midland. This will complete their link from Pierre to Rapid City. Watch here for further info as it becomes avail. Lake area club at Watertown reports a 50% improvement in their Field Day score over their past 2 yrs. KAØUEQ reports problems with a 30-ft structure height imposed by the Milbank City Council. Action delayed on his request to put up a 56-ft tower 'til Aug mtg, so we will watch the outcome of this. Pierre Jr H S principal is interested in having a ham radio course, as Pierre Club is working on this. Total tfc reported for July was 466. Tfc: KØERM 107, WØMZI 35, KØAIE 128, KAØKPY 95, KDØYI 28, KAØUEQ 64, WØYMB 9.

DELTA DIVISION

ARKANSAS: SM, Bob Harmon, W5SEP—Looks like Field Day was a great success from the tfc I received. Msgs were received from Ft Smith ARC, AR TN RAC, SW AR RC, NW ARC, AR River Valley ARC, ARF, MARC & CAREN, reporting they had 150-200 visitors at their Field Day. The buzz in the NE corner of the state concerning the predicted earthquake for Dec is becoming louder. The AR Nat'l Guard is moving heavy equipment into the area & planning exercises. An exercise is planned to be conducted by the Nat'l Disaster Medical System on Oct 10-13 in the E AR area. The exercise starts with a simulated earthquake with the epicenter at Marked Tree, AR. ARES & RACES are to provide comms for the exercise. For further info on the exercise, contact Bailey, K5TML, the AR RACES coord or Wayne, WB5OFN. Congrats to Bailey on his appointment as State RACES Coord; he certainly has a vested interest, living in the predicted earthquake area. If any amateurs have equipment that can be easily airlifted into a disaster area, you should supply this info to Bailey or Wayne. This is true if you'd be avail to be airlifted into the area & prepared to stay for several days under rugged conditions. Many schools in the area are going to let out on the predicted dates. This area was hit in the early 1800s with one of the most severe earthquakes that ever hit the US. The upheaval was so severe that the Mississippi River flowed backward for several days & a new lake was formed. Lets hope the predictions are wrong, but as amateurs, we should always be prepared to assist as we have always done. Our Field Day exercises just conducted will certainly be helpful in any emergency situation.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—ASM: KB5CX. ACC: K5KR. SGL: KD5SL. STM: WB4FDT. SEC: KG5PV. Packet: WB5ASD. TC: KE5FZ. Bill Yorty, W5RWF, ARRL Tech Coord for the past several yrs moved out of state & resigned his appointment. His wide knowledge & steady personality will be missed by his many friends who wish him smooth sailing in his new position. David Pierce, KE5FZ, from Sunset, has been appointed Tech Coord. He has an equally impressive engineering background. Welcome aboard to James Dugal, N5KNX & Stephan Mahler, KF5VH, both from Lafayette, as Asst Tech Coords. Raymond Arceneaux, N5LRZ, of Opelousas, appointed an Emergency Station. Anita, KN2N, of Alexandria, regularly contributes a well-written "DX is" article in the Central LA publication *The Brass Key*, avail to other clubs by request. Regretfully, Tom Palko, WB5ASD, resigned after several yrs as editor of the newsletter; we'll miss the professional job you did, Tom. Phil Sager, WB4FDT, LA Tfc Mgr from Ruston has been doing a terrific job managing & expanding the CW & SSB nets; why don't you join in? Everyone is welcome. After a few sess, you'll feel right at home. The SSB Net meets at 3910 at 6:30 PM & the CW Net meets on 3615 at 7 PM. 73, "Wondy," K5KR. Tfc: WB4FDT 78, N5CNK 67, N5BFV 39, K5AZR 31, K5WOD 30, WA5TQA 21. (Jun) WB4FDT 73, N5CNK 62, K5WOD 36, N5BFV 6.

MISSISSIPPI: SM, Butch Magee, KF5DE—ASM: WD5GHW. STM: KB5W. SEC: N5DVR. SGL: KA5WRX. OOC: WA5TMC. TC: W5VZF. This month brings the Gulf Coast Convention & all the great things the Coast area has to offer. I'm writing this in Aug, so I hope you get this issue of *QST* in time to put the Hamfest & Convention on your calendar if you haven't done so yet. A reminder to all tfc handlers, NCS & NMs: Please get reports to Jim Leist, KB5W, no later than the 5th of the month. When you get the report in to Jim, that ain't the end of the handling; he has to compile several reports & get them to me & ARRL HQ. Please work to make our jobs a bit easier. If your club is offering VE exams, please get this info to me & League HQ & we can help publicize for you. 73, Butch Magee, KF5DE. Tfc: NS5M 146, W5DEJ 36, KT5Z 16, KB5W 353, W5JDF 156,

TENNESSEE: SM, Harry Simpson, W4MI—Eastern SM & PIC: W4TYU, Western SM & ACC: K4CXY. STM: WB4LAL. SEC: K4UVH. OOC: K4LSP. TC: W4HHK. I asked in an earlier column for someone to help K4WWQ who was handling DRN5 tfc all by himself. Glory! K4ZUY moved back from GA & the WB5YDD report reads, "62 sess, 566 msgs, TN represented at 79% of the sess by K4WWQ, KN4HL & K4ZUY." In addition to help from Charles & Jack, Steve, NX3W, saw the request for help & is trying to adapt his busy sched to add his support. Oct is a busy month for hamfests: Memphis 13-14, Tri-Cities 20 & Chattanooga 27- 28. SM W4TYU will join me at most of them. I suppose I'll have to rest the remainder of the yr. Congratulations to a newly affiliated ARRL club, the Campbell Co H S ARS in LaFollette. Congratulations to Jack Archer, WB4TUO & the Greene Co Emergency Comms Team for their fine front-page story in the *Greeneville Sun*. I received a nice report from Anderson Co EC Dave Brown, WA4HGP; his group is doing an excellent job & looking forward to the NDMS Exercise Oct 10-13. Here in Memphis, astride the New Madrid fault, we'll be busy during that period. W4OQG is handling MARS activities & EC NX3W will handle ARES. The TN Phone Net is on 3980 kHz with early sess at 6:40 AM

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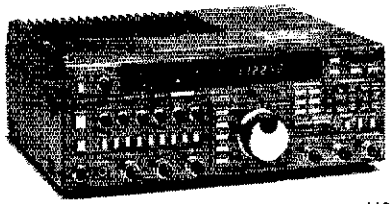

HF Transceivers	LIST
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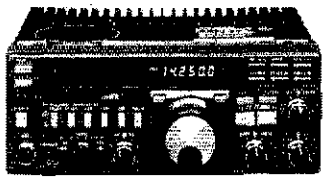
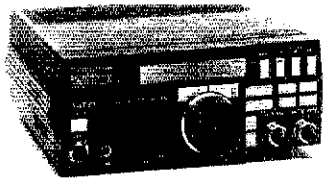
2M/767 2m module	239.00
6M/767 6m module	196.00
430/767 430-440 module	296.00
440/767 440-450 module	296.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/phone patch	136.00
FAS-1-4R Remote antenna selector	120.00
FIF-232C Interface	95.00
FTS-8 Encoder/decoder	55.00



FT-757GX MkII 9-band xcvr w/mic	$1089.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
FC-757AT Automatic ant. tuner w/memory	429.00
FAS-1-4R Remote antenna selector	120.00
SP-767 Speaker w/audio filters	99.00
SP-767P Speaker/patch	136.00
FRB-757 External relay box	14.00
MMB-20 Mobile mount	26.00

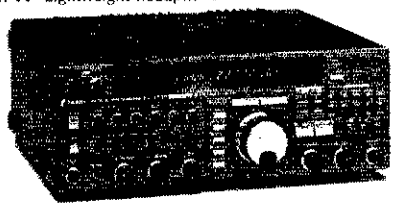


FT-747GX HF transceiver	$ 889.00
FP-757HD Heavy duty supply with fan	309.00
FP-700 Power supply	244.00
SP-767 Speaker w/audio filters	99.00
MD-1B8 Desk microphone	115.00
MH-1B8 Hand microphone	29.00
FM-747 FM unit	47.00
MMB-38 Mobile bracket	14.00
TCXO-747 Increased freq. stability unit	42.00



FL-7000 Solid-state HF linear amplifier $2279.00

Misc. accessories	LIST
MD-1B8 Desk microphone	$ 115.00
MH-1B8 Mobile microphone	29.00
YS-60 1.8-60 MHz 2KW wattmeter	Call for Special
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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FEX-736-220 220MHz module	322.00
FEX-736-1.2 1.2GHz module	589.00
TV-736 1.2GHz ATV converter	163.00
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FTS-8 Encoder/decoder	55.00
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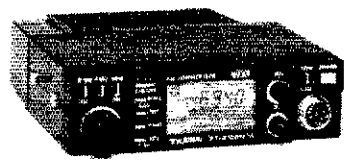

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FT-712RHT/C8 35w 440 FM w/autodial mic	497.00
FT-290R MKII 25w 2m FM/SSB xcvr	610.00
FT-690R MKII 10w 6m FM/SSB xcvr	752.00
FT-790R MKII 25w 430-450 FM/SSB xcvr	681.00
FBA-8 Holder for C-cell Nicads	32.00
NC-26B Wall Charger for FBA-8	10.00
CSC-19 Soft case	16.00
MH-10F8 Speaker/Microphone	30.00
MH-10E8 Hand Microphone	24.00
FTS-7 Encoder/decoder	40.00
FT-4700RHT/C8 50/40W 2m/440 FM/TTP	799.00
AD-2 50w 2m/440 duplexer	48.00

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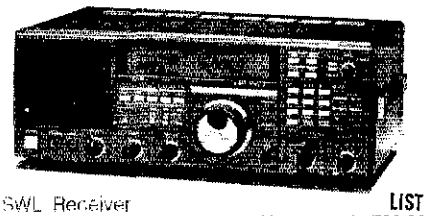
FT-470 2m/440 FM HT	Call for Special
FT-23R-17 2m 2.5w HT	306.00
FT-33R 5w 220MHz HT	328.00
FT-73R 2w 440MHz HT	Call for Special
FT-73R/TTP 2w 440MHz HT w/TTP	Call for Closeout



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FRA-7700 Indoor active receive antenna	58.00
FRT-7700 Antenna tuner	77.00
FRV-8800 118-174 MHz VHF converter	107.00
FIF-232C Interface	95.00
DC-8800 DC kit	4.00
FM-W/8800 FM-wide kit	21.00

Antenna Rotors	List
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G-5400B Az/El rotor combo	497.00

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GREAT LAKES DIVISION

KENTUCKY: SM, John Thernes, WM4T—Asst SM: KC4WN. SEC: WB4NHO. STM: KA4MTX (July). My thanks this month to the Capitol RC of Frankfort during my visit. New appointments this month: KC4DUV DEC, N4SFA EC, KA4NQC EC, WA4ZKX Asst EC. Congrats to Gerald Kasselmann, KD4QA, for being voted by the ARRL Board as 1989 Instructor of the Yr. The Div cabinet mtg July 7 in Findlay, OH, was informative. I'm pleased to announce the KY Colonels ARC has again been renewed as having met the criteria for ARRL Special Services Club.

MKPN	1269	95	31	WD4RWU
KTN	723	41	31	KC4FRA
KYN (both)	309	82	62	K4AVX/KZ8Q
TSTMN	391	25	31	KZ8Q
KNTN	195	67	40	KB4UJA
CARN	742	40	31	KN4IV

SAR (July): WD4RWU 95, KB4UJA 72, K4VHF 60, KC4OBX 53, K4AVX 41, KC4WN 29, KA4MTX 26, WD4COF 13, N4PEK 11, WA4EBN 11, WA4HLW 7, N4LAF 5, KU4A 2. PSHR: KA4MTX 76. Thanks & 73.

MICHIGAN: SM, George E. Race, WB8BGY (@ WA8URE)—STM: WB8R (@ NT8R). SEC: K8COF (@ N8JAT). SGL: N8CNY. TC: W8YZ. OOC: WA2AJQ. BM: N8IWS (@ WA8OOH). PIC: WR8R (@ KC8TU). ACC: W8POX. SK with deep regret, WA8LKH. My "Iron Man" award goes to KF8AU for his July BPL total of 583; way to go, Dean! Delayed May & June WSSBN report—444-34-31, 429-31-30. Congrats to K8GWW, recently named RACES RO for Manistee Co. Thanks to WB8Q for the yrs of service as District no. 8 DEC. Bill is being replaced by Jim, WD8DJA, who is also Marquette Co EC. Welcome to N8KUF, new EC of Monroe Co. Thanks to retiring EC Dale, WA8EFK, for all the service to the MI ARRL; Dale has been involved in ARES for nearly 20 yrs as SEC & EC. SEMTN Mgr N8HSC, has appointed Diane, WI8K, as asst NM for SEMTN. Diane will be working with Dale, N8IIC, managing the affairs of the SEMTN. Congrats to Gerry, WB8RNY, recently appointed OES for Wayne Co. If you think you qualify for an OES appointment, request an application from Joe, K8COF, our SEC. Did your club receive the 1st issue of the *QRV Bulletin*? A new publication by Mike, W8POX, our ACC, will provide a method of coordinating & advertising MI club functions & hamfests. Please put Mike on your club mailing list for your newsletter. The highlight of the past month was the UP Hamfest. Our yrly trek up north always provides the renewal of old acquaintances & mtg new friends. The highlight of the day was when Vi, W8JXJ, came into the UP Net mtg. She's looking great & everyone was pleased that she was able to attend. Walt, WB8SYA, replaced Vi, W8JXJ, as UP Ham of the Month awards person. Hugh, W8KIQ, was named UP Ham of the Yr for 1990-91. Next yr's UP Hamfest will be held in Houghton. Thanks to Div Dir, Al, AB8P & MI League staff: Larry, WB8R & Joe, K8COF, for their presentations at the Hamfest. The DEC mtg was also attended by DeLynn Rice, our State of MI RACES Comms/Public Info Specialist. See you at the MI ARRL Convention Sept 21-23. 73. Please support the following MI area Nets:

Net	*Freq*	*Time/Day*	*QNI*	*Tfc*	*Sess*	*NM*
MiTN	3953	7 P Dy	583	182	31	WD8EIB
QMN*	3863	6 P Dy	486	127	59	WB8SYA
SEMTN	145.33	10.15 P Dy	279	108	31	N8HSC
GLETN	3932	9 P Dy	956	58	31	NW8M
MNN*	3722	5:30 P Dy	82	56	31	KF8AU
UPN*	3921	5 P Dy	1073	47	36	WA8DHB
MACS*	3953	11 A M-Sat	311	40	31	K8OCP
NMTN	147.12	7:30 P Dy	347	37	31	N8JCL
WSSBN	3935	7 P Dy	497	35	31	K8GOU
VHF Net Activity			803	18	64	N8CRV

*QMN Early-5:30 PM Dy; QMN Late-10 P Dy; MNN Late-8 P Dy; MACS-1 P Sun; UPN-12 P Sun. Tfc for July: KF8AU 583, KA8CPS 252, WB8I/BBS 192, WA8VYN 102, N8FPN 85, WB8SYA 74, K8GXV 71, WB8R 70, W7LBV 63, K8HAP 45, K3UWO 42, WA8DHB 41, WB8BGY 41, WD8MJB 41, N8IIC 37, W8EOI 32, K8OCP 28, W8IHX 27, N8CRV 27, NY8W 27, *W8CSO 26, K8UPE 26, KA8BYK 25, WT8J 23, W8CUP 21,* K8ZJU 19, N8CNY 18, WD8EIB 14, KB8DZX 13, K8GOU 12, WB8EZ 11, W8RNQ 10, KI8Q 9, WB8WJV 8, KD8LZ 8, W8VIZ 6, N8EXS 4, KN8JDN 3, W8URM 1.

OHIO: SM, John Haungs, WA8STX (@ KC8TW), tel 513-563-7373. ASM: David Kersten, N8AUH (@ NO8MI, tel 216-221-6740. SEC: WD8MPV @ WA8BXN. STM: KF8J. ACC: KJ3O. BM: W8PH @AD8I. TC: KB8MU. OOC: WB8ZCE. SGL: N8CVK. PIC: K8QOE. July brought more disasters. ARES was on standby after the July 19 plant explosion in greater Cincinnati. Extensive damage was done to property for several blocks around the plant. One person was killed & 72 people were injured. Red Cross QCEN amateurs were activated for damage assessment. Congratulations to the following clubs that have been officially designated ARRL Special Service Clubs: OH-KY-IN & N Coast ARC. Those renewing their SSC, Portage ARC, Canton ARC, Sandusky Valley ARC, Reservoir ARA, Triple State RAC & Lake Co ARA. Through the work of their members, these clubs are recognized for their continued efforts on behalf of Amateur Radio & service to their communities. Congratulations to Gerald L. Kasselmann, KD4QA, selected as Professional Teacher of 1989 from the U of Cincinnati OMI College of Applied Science. He was nominated by OMI ARRL-affiliated club K8ORW. Congratulations to the new officers of IARC: pres Mike, NC8S; secy Scott, KC8SS & dirs Gino, KA8YPZ; Jerry, NR8W & Dean, KB8MG, who is also treas. Congratulations to Chuck, WD8PQG, the new pres of the Triple States RAC. Congrats to David Kersten, N8AUH, from Lakewood, who will take over as SM the 1st of Oct. He is unopposed, so no election is necessary. I'm sure Dave will do a good job & he'll be looking for volunteers to assist in the activities of the Section. It has been a pleasure serving as the ARRL OH SM the past 2 yrs & a privilege to have a professional staff of amateurs who volunteered their time & efforts to make the OH Section the best. The Section's Field Org volunteers are outstanding, including the tfc NMs & NCSs.

Net	*QNI*	*QTC*	*Sess*	*Time(local) Day*	*Freq*	*NM*
BN(E)	195	67	31	1845 Dy	3.577	WD8C
BN(L)	259	114	31	2200 Dy	3.577	KD8HB
BNR	193	60	31	1800 Dy	3.605	W8EK
OSSBN	1581	623	93	1030,1615,18453	3.9725	N8IBS

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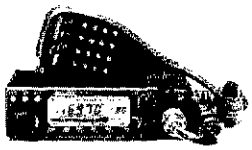

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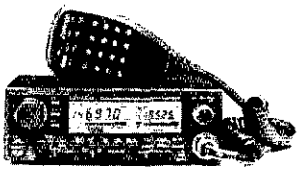

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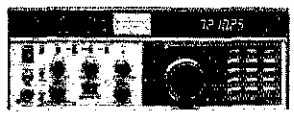

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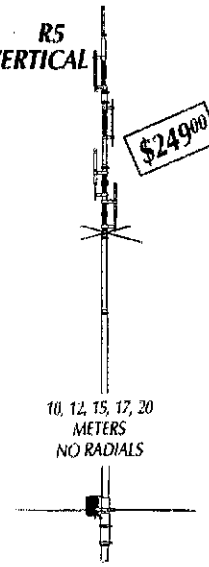

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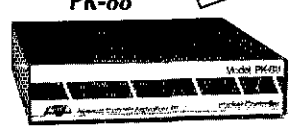

PACKET CONTROLLER



2 Meter $49.95

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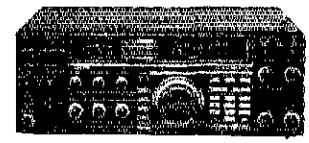
ICOM

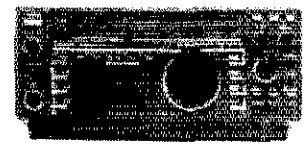
SIMPLY THE BEST

IC-765



COMPETITION GRADE

IC-735

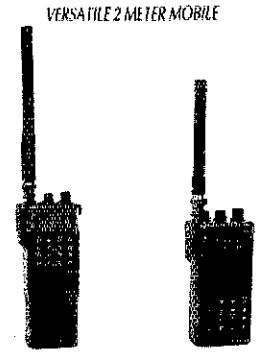


PROVEN WINNER

IC-229H NEW



VERSATILE 2 METER MOBILE



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YELLOW **CAT# LED-4Y**
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TRW/ Optron# OPB711
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Optek# K-8711
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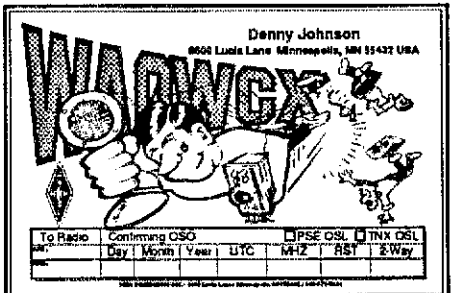

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Tfc: W8BO 277, KD8HB 265, K8TVG 243, K8DHD 204, KD8KU 159, WA8STX 155, N8IIP 152, W8PMJ 152, KE8CV 149, KF8J 129, W8JLW 109, KC8TW/PBB 103, W8SKP 102, WB8JGW 95, K8IOW 93, WA8SSI 93, W8EK 90, WB8DPZ 86, N8FWA 84, WA8HED 76, W8RG 76, KA1S 72, WD8RIB 72, K8JDI 66, WB8FSV 65, W8QZK 59, W8LDU 47, N2NS 46, K8ALV 46, NS8C 43, WD8IKC 40, KA8SON 40, WB8KWC 40, WA8EYQ 40, WD8KBW 38, N8GOB 34, KE8WA 33, W8PBX 32, KA8YIT 32, KB8DUX 31, K8JA 31, WB8VNV 31, N8HJB 29, N8JOC 28, W8JYE 28, WB8HHZ 27, KA8HBN 26, N8INP 26, KB8ESU 25, KC8JV 25, W8GDQ 24, W8VND 24, N8CXI 21, WV8B 21, N8JRV 21, K8ES 20, W8QCU 20, WK8H 20, W8BDC 20, NF8B 20, KC8UR 16, KA8CGF 15, W8PH 14, N8JHP 12, N8JYV 12, KA8BNQ 11, N8AJU 11, K8CKY 10, N8XX 10, KB8GUM 9, W8LDQ 9, K8EF 8, KB8HJJ 8, WA8MWA 8, NY8V 7, K8WZX 6, N8FPH 6, N8CW 6, KD8XL 5, W8FPA 5, AD8IC 3, WB8NHV 2, KA8QIP 1, W8XT 1. (Jun) KD8XL 8, W8SWM 7, KB8HJJ 7. (May) N8JRV 13.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—STM/ASM: K2ZM. SEC: WA2ZYM. ACC: KV2A. SGL: KB2HQ. BM: WB2IXR. OOC: N2DVQ. PIC: KB2TM. ATC: WA2VGM. ASM/PACKET: N2FTR ASM/Newsletter: WB2NHC. Special thanks to N5MEA for an excellent job done as NM of NYSE & congrats to WI2G who is taking on the job. Club news: Albany ARA & Schenectady ARA assisted with comms for the Albany end of the Buffalo-to- Albany Relay Race. Those helping included W2CJO KA2MBA WA2QAD WA2TSW N2EKU K2TJB N2CNZ WT2F KB2GLV K2RI WB2VJC W2JVF KA2VNP. Albany ARA, R. V. Winkle ARC & Poughkeepsie ARC assisted on the MS bike ride with N2HFV KA2MBA N2ENX WA2YBM WB2FMB WA2WQZ KA2SKG WA2MKJ W2CJO WD2AJS WE2G WD2K KA2RLH WB2UEB N2IWB W2AWX helping. WECA assisted Westchester Co at a women's triathalon & the NY Philharmonic concert. Overlook Mtn ARC heard from WA2DHF & WB2VUK—finally! The tfc handlers picnic was once again held at home of W2MTA. K2ZM & I drove up & had a great time chatting with many of those active on the nets. EC of Westchester Co, WB2NVR, has been holding regular training sess with SDN & reports plans to hold the SET with an Emergency Medical Service drill in Oct. Try to run your SET in conjunction with an exercise of a served agency in your area. A ENY cabinet mtg is being planned for later this fall; further word will be forthcoming. Hope everyone had a good summer. Net reports for July (checkins/tfc): AESN 43/3; CDN 528/66; NYP 111/53; NYPON 416/240; NYS/E 405/182; NYS/L 330/126; NYS/M 305/189; SDN 435/110. July PSHR: KB2EPU WB2VUK N5MEA WE2G WB1BTJ WF2M N2JBA. July tfc: N5MEA 239, WB2VUK 123, KB2EPU 105, WB2IIV 92, W2CJO 61, WF2M 49, WA2YBM 48, N2FTR 40, WE2G 38, WB1BTJ 32, WA2GYY 25, K2LYE 24, N2JBA 9.

NEW YORK CITY-LONG ISLAND: SM, Walter M. Wenzel, KA2RGI— ASM: WB2IBO. ASM: N2GQR. ASM/ACC: KA2LCC. SEC: W2HPM. STM: K2MT. OOC: NB2T. PIC: KA2JMA. TC: W2QUV. BM: W2JUP. VE sess: LIMARC (ARRL), 2nd Sat ea month, 9:30 AM, Salten Hall, NY Inst of Tech, Old Westbury—contact Al Jones, W2ZDB, 516-676-5790; Suffolk Co VE Team (ARRL), 2nd Sat ea month, 9:30 AM, Suffolk Co Community Coll, Islip Arts Bldg, Selden—contact George Sintchek, WA2VNV, 516-751-0894; Grumman ARC (W5YI), 2nd Tues ea month, 5 PM, Grumman Rec Ctr, Plant 113, 800 S Oyster Bay Rd, Hicksville—contact Howard Liebman, W2QUV, 516-354-6861; Great S Bay ARC (ARRL), 4th Sun ea month, 12 noon, Babylon Town Hall Office Annex, 281 Phelps Ln, N Babylon—contact Walter Wenzel, KA2RGI, 516-957-5726. If your group is planning a VE sess, please let me know so it can be added to this listing; even if you don't hold a regular sess, please let me know of it at least 2 months in advance so it can make the column. Upcoming events: Oct 13-14 NDMS Exercise; Oct 20-21 Lung Assn Bike Tour; Oct 20-21 MS Family Bike Tour; Nov 4 NYC Marathon. New appointment: Ron Barbera, KA2LAD, DEC W Suffolk Co. I haven't been getting club activities & events in time to add them to this listing; if you'd like to see an event or happening listed here, please let me know about 2 months in advance (minimum) so it can make the deadline. Congratulations to the following groups for the spectacular news coverage because of their press releases for Field Day: Radio Central, Suffolk Co ARC, Great S Bay ARC, Larkfield ARC, LIMARC & Wantagh ARC. I know there were more, but these were those I've seen or been sent copies of. Speaking of press releases please remember to send a copy of any PR of any event you have to me & PIC, Bill Frisch, KA2JMA. If any group needs help in PR, please contact Bill for further assistance. Norm Sternberg, W2JUP, (BM) & Harry Morton, W2NIP, (Asst BM—Voice Operations) are looking for people who will assist in the passing of bulletins & other related msgs within the section. If you are interested in this or gathering more info, please contact them for the info & see how you may be of assistance. The following are tfc nets in & around the section that handle NLI:

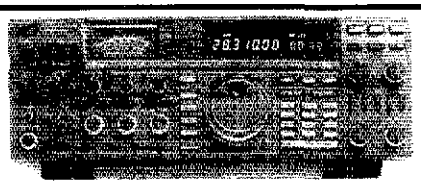
Net	*Freq*	*Time*	*Day*	*NM*
BAVHF	145.350/R	2000	Dy	K2TWZ
NCVHF	146.745/R	1930	M-F	N2IMP
NCVHF	146.805/R	1930	S-Sun	N2IMP
SCVHF	145.210/R	2000	Dy	KA2JMA
NYP	3.925 MHz	1300	Dy	W2MTA
NYPON	3.913 MHz	1700	Dy	KA2UBD
NYS/M	3.677 MHz	1000	Dy	N2EIA
NYS/E	3.677 MHz	1900	Dy	N5MEA
NYS/L	3.677 MHz	2200	Dy	W2YGW
NLT	28.450 MHz	2100	Wed	N2IMP
ESS*	3.590 MHz	1800	Dy	W2WSS

*Independent Net, recognized by NTS, local times:

*** Pkt Node Stations ***

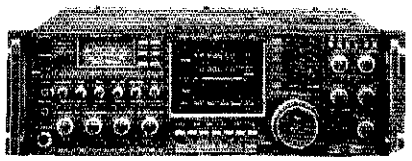
Al2Q-4 Freeport	145.010 Nassau, W Suffolk
W2HPM-4 Farmingville	144.970 Cent Suffolk
NR2L-4 Water Mill	145.090 E Suffolk
WB2IBO-4 Massapequa	145.030 Backup for Al2Q-4

NORTHERN NEW JERSEY: SM, Richard S. Moseson, NW2L (@ KD6TH)—ASMs: Recruitment KA2F, Youth (Vacant), Vol Counsel N2IGO, SE KY2S, SW KC2ZA, NW NW2S. ACC WA2QYX. BM: K2ULR. OO/AAC: KA2BZS. PIC: WE2R. SEC: WB2HBZ. STM: WB2FTX. TC: WG2W. Ham radio infoline

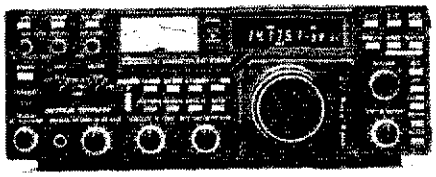


HF Equipment

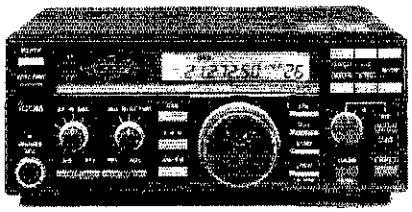
	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner.....	3149.00	2699



IC-781 Xcvr/Rcvr/ps/tuner/scope	6149	5199



IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1469
PS-35 Internal power supply.....	219.00	199.95
FL-63A 250 Hz CW filter (1st IF).....	59.00	
FL-52A 500 Hz CW filter (2nd IF)....	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)....	115.00	109.95
FL-70 2.8 kHz wide SSB filter.....	59.00	



IC-735 HF xcvr/SW rcvr/mic.....	1149.00	989.95
PS-55 External power supply	219.00	199.95
AT-150 Automatic antenna tuner	445.00	389.95
FL-32A 500 Hz CW filter.....	69.00	
EX-243 Electronic keyer unit.....	64.50	
UT-30 Tone encoder	18.50	
IC-725 HF xcvr/SW rcvr..... *(Special)*	949.00	799.95
AH-3 Automatic ant tuner .. *(Special)*	489.00	379.95
IC-726 10-band xcvr/6m/.5-30MHz rx	1299.00	1129

Accessories	Regular	SALE
IC-2KL HF solid state amp w/ps.....	1999.00	1699
IC-4KL HF 1KW out s/s amp w/ps.....	6995.00	5995
EX-627 HF auto. ant. selector *(Special)*	315.00	269.95
PS-15 20A external power supply	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal; 751A, etc ...	79.00	
SM-6 Desk microphone.....	47.95	
SM-8 Desk mic - two cables, scan	89.00	
AT-100 100W 8-band auto. ant. tuner ...	445.00	389.95
AT-500 500W 9-band auto. ant. tuner ...	589.00	519.95
AH-2 8-band tuner w/mount & whip	758.00	689.95
AH-2A Ant tuner system, only .. *(Special)*	559.00	469.95
GC-5 World clock..... *(Special)*	91.95	69.95

Accessories for IC-765, 781, 725 • CALL for Prices

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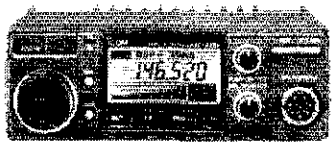
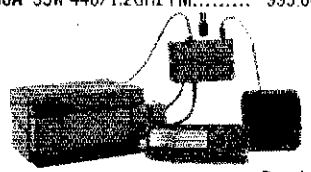
VHF/UHF Base Transceivers	Regular	SALE
IC-275A 25w 2m FM/SSB/CW w/ps...	1299.00	1129
IC-275H 100w 2m FM/SSB/CW.....	1399.00	1199
IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	1199
IC-475H 100w 440 FM/SSB/CW *(Spec)*	1599.00	1269
IC-575A 25w 6/10m xcvr/ps *(Special)*	1399.00	1099
IC-575H 25w 100w 6/10m xcvr.....	1699.00	1469



VHF/UHF Mobile Transceivers	Regular	Sale
IC-228H 45w 2m FM/TTP scan *(Special)*	539.00	419.95
IC-229A 25w 2m FM/TTP mic	449.00	389.95
IC-229H 50w 2m FM/TTP mic.....	479.00	419.95
IC-448A 25w 440 FM/TTP ... *(Closeout)*	599.00	499.95

Dual-band FM Transceivers	Regular	Sale
IC-3210A 25w 2m/440 FM... *(Closeout)*	739.00	499.95
IC-3220A 25w 2m/440 FM/TTP mic...	659.00	569.95
IC-3220H 45w 2m/35w 440 FM/TTP	699.00	599.95
IC-1200A 10w 1.2GHz FM.... *(Closeout)*	699.00	549.95
IC-2400A 2m/440 FM/TTP ... *(Special)*	899.00	699.95
IC-2500A 35w 440/1.2GHz FM.....	999.00	869.95



Multi-band FM Transceiver	Regular	Sale
IC-901 2m/440 Fiber opt. xcvr *(Special)*	1199.00	929.95
UX-R91A Broadband receiver unit...	389.00	349.95
UX-19A 10w 10m unit.....	299.00	269.95
UX-59A 10w 6m unit.....	349.00	319.95
UX-S92A 2m SSB/CW module	599.00	529.95
UX-39A 25w 220MHz unit *(Special)*	349.00	279.95
UX-129A 10w 1.2GHz unit	549.00	499.95

VHF/UHF Mobile Transceivers	Regular	Sale
IC-970A 25w 2m/430 MHz transceiver	2895.00	2499
IC-970H 45w 2m/430 MHz transceiver	3149.00	2699
UX-R96 50-905 Mhz receive unit....	389.00	349.95

Mobile Antenna	Regular	Sale
AH-32 2m/440 Dual Band mobile ant	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	28.75	

Repeaters	Regular	Sale
RP-1510 2m 25w repeater	1849.00	1649
RP-4020 440MHz 25w repeater.....	2299.00	1999

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Hand-helds	Regular	SALE
IC-02AT/High Power	409.00	349.95
IC-04AT 440 *(Closeout)*	449.00	329.95
IC-2SA 2m .. *(Special)*	419.00	299.95
IC-2SAT 2m/TP *(Spec)*	439.00	359.95
IC-3SAT 220 HT/TTP	449.00	369.95
IC-4SAT 440 HT/TTP	449.00	399.95
IC-2GAT 2m HT/TTP	429.00	379.95
IC-4GAT 440MHz, TTP	449.00	389.95
IC-32AT 2m/440 HT	629.00	549.95
IC-24AT 2m/440 HT	629.00	549.95

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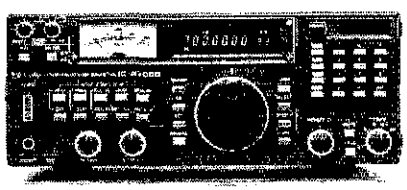
IC-12AT 1.2GHz FM HT/TTP... *(Closeout)*	473.00	349.95
IC-12GAT 1w 1.2GHz HT/batt/cgr/TTP	529.00	469.95

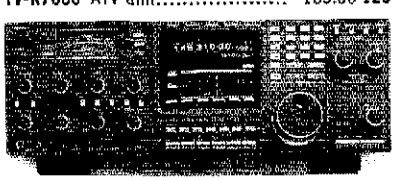
Aircraft band handhelds	Regular	SALE
A-2 5W PEP synth. aircraft HT.....	525.00	479.95
A-20 Synth. aircraft HT w/VOR.....	625.00	549.95

For HT Accessories • CALL for Prices

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	



R-7000 25MHz-2GHz receiver.....	1199.00	1029
RC-12 Infrared remote controller....	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit.....	139.00	129.95



R-9000 100KHz-2GHz all-mode rcvr ...	5459.00	4699

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D-52	10/15/20/40/80	2	105'	74.95
D-56	10/15/20/40/80	6	82'	119.95
D-68	10/15/20/40/80/160	8	146'	154.95

TRAP VERTICALS-"SLOPERS":*

VS-41	10/15/20/40	1	28'	54.95
VS-52	10/15/20/40/80	2	49'	69.95
VS-53	10/15/20/40/80	3	42'	79.95
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*Can be used without radials
**Feedline can be buried if desired

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ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

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D-15	15	22'	18.95
D-20	20	33'	19.95
D-40	40	66'	33.95
D-80	80/75	130'	36.95
D-160	160	260'	37.95

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End insulators.

LIMITED SPACE DIPOLES

- Reduces overall length over 40%!
- "Shorteners" are enclosed, sealed, weatherproof and lightweight.
- Complete with Deluxe Center Connector, 14 ga. CopperClad antenna wire, end insulators, and assembly instructions.
- Use as inverted "V", or flat-top.
- Excellent for all class amateurs.

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Type	Length	With antenna purchase	Separately
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RG-8	100'	41.00	46.95
RG-8X	50'	12.95	17.95
RG-8X	100'	19.95	25.95

"PRO-BALUN" PB-1 $17.95

- 1:1 For Dipoles, Beams & Slopers
- Handles Full legal power
- Broadband 3 to 35 Mhz.
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- Deluxe connectors require NO soldering
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PLACE YOUR CHRISTMAS ORDERS NOW!

201-680-1585. Things are pretty quiet as I write this in early Aug. Just returned from a work trip to San Francisco, where I was again reminded of one of the best reasons for being a ham: the people. After a brief 2-meter QSO with a ham heading in the same direction I was, I ended up spending the afternoon & much of the evening with this former stranger & his wife. As someone much wiser than I once said—and it's especially true of hams—"There are no strangers; only friends we haven't met yet." I hope we can extend similar courtesies to visitors in our area. Field Organization news: We have 2 new DECs who are in charge of ARES activities in their respective cos. Ted Wolf, KB2BLX, is now DEC/Passaic Co & Gordon Beattie, N2DSY, is DEC/Bergen Co. Thanks to their predecessors, N2DZZ & WB2AIU, for their service to the section. Club news: New Prov ARC had its picnic July 28; enjoyed seeing many of you at Sussex ARC hamfest July 15; Bergen ARA reports 14 new members so far this yr—good work! NJDXA Pres K2AIO wrote excellent newsletter column on reasons for belonging to the League— thanks. Coming up this month—a great opportunity to introduce young people to ham radio: the annual Jamboree on the Air (JOTA), sponsored by Scouting organizations around the world, the wknd of Oct 20-21 (see Sept *QST*, p 52); contact your local Cub Scout/Boy Scout/Brownie/Girl Scout unit or local Scout office & invite interested kids to come operate with you that wknd; there are nice QSLs & such for all participants. Your local Scout office should have full details. Otherwise, send a business-sized SASE to: JOTA, Sum 221, 1325 W Walnut Hill Ln, PO Box 152079, Irving, TX 75015-2079. Reminder: be sure to vote for ARRL Hudson Div Dir & Vice Dir. July net stats (QNI = no. checkins/QTC = no. msgs passed):

Net	NM	Freq	Time	Sess	QNI	QTC
NJM	WB2ZJF	3695	1000	27	167	73
NJN/E	KA2INE	3695	1900	31	191	38
NJN/L	WA2OPY	3695	2200	31	100	25
NJPN	W2CC	3950	1800	36	365	96
NJSN	WR2E	3735	1830	31	147	19
OBTTN	WR2E	147.12	2000	26	138	83
NJTTTN	N2DXP	223.88	2100	31	105	17
NJVN/E	WB2FTX	146.895	1930	31	435	77
NJVN/L	KA2KJF	146.49	2230	31	239	60

July tfc (call sign/total msgs/PSHR): W2ONL/ 249/112 N2DXP-T/163/63 W2MTO/162/90 N2XJ/118/102 K2VX/92/86 K2PBP-T/69/73 KB4CYC-T/69/65 KA2INE/59/70 WR2E/57/37 W2RRX/56/75 WB2FTX/56/64 W2DMM/50/93 KA2KJF/46/70 WA2PAC/38/62 W2CC/29/- WA2CLP/24/- W2XD/15/-. 73 de NW2L

MIDWEST DIVISION

IOWA: SM, Wade Walstrom, WØEJ—ASM, KØCNM. SEC: KDØBG. STM: WØCON. ACC: NUØP. OOC: WAØQMU. BM: KØIIR. TC: KØDAS. SGL: WRØG. PIC: WEØM. WØCON has been appointed as the new IA STM. Lloyd is an experienced tfc handler & has been active on pkt. The Des Moines Hamfest was well-attended at its new location. The WX cooperated which helped the outdoor flea mkt activity. I enjoyed seeing many of you there. The 18th RAGBRAI once again put a large amount of tfc into the system for its 1-wk duration, mostly on pkt. Thanks to the clubs & groups at each of the 8 stops that originated tfc & gave Amateur Radio a positive public presence. A number of amateurs rode RAGBRAI this yr, including WØEJ, WBØRSW, NUØQ, KAØVSL, WYØV & KØAL from IA & many from other states. 2-mtr contact was maintained among these participants & many along the rte helped in providing emergency comms when needed. The Quad Cities ATV Club is the new name for BRATS & they plan to televise the 1990 Bix Run. New call: KAØHFN. Club newsletters: Quad Cities ATC, E IA DX Assn, Cedar Valley ARC, CIRAS, Ft Madison ARC, Collins ARC, Mt Pleasant ARC. Tfc: KØCNM 588, KØIPT 212, WØSS 192, KAØADF 100, KØGP 86, KØKQJ 14, NØJAR 14, KØEVC 12.

KANSAS: SM, Robert Summers, KØBXF—SEC: KØBIX. STM: WØOYH. ACC/OOC: KØBXF. TC: KAØHEP. BM: open. PIO: WBØWSG. SGL: NØIZE. By the time you read this, we hope WBØSEE will be back from his heart surgery & doing NCS duties again. No one else was reported ill this month; that's the way it should be. 39 hams in the metro KC-area provided comms for the 100/62/25-mile bike-a-thon for the Alzheimer's Assn. Active were KØBIX KØBXF KØIEW KØWFN KAØDJR KAØILN KAØLFT KAØRZQ KC4VG KEØDK KFØDA KFØGT KFØN NØDMJ NØGAB NØHKW NØHYG NØJMR NØJPT NØKOB NØKUG NØLLN NØLQY NØLVF NØLVG WØEUY WØNYG WAØHUJ WAØPWE WBØCEF WBØEJJ WBØERI WBØMDF WDØDOT WDØDPB WRØM WSØQ WTØE & WVØT; a good turnout for a 1st-time public service event. June was not without its usual stormy WX & several ECs reported activity & checkins to their local ARES/WX net watches. PKARC, Leavenworth, reported 10 new hams/upgrades in 1990. Sept is the month of a new start for Novice classes in quite a few clubs—keep us informed. Net activity for June '90: KSBN QNI 1184/QTC 124. KPN: 375/30. KMWN676/553. KWN 903/555. CSTN 1850/86. OKS 249/44 OKS-SS 25/9. Tfc: NZØM 254, KØBXF 245, WØFIR 240, WØFRC 153, NØKOJ 107, WØOYH 80, NBØZ 39, KBØEY 28, WBØZNY 24, WTØE 19, WØPB 14, WØLB 13, WØMYM 13, KB4BH 12, KXØI 9, WØOE 7, WVØL 6, WØCHJ 5.

MISSOURI: SM, Bill McGrannahan, KØORB—Last month, I listed several members of the Suburban ARC who earned Emergency Communications Commendations for their service during a flash flood. Outstanding among those honored was 9-yr-old Melissa Flodden, KBØFYI, a 3rd-generation ham who received her ticket in Jan. Who says all good hams are old duffers? PhD & Suburban ARCs received citations from the Amateur Radio News Service for their news magazines' excellence. Congratulations to Kate Simpson & Paul, KCØYZ, on birth of twin boys; & to Mr & Mrs Carl Hohenberger, WBØRIP, on their 50th wedding anniversary! The MO-KAN Council of ARCs elected Mike Bellinger, KØUAA, pres; Beryl Masters, WBØEJJ, vp; Gene Chadwick, KDØRK, secy; & Vern Ellis, KØIEW, treas. Shawnee Mission Med Ctr Triathlon was aided by WØAIB, KC4VG, KØUAA, KAØREN, WVØT, KAØVJE, NØKUG, KØTCB, KØTGU & WAØPFS. Sgt Harry Gunn, NØKJB, of the KCPD served on the Lees Summit Underwater Rescue Team during this event. Your SM drove to St Louis to present the EC Commendations, then stayed over for the Zero Beater Washington Hamfest—this one gets better every yr! Met with ASM Roger Volk, KØGOB, while there. Also gave an informal talk at the mtg of the Platte Co ARES group. DECs & ECs, please plan for SET Oct 20-21. Carol Rosson, WBØWLU, is now DEC for Dist F, which includes the State Capitol. We lost

Ameritron Linear loafs at full legal limit . . .

massive power supply capable of 2500 watts for half hour!

What makes the Ameritron AL-1200 stand out from other legal limit amplifiers?

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The heart of the AL-1200 power supply is a highly efficent Peter Dahl tape wound hypersil® transformer weighing 32 pounds. — it's equivalent to a 45 pound transformer using standard E-I laminations.

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You get genuine high current, full height *computer grade* capacitors with screw-on terminals — not short stubby, light duty soldered in "capacitors" that can't dissipate the heat generated by high current.

Why some filter capacitors explode

The failure of *carbon* equalizing resistors — used in most linear amplifiers — is the primary cause of filter capacitor failures.

When a *carbon* resistor gets hot its resistance drops, causing more current to flow, causing the resistor to get hotter.

This destructive cycle repeats until the *carbon* resistor opens and causes excessive voltage on the capacitor — the capacitor can explode.

Carbon equalizing resistors *can't* fail in the AL-1200. Why can't they fail? Because no-compromise *wire wound* SEVEN WATT 50 K ohm equalizing resistors — not the 2 watt 100K resistors others use — safely protect each filter capacitor. Plus, the lower value gives you better voltage regulation.

A direct short won't blow these rectifiers

The AL-1200 rectifier board uses diodes rated for a massive surge current of *200 amps* — you can accidentally short the high voltage supply and the diodes won't blow!

Will the amplifier you're considering withstand a direct power supply short?

Eimac® 3CX1200A7: the durability of glass and the power of ceramic

The AL-1200 uses one of Eimac® 's toughest ceramic transmitting tubes — the high gain 3CX1200A7. It has the durability of glass tubes and the power dissipation of ceramic tubes.



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3CX1200A7: 12 times tougher than the 3CX800A7

A 3CX1200A7 has a 50 watt control grid dissipation — that's more than 12 times tougher than the delicate 4 watts grid dissipation of a 3CX800A7.

If you accidentally drive a 3CX1200A7 with your 100 watt exciter when your amplifier is off, you won't fry your control grid. But don't make that mistake if you have a pair of 3CX800A7s — unless you're ready to buy another pair.

Full legal power at half the price

A *single* 3CX1200A7 in the AL-1200 delivers the *same legal limit* as a *pair* of 3CX800A7s that cost nearly twice as much. What do you get for paying twice as much? Twice as many parts to fail.

Plus more . . .

The UPS shippable AL-1200 also gives you . . . all mode, all band coverage including WARC and MARS, Pi-network tuned input, Step-Start Inrush Protection™, multi-voltage primary, Pi-L output tank with silver-plated components, separate filament transformer eliminates poor regulation and surges, adjustable ALC, SSB/CW switch for best linearity and efficiency, operate/standby switch, transmit indicator LED, 12 VDC auxiliary output, 35% safety factor for tuning capacitors and bandswitch virtually eliminates failures, shielded RF compartment, quiet die cast blower has 4 speeds, two illuminated meters show continuous grid current, peak RF watts out, drive power/ALC, plate voltage and plate current, ball bearing vernier reduction drives on plate and load controls, optional QSK board, one year limited warranty and more.

Call your dealer for your best price

Even at $2045 list it's a bargain. For your best price, call your favorite dealer and order today!

Pair of 3-500Z tubes give you full legal output for . . . $1995

Want a pair of tough 3-500Z workhorses?

The AL-82 is the **same** amplifier as the AL-1200 except it uses a pair of 3-500Z tubes. It has the same super heavy duty power supply to give you full legal output. Some amplifiers With a pair of 3-500Zs can't deliver full legal output because they use a lighter duty power supply.

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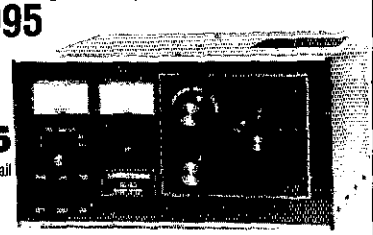
Suggested Retail



That's why the AL-82 costs a little more -- and why it's well worth it. Call for your best price today!

Legal limit antenna tuner

ATR-15
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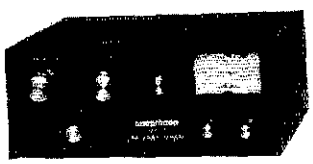

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Ameritron's most powerful amplifier

AL-1500
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Ameritron super power amplifier uses the herculean 8877 ceramic tube.

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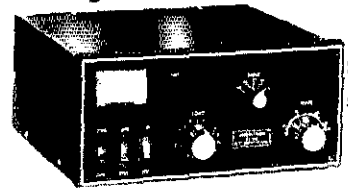

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an outstanding YL ham this month—Marie Ballard, KØPEG, wife of our friend Jim, KØOGU. Ex-MO Silent Keys: N4UMV, ex-WAØHOC & W5OGX, ex-WØZOS. Net reports for June & July: MOSSB QNI 1194 QTC 138 NM WBØWLU; MEOW 966/114 WDØELL; HAMBUTCHER 928/47 KØDSQ; HARC *347/20 KAØSXY; PHD 629/16 WAØKUH; CCARES 125/30* KAØSXY; SUL2MTR 148/5, ROLLA 540/3 WØDLG; SWMOSKY 348/8 KDØUD; SLARES 536/6 KØWEX; CMEN *142/1 KØPCK, PREVERE 554/2 WBØEJJ*; KCBARC *220/2* NØWA; AARES 26/0 NUØH 26/0 NUØH; JACKARES 154/0 KØUAA; JEFTCTY 96/0 WØORI; CARL 150/0; WBØWLU; FRI2MTR 178/0 WØRTL; 2MBKFST 630/2 WØRTL; QCWA 35 153/4 WØWHK; PIKEARES 18/0 KEØAH. (Jul) Tfc: NØFBW 1253, WRØR 252, WAØYJX 219, WBØOIZ 134, KØORB 125, NDØN 108, WØOUD 67, WØBMA 36, WBØWLU 29, KFØBM 21, KEØAH 8. 73 de KØORB!

NEBRASKA: SM, Vern J. Wirka, WBØGQM—Questions regarding business comms & public service events using amateur freqs continue to be asked. The best advice is to consult the latest *FCC Rule Book*, published by the ARRL. If you conduct the business of an org with the use of Amateur *Radio, you are violating the rules. FCC rules do not distinguish* between profit or nonprofit groups. Amateur Radio can be used to benefit the public, such as providing comms for *emergency medical services during an event. If you are faced* with a request for comms that constitutes business, there are other alternatives that would be more beneficial for you & for Amateur Radio in general than a flat refusal. For example, you could offer trained operators who would be willling to handle comms, but the sponsoring org would be responsible *for obtaining properly licensed radios that operate on freqs* allocated for the purpose of conducting business. Another method could be the use of cellular telephones. Our STM, Jerry Kohn, WDØEGK, put it well in a recent article in the *Lincoln Log:* "In short, what this boils down to is, Think before you talk." Pleasant weather, eyeball QSOs & plenty of good food were enjoyed by all who attended the 30th annual Victoria Springs Hamfest near Anselmo this July; around 250 were served at the Sun steak-fry. This report contains the tfc counts for June & July because of a vacation sched & column *deadline time conflict. (June) WBØGQM 23, KØMZV 21, KEØXQ* 20, WCØO 9, WDØEHW 6, KØGND 5, NFØN-BBS 13, KØBOY-BBS 70. (Jul) KEØXQ 24, WBØGQM 14, WDØEWH 7, KØGND 4, *KØBOY-BBS 390, NFØN-BBS 161.*

NEW ENGLAND DIVISION

CONNECTICUT: SM, Caesar Rondina, N1DCS—ASM: KB1H. STM: K1EIC. SEC: N4GAA. ASEC: N1FIQ. OOC: KY1F. ACC: NK1J. BM: N1API. PIC: WA1CMF. TC: W1HAD. SGL: K1AH. Greetings once again. The kiddies are back in school, & fall is now upon us, time to shore up the antennas for winter. CT had 96.8% & 95.1% rep in 1RN Cycles 3 & 4. Dan Brochu, KY1F, was voted Ham of the Yr by Tri-City ARC. Congrats *Dan & thanks for your commitment to the hobby. Members* of SCARA & Milford ARA provided comms for the June 17 Milford triathlon. All proceeds from the event went to the Juvenile Diabetes Foundation; nice job & thanks to both groups. Deerfield, NH, flea mkt is Oct 8. The big MARS/CARES/CMSARC ARRL-Affiliated Hamfest is Oct 28 at Cromwell Middle Sch; contact WA1K or KA1DXP. Watch for the upcoming SCARA flea mkt in Nov. I'll be serving as your SM for another term. As SM, I feel it's my job to be sure all aspects of our projects are complete. We're working on adding another node site to our pkt network & coordinating *our network through TSARC. The next TSARC mtg is tenta*tively scheduled for sometime in Oct; watch your PBBSs & mail. W Haven ARA reports they have added the capabilities of 2 remote rptrs; this will greatly increase hand-held coverage in emergency situations—thanks to N1ELV for his support in that project. The W Haven ARA requests special thanks to N1EDX for his efforts in making their ARC station a success. Welcome to N1EZC, as the new EC for Naugatuck; glad to have you aboard, Jeff. The TSARC 440-band revision & verification is almost complete & going well. If you've received a letter, please respond. That's all for now. 73...Caesar.

Net	Sess	Stations	Tfc	NM	Liaison
Conn Phone Net	30	377	130	KY1F	1RN
Conn Net	*62*	*344*	*179*	W1WCG	1RN
Nutmeg VHF TN	31	359	131	K1HEJ	CPN
RASON TN	31	316	76	WA1FCA	CN
WESCONN	31	393	113	KA1GWE	CPN

PBBS Reports

PBBS	Received	Forwarded	Total
CSTN N1DCS-4	412	352	764

Tfc: NM1K 591, KA1VED 555, KA1JAN 313, W1WCG 292, KA1GWE 187, K1EIC 144, N1GBP 134, KA1VEC 119, WA1K 106, K1HEJ 98, KY1F 69, N1GUU 57, W1NJM 45, KA1SHO *43, W1KYD 38, N1GKJ 33, W1YOL 29, KF1B 22, N1API 18,* KA1TBM 12, NX1Q 11, W1CUH 5, W1GPS 5.

EASTERN MASSACHUSETTS: SM/SEC, Barry Porter, KB1PA—STM: WA1TBY. ACC: N1GTB. BM: KA1NOI. SGL: *K3HI. TC: KA1IU. PIC: K1HLZ. OO/AA: KA1SNA. EMass hot*line: 617-437-0111. Fall means back to school; it's a perfect time to contact your local school & ask offer to start a ham club. The best place to start would be to contact the local Parent-Teachers Assn. If the idea takes off, contact the local Jaycees, Kiwanis or Lions clubs; these community groups might be willing to sponsor a school station. If the FCC decides to have a codeless license, is your local club ready? Initially, there will be a great deal of interest. There is also a need to have a local & nat'l marketing campaign to get more people interested in our hobby to ensure our long-term survival. Lately, there has been a lot of anti-ARRL verbiage floating around. I know this is preaching to the converted, but: The *ARRL is not some mythical organization headquartered in* Newington, Connecticut—it's **you & me.** The good folks at HQ function to *serve* ARRL members. ARRL decisions are *our* decisions & when the ARRL gets spat upon, **you & me** are spat upon. No organization is perfect, but I'm getting tired of hearing that the ARRL has done this or that to hurt ham radio—the sad thing is, potential hams read & hear this bickering & complaining & get the wrong impression of the hobby. Next time you hear someone complaining, ask them when was the last time they expressed an opinion to their *elected ARRL representatives. In E MA, there are many hams* working hard at improving the image of ham radio. If you're one of them, thanks! If not, why not? We need to do our ut*most to ensure that the nonhams in our communities become* aware of the opportunities ham radio provides. Are you doing your part?

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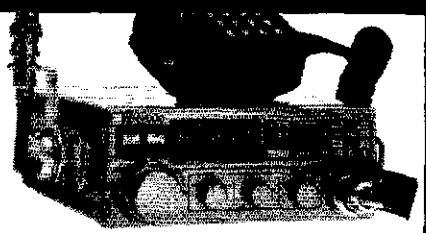

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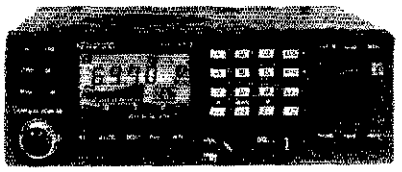

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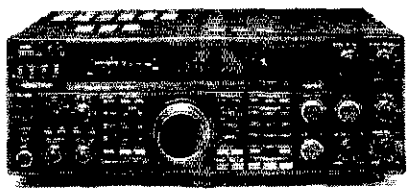

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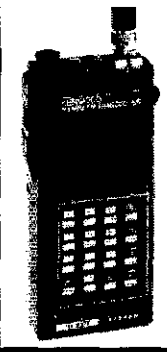

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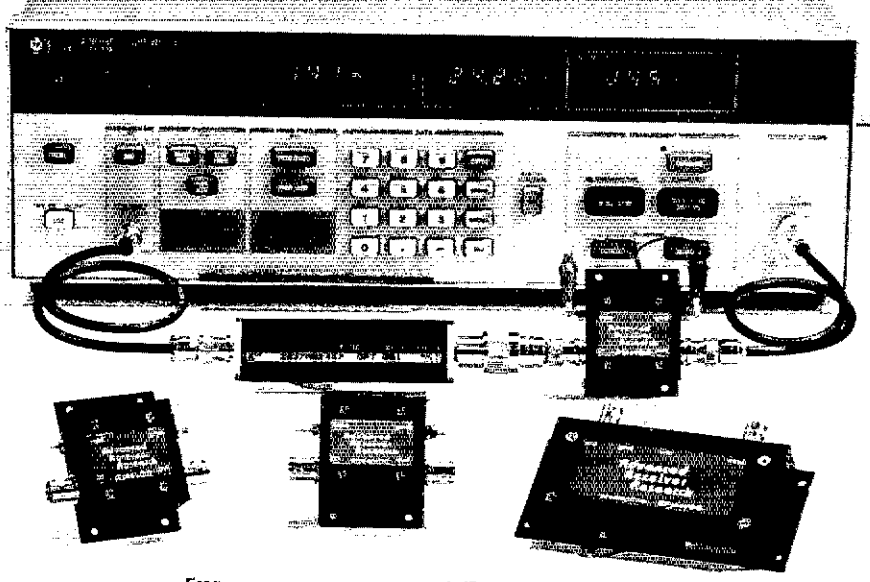

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P50VDG	50-54	≤0.5	24	+12	GaAsFET	$79.95
P144VD	144-148	≤1.5	15	0	DGFET	$29.95
P144VDA	144-148	≤1.0	15	0	DGFET	$37.95
P144VDG	144-148	≤0.5	24	+12	GaAsFET	$79.95
P220VD	220-225	≤1.8	15	0	DGFET	$29.95
P220VDA	220-225	≤1.2	15	0	DGFET	$37.95
P220VDG	220-225	≤0.5	20	+12	GaAsFET	$79.95
P432VD	420-450	≤1.8	15	−20	Bipolar	$32.95
P432VDA	420-450	≤1.1	17	−20	Bipolar	$49.95
P432VDG	420-450	≤0.5	16	+12	GaAsFET	$79.95
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SP28VD	28-30	≤1.2	15	0	DGFET	$59.95
SP50VD	50-54	≤1.4	15	0	DGFET	$59.95
SP50VDG	50-54	≤0.55	24	+12	GaAsFET	$109.95
SP144VD	144-148	≤1.6	15	0	DGFET	$59.95
SP144VDA	144-148	≤1.1	15	0	DGFET	$67.95
SP144VDG	144-148	≤0.55	24	+12	GaAsFET	$109.95
SP220VD	220-225	≤1.9	15	0	DGFET	$59.95
SP220VDA	220-225	≤1.3	15	0	DGFET	$67.95
SP220VDG	220-225	≤0.55	20	+12	GaAsFET	$109.95
SP432VD	420-450	≤1.9	15	−20	Bipolar	$62.95
SP432VDA	420-450	≤1.2	17	−20	Bipolar	$79.95
SP432VDG	420-450	≤0.55	16	+12	GaAsFET	$109.95

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EM2MN	28	157	376	N1DUB
HHTN	31	160	300	N1FLO
CITN	29	466	102	KB1AF
NEEPN	5	20	44	WA1FNM

Tfc totals for July: W1CE 24, KA1AMR 18, KA1RSY 42, K1ABO 86, N1GZQ 44, KA1KCU 5, K1GGS 82, KA1PEP 36, N1FWV 20, K1UXB 43, WA5NVI 38, WA1TBY 319, KC1TI 22, KA1EDY 20, KB1AF 302, N1AJJ 12, KA1GEP 120, KB1EB 27, N1FLO 106, W1TC 104, K1UGM JUNE 692, K1UGM JULY 786, NS1N 64, WA1FNM 126, NZ1D 13, KA1VAX 25, WF1M 20.

MAINE: SM, Jeff Weinstein, K1JW. My sincere thanks to the ME amateurs who have expressed their support of the key programs introduced in the past few months. The encouragement has been magnificent & I look forward to working with each of you in pursuit of the betterment of Amateur Radio in ME. Beautiful WX July 21 enhanced the success of the Union Hamfest, one of ME's largest & best-attended gatherings. The WX was frankly miserable for the St Albans Hamfest Aug 11 with a small-but-enthusiastic contingent keeping watch on the parking lot to see if Noah's Ark would bring in the next group of attendees. The good people, good food & camaraderie at St Albans, however, more than offset the effects of the "wicked wet." Kudos to K1MZB for running a "well-organized & disciplined" VE sess at St Albans, as reported by an examinee. New & renewed section appointments: STM KA1ODT; OOC W1KX; PIC NW1A; DECs WA1HXF & KA1LPW; ECs KA1NXJ, KA1SQH, WA1YNZ, KA1RFD, KA1LUN, KB1P, W2OLV, WA2ERT; NMs W1KX, K1GUP, KA1LPW, N1EXD, N1DZI, K1UNQ; OBSs KA1JPR, WA1YNZ, KA1LPW, KA1REB; ATCs WA2YVL, W3EZ, KA1IOD, K1WWT, W1DEO, KA1REB; PIOs KA1IOD & KA1REB; OOs W1KX, K1NBG, W1ISO, WA1SAZ, K1WWT, KA1LPW, KA1CNG, KA1JPR, K1NIT; OESs KA1LUN, KA1REB, KA1ODT, WA1HXF, WA1SAZ, KA1NXJ, N1EXD, N1DZI, WA2ERT; ORSs W1OTQ, W1ISO, WA2ERT, K1GUP, W1KX, WA1HXF, KA1ODT, ND1A, W1JTH, KA1REB. If you're interested in an ARRL appointment, please contact me at the address or phone number listed ea month on p 8 of *QST*. Arrangements have been completed for key ARES members in the S ME District to have voice pagers, dramatically improving the response capabilities in the event of an emergency requiring ARES resources. Negotiations are underway to expand pager availability to other districts. ARES is becoming more active & better-organized throughout the state. If you'd like to join, please contact your local EC or DEC, or me directly, for more info. ARES requires a minimal amount of time, but can reap big dividends for your community if ever needed. ARES members provided comms for 2 major events in July: At the Yarmouth Clam Festival July 20, comms for ME's largest parade were provided by KA1NXJ, N1EXD, N1FCU, N1ELG, KA1KAR, N1ALC, NX1A, KA1IOD, N1AKP, W1JRS, KB6JRJ, KC1UX, W3EZ, WA1HXF, W1UMQ, N1GRO, K1JW. At the Oxford Hills 8th Annual Triathalon at Norway July 22, participants were KA1REB, KA1ADK, WB1HBJ, N1APN, KA1BRY, KA1UIP, KA1VHH, N1BHM, K1JBL, KA1LUN. Thanks to all for demonstrating that public service is alive & well in ME!

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—ASMs: W1NH, KX1L, WB1DXN, WB1HBB. SEC: N3CLZ. I missed the June deadline (work sched), so I combined June and July for this one. First, welcome 3 new appointees: Daryl Borgman, WB1DXN, ASM/NHARA Pres; Warren Rothberg, WB1HBB, shifts to ASM/PSAC Liaison; & Gary O'Kula, N3CLZ, as our new SEC. Welcome & thanks for your willing efforts to support the Field Org! Daryl & I traveled around the state visiting FD sites this yr with spectacular results! It seems thunder & lightning or mild flooding arrived when we did! CNHARA provided ferry service between 2 of their stations & Contoocook VARC found 1 station marooned in a small instant lake! GSARA was in full swing when we arrived & high & dry. We had lunch on-site & wine steward K1RD provided an excellent selection of vino! AF1T was situated in Mason & his spring planting of low-band verticals was in full bloom! We had dessert at NARC under the aluminum "roof" of antennas as they did 15A once again. Then to Derry & the IRS site with a great view & flea mkt adjoining. The intrepid FD band had survived a wild horse stampede through the site & around the guy wires Sat night & was ready for anything! Seriously, most sites were shut down for some part of Sat because of severe electrical storms in the state. We enjoyed the visits & chance to see everyone. Welcome to a new club in the section: the Amoskeag RC Inc in New Boston, NH. Al, N1FIK, is pres & they're applying for affiliation with the ARRL. The Crotched Mtn Sch ARC may become active, based on an inquiry from NØCUH. There have been 4 other inquiries about forming school clubs, so things are on the move! The big public service event was the Mt Washington Race to the Clouds & John, NV1Y, reported on the support provided by 40 ham operators! Our role was strictly in support of safety & if you've seen any videos of the race, you know why! Bad WX on the 8-mi course challenged the operators & John commended several hams as fully accredited members of the Veterans of On-Foot Checkpoints. These folks stood on cliffs, in creeks, hung from trees & were generally exposed to the elements: KB1DL, KA1IXA, KA1REA, N1GYV, WE1E, KA1VPZ, W2EMU, W1IOO, N1CMD & WA1ALM. A full listing is included in the pkt version. Warren, Bob & I attended the Div Dir's cabinet mtg prior to the ARRL Bd of Dirs mtg; concerns & issues from you members were presented & discussed & concerns about the spectrum battles & health of the ARRL were expressed. Finally, I spoke with WA1THQ via AO-13 recently. Karen is an ATC & vp of the Port City ARC & is on an expedition to central Greenland for the summer. She should have a good slide show for interested clubs starting this fall. Nets: VTNH 186, GSPN 128, GSFM 70. Tfc: W1PEX 1619, W1FYR 640, K1TQY 488, N1CPX 226, KB4N 178, W1ALE 138, KK1E 44, KA1SXM 28, WB1HBB 21, KA1QWT N1ALM 19, KA1HPO 18, WB1EAE 17, K1PDY 15, KA1LMR 10, WB1GXM W1ECA KA1KFX 4, NR1N KA1MTM 3, KB1XU K1OJ 2, N1DCT 1. PSHR: W1PEX, N1CPX W1ALE, KA1HPO/T. BPL: W1PEX, W1FYR, K1TQY.

VERMONT: SM, Mitch Stern, WB2JSJ (@ N1GMU)— STM: KT1O (@ WB2MIC). SEC: NB1K (@ W1FYR). SGL: KA1TIF. OOC: WB1BWV. PIC: N1DMP. In Barton, VT, a train derail-

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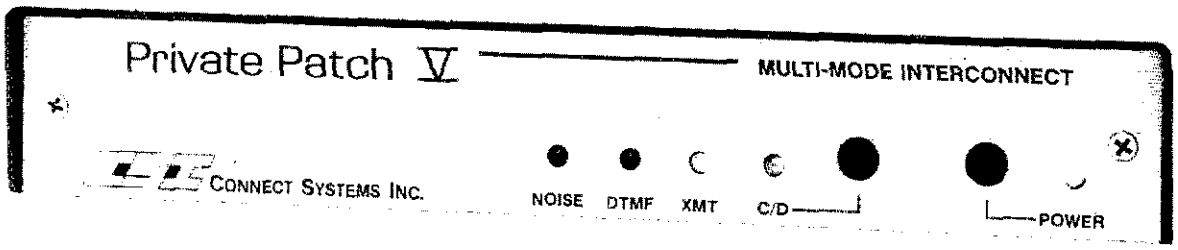

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ment, including a tanker full of propane, necessitated an evacuation of the area. Amateurs from the Border ARC provided excellent comms for the sheriff's dept & Red Cross during this period, July 24- 26, using the Jay Peak rptr. Thanks to WB1DSD & his crew: KA1DXP KA1KHA KA1QZR KA1NIS KA1GQH N1GGQ N1GRV N1HUM WA1HSG WA1JOG WA1JVV W1ZNM K1WML WA4AYR. Despite rainy WX, 550 people showed up at BARC Hamfest in Essex Jct. Upgrades (Essex Jct): Amateur Extra Class: KE2TP; Adv: N1HLO, KA1TMH; Gen: KA1TQK; Tech: KA1VEY. (Newport) Gen: N1EYJ; Tech: KA1VDV. Thanks to all examiners: K1ADQ WA1JVV K1WML K1CQ K1JKJ KA1DXP WB2JSJ KE1R KH6KD NN2I NB1A WA1PRY NW1N NV1Y WE1E. Proud parents KD1R & WA1SQO report son Tim, N1BYC, married Amy July 22—when is Amy taking her Novice test? Big New England hamfests this month: Deerfield Oct 6 & Boxboro Oct 13-14. SET takes place Oct 20-21; contact your DEC, EC or club to find out about activities. NE VT amateurs are happy to have Mt Washington back on 2 mtrs (W1BPI, 146.655, 100-Hz tone). Nets (Sess/Check-ins/Tfc): VTNH 31/230/186, GMN 26/497/35, CARRIER 23/521/33, VTPN 5/57/7, TSFMEN 4/69/7, CVFMN 5/58/5, VPEN 5/31/0. Tfc: WA2SPL 765, KT1Q 294, WA1JVV 232, N1GMU 150, KC1KI 131, NB1A 30, W3QQ 27.

WESTERN MASSACHUSETTS: SM, Jean Hurtle, KA1IFC—OOC/TC: KA1SNA. PIO/ACC: K1BE. STM: KA1EXJ. STM: KA1EXJ. The WMA tfc handlers & friends have adopted the residents of the Masonic Home in Charlton to send msgs, cards, etc. to. Cas, WA1OUZ, is the 1st amateur to reside there & has introduced our world of Amateur Radio to many & opened doors for others who will follow. WA3RKB, OBS for CDARC (Capitol District Amateur Radio Council), NY, is now giving informational bulletins on the Mt Greylock, 146.91/31 MHz rptr Mon at 5:20 PM & Thurs at 7:20 PM. This is a new intersectional, interdivisional effort & you'll find these bulletins most informative. Folks in the greater Spfld area, watch for a taped showing of Agawam's Field Day activities on a local TV channel; the taping was done by AC1T & is being edited at this writing. Club newsletter eds, I'm sure you're finding the *Clearinghouse* newsletter useful—K1BE is putting much effort into it for your use & benefit; don't hesitate to contact him or any other section official to assist you. Time for fall mtgs & activities to resume. As of Sept 1, Joy, KA1EXJ, steps down as NM of the WMN & the position will be filled by Art, W1KK. I thank Joy for the time & effort she has put into the net & Art for his continued interest in keeping CW alive in WMA. Welcome to Jim Davis, N1HFK, ATC for the Spfld area; anyone in that area with tech questions or problems, please contact Jim. During the summer, many clubs cease mtgs, but the membership is still involved in public service activities, so PIOs, club secy's or anyone, please send me what you have been doing. If I'm not made aware, you won't see it here & others in the section won't be aware of the positive things going on. Come fall, with mtgs resuming, newsletter editors take note also. Have you made plans for SET wknd? It's not far away now! ECs, if your community is involved in a situation, please advise your DEC or SEC to keep them aware of situations in your district— communication makes for a working section! Tfc (June): KA1IFC 672, KA1EXJ 224, WA1OUZ 116, W1KK 89, KA1QFV 81, W1SJV 76, NX1K 51, NM1U 29, KA1TDL 16, W1ZPB 3. PSHR: KA1EXJ W1KK, KA1IFC. Tfc (July): KA1IFC 810, W1UD 602, KA1EXJ 198, WA1OUZ 145, *W1KK 101, KA1QFV 68, W1SJV 65, NM1U 46, NX1K 43,* KA1TDL 20, W1ZPB. PSHR: KA1EXJ, KA1IFC, W1KK.

NORTHWESTERN DIVISION

ALASKA: SM, Harley Steward, KL7IZZ—ASM: KL7HO. SEC: *AL7KE. STM: AL7LX. TC: AL7CE. OOC: KL7IKX (VHF)* & AL7BB (HF). Congratulations to Alan Wintersteen, KL7IEI, of Bethel, AK, responsible for 17 new Novices from grades 2-6 & on being chosen AARC Ham of the Yr. Thanks to Susan, NL7NN, flea mkt chairperson for AARC. Juneau ARC mtgs *held 3rd Wed ea month at 1930 at Juneau Fire Hall.*

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. STM: W7GHT. OOC: WB7CYO. PIO: WG7E. I'm glad to see that Bill, W7GHT, is feeling better & back at the switch. Many thanks to Rob for helping out. Sorry I missed WIMU; we got as far as Mt Home & developed problems & had to limp home. Lee, WB7CYO, tells me we need a couple of active OOs & I also need an ACC. If you can help, please call.

Net	*Sess*	*QNI*	*QTC*	*NM*
NWTN	31	1740	17	N7AH
FARM	*31*	*1908*	*32*	*K7CDA*
CD	22	658	21	K7UBC
IMN	31	259	65	WS7U

Tfc: WS7U 64, W7GHT 50.

MONTANA: SM, Pete Peters, KF7R—ASMs: KA7LEB & WB7QDN. SEC: KS7R. STM: W7TGU. OOC: W7DEO. ACC: KC7OA. SGL: KY7I. TC: K7YD. PIC: K7BFJ. BM: K7KCR. Upgrades: Techs KB7KJQ, KB7LJB, KB7LHI, KB2KKR, KB7IPH. There is a new pkt BBS in the Bozeman area, call sign KL7JGS; connect through BZN. For personal contact with *KL7JGS, connect to KL7JGG-14, the freq is 145.01 MHz.* W7IOJ was in the hospitals & had an operation; George is out & doing well, except for being sore from the operation.

MSN	79	1	5	KF7R
MTN	1167	65	31	N7AIK
IMN	*259*	*65*	*31*	*KA7EEB*

Tfc: W7TGU 359, WB7WVD 75, KA7YYR 62. PSHR: WB7WVD 84.

OREGON: SM, Randy Stimson, KZ7T— ASM: W7FBP. ASM: AL7IN. STM: W7VSE. SEC: KV7F. PIO: KC7YN. SGL: KA7KSK. ACC: WF7Q. OO: WN7W. STC: N7ENI. The Klamath ARES/RACES members were involved in 3-day events. First, the Klamath Basin Amateur Assn was involved in the 3-day search for Nathan Masden, missing since Oct in the Mt Thielson Wilderness Area. Portable pkt was used at the base camp & at the clubhouse & 2-mtr vice with autopatch. John, AL7IN; Tom ND7N; Dick, K7DDI; Fred, KC7VF; Rosie, K7JIY; Ruth, K7RFO; Carolyn, N7ORJ & Ed, N7ORK, worked on the project. The Keno ARC had their Field Day at the Keno School & invited the public to come over & see what Field Day *was all about—that's a great idea. There was also a Field Day* at Lofton Lake at the 6000- ft level. Great job, Klamath Co, for all the participation in Field Day. There's one of the most difficult public service events I do coming; it's the Cycle Oregon event. This is a bicycle tour from Pendleton to Newport. The hams are out on the course from 5 AM-7 PM for 7 days. After we get done eating, we have mtgs with the

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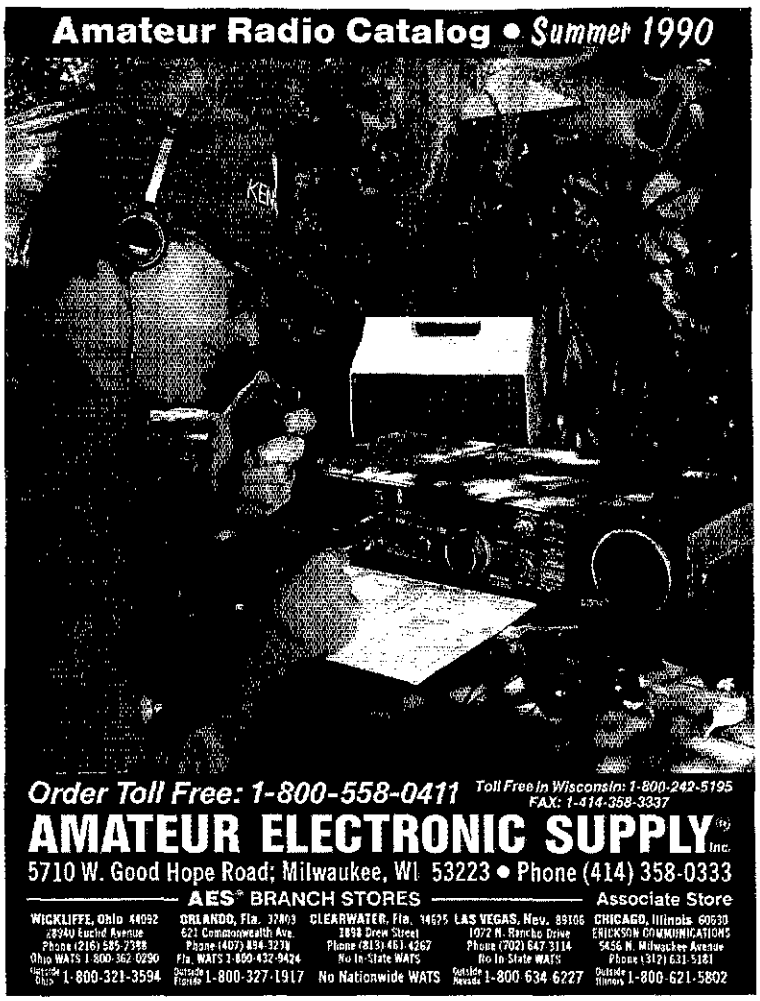

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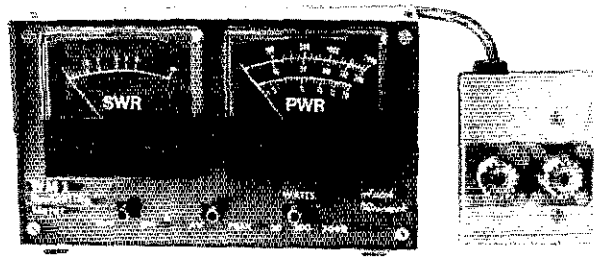

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Cycle Oregon people. Then we meet to talk over the next day's comms problems. The "up" part of the event is the exposure to state officials with us. They tried the 1st tour with other types of comms & it didn't work well, so we get thanks & praise for our work. Tfc: (P) = Packet: W7VSE 371, W7DCR 309P, N7BGW 232, AL7IN 220P, KA7OVG 87, AA7CV 61, N7JQK 60P, W7ODG 57, WB7VMS 46P, W7LNE 44, KA6DFN 38P, KB7HOA 30, N7DXT 38P, KA7CZG 22, KA7AID 19, KB7FQK 18, W7XI 18P, KA7DEF 17, W6RLI 16P, K7NLM 12, W7DRP 6. Late June AA7CU 68, W7DAN 6. Late May: W7DAN 2.

EASTERN WASHINGTON: SM, Tom Plaisance, KC7PH—STM: W7GB. SEC: WA7CBX. OOC: W7LKR. ASM: NQ7M. SGL: KD7AC. ASM & WEN NM: KE7WG. BM: W7EQU. PIC: N7DWD. ACC: WV7Y. Welcome to the new ACC Betsy Townsend, WV7Y, from Spokane. Congrats to her OM WS7I, ARRL RTTY Champion & to WB7RBJ, also from Spokane, who was the low-power top scorer for the Div in the same contest. Everyone had a great time at the annual Warts picnic. Present at the Warts Board of Dirs mtg were Dirs KF7GA (NW), KC7PH (SE), KA7EGM (NE) & W7KYV (At Large). Reappointed to their positions were W7GB, NM; KA7CRN/Asst NM; W7BUN/Secy-Treas Don, W7GB, also became the NM of the Wash Section Tfc Net. 73. KC7PH @ N7HHU PBBS. Tfc Nets *(Name/Freq/Time)*: Warts/3970/6 PM; CBN 3960/7 PM; NWSSB 3945/6:30 PM; Noon Time Net/3970/12 noon; Tfc Handlers 3995/10:20 PM; ID MT Net/3635/8 PM; Wash Section Net/3590/6:45 & 9:45 PM. Tfc: K7GXZ 148, W7GB 112, W7LBK 48, WA7YEN 138, N7HXT 4.

WESTERN WASHINGTON: SM, Mary Lewis, W7QGP—STM: KD7ME @ W6LVJ. SEC: NM7N @ VE7VBB BC, Can; SGL: KD7AC. ACC: W7QGP. TC: W7JWJ. BM: N7CAK @ W6LVJ. OOC: N7DVR. The goodwill & fellowship the HF World Radiosport Team Championship (WRTC) accomplished Aug 20, with 23 internat'l teams of 2 operating identical stations in Seattle, may not be duplicated again. Thanks for a job well done to the following contest stations: KT7G, N7MJZ, W7TSQ, N0AX, W7WKR, N7NKG, K7LR, W7KT WA7BUY, K7SS, W7QPG, K7RI N7FSW, K7GEX, WA7EBH, K7LXC, K7WA W7KJJ, KR7G, K7LZJ, KA7MCX & K7UU. The committee members of WRTC were K7LR, K3EST, KF7YB, KA7VMP, W6OAT, K7SS, N7ZZ, N7MJZ, KE7V, OH2BH, W7QPG, KS7L, K7LXZ, N7NKG, NV6Z, KM7E, N0AX, W7NG, N7MYO & N7LSL. Again, a job well done. Pat Meeks, KS7L, kept her cool when her computer died. She purchased another, fought a new program, but kept the committee informed on hosting, air travel, drivers, radio ops & skeds—Pat, we would have had a hard time without your excellent reports. The numerous people not listed were the 3rd group that made it all possible; thanks to all of you. Olympia ARS, an ARRL Special Service Club, has appointed Terry Rohr, AA7DO, as HF & VHF Awards Mgr. WRTC attended DX Convention in Portland, OR, Aug 21-22 & returned by bus with a stopover in Olympia for a box lunch & excellent eyeball contact with the international DXers. Thanks OARS; the DXers appreciated the visit. Tfc reports will be listed next month. 73 & 33.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: W6LKE. STM: K6APW. OOC: K6TI. TC: N6AMG. Hayward RC's *The Chewed Rag* is now being edited by N6MON & his use of some form of desktop publishing software is superb; the latest issue even includes pix of their K6EAG FD effort. Congrats to MDARC for having been officially designated an ARRL Special Service Club. By the time you read this, I will have had the pleasure of presenting their SSC Certificate to them. They welcomed new members W6BEP, KC6JET, KC6JWN, WA6AXG, Elisabeth Neubert & James Neubert. LARK will start their next Novice, Tech & upgrade class on Tues, Oct 9, at Granada H S, Science Bldg, Rm 106, 400 Wall St, Livermore; contact K6TB at 447-5872 or N6FDQ at 462-8946 for further info. New LARK officers: pres N6FDQ, vp N6SYP, secy N6YXZ & treas W6BNG. SBARA encourages check-ins on the Tri-City ARES Net, Tues at 1930 local time on 147.015 MHz (-600). The CCCC welcomed new members KC6KAS, N6YBH & N6YPW. EBARC mourns the loss of Life Member WA6KTL. They are encouraging participation in their nets: Slow CW, 2000 Wed on 21.115; SSB, 2100 Wed on 28.395; FM, 1930 Thurs on 444.450 (127.3). July tfc: W6VOM 132, WB6UZX 27.

NEVADA: SM, Joe Lambert, W8IXD—ASM: K7HRW. TC: NW7O. STM: KK4M. SEC: K7HRW. After Dir W6DPD's Div Cabinet mtg in Livermore, CA, we had good section mtgs in Reno & Elko; thanks to K7HRW & WA7BWF for organizing these. I had a useful & enjoyable week in the Newington, CT, area, getting acquainted with ARRL HQ personnel who were helpful & I know will be in the future. The results of the Board mtg are published in Sept QST, p 54, but I think you'll be interested that most of the positions of the NV section are reflected in the Board's decisions on such issues as the codeless license, 220 MHz situation, WARC-92 preparations, etc. I finished the month by mtg many NV hams at the Flagstaff Hamfest. I thank everyone who made these meetings in NV & at ARRL HQ such a success. Tfc: N8IA 291, N7KLO 100, KK4M 69, KF7GB 10, KB7GYS 6, N7MME 5, KB7LOD 2.

PACIFIC: SM, Ron Phillips, AH6HN— My thanks to Bob, WH2AEN & his son for visiting the Big Island & sharing info on emergency comms & other things. SEC Chris, AH6GG, is finalizing the Section emergency network to include pkt, VHF & HF. Maui ARC reports that the KH6RS rptr on 146.94 MHz is up & running after 2 yrs downtime. Kauai ARC's July mtg had 2 guests from Australia: Dave, VK5RN & Denise, VK5YL. Congrats to Patty, AH6KN, on her upgrade to Adv. Congrats to Sam, KH6AFS, on his award of recognition for teaching outstanding Novice radio courses at Waiakea High. Ham radio comes through again. Hawaii hams were busy relaying info from the Philippine earthquake to concerned parties. Tfc: KH6RS 30, WV6K 24.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—Don't forget the Pacific Div Conv "Pacificon" in San Jose at the LeBaron Hotel, Oct 12-14; I hope to see you there. Also in Oct is the California QSO Pty Oct 6-7. Congratulations to Lyle Autranc, AA6DJ, for being selected Instructor of the Yr! A SEC/DEC/EC mtg was held in Sacramento to discuss emergency comms in & out of the section. We need ECs in the thinly populated cos in the Sierras. If you're interested in being an EC, contact Walt Cross, KE6EP. The N CA Net (NCN), a part of the NTS, meets on 3630 kHz at 7 PM, 3705 at 8:30 PM & 145.41- at 7:30 PM ea day of the yr. The Sacramento Valley Tfc Net meets at 8:50 PM on 146.85 MHz

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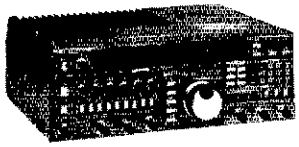

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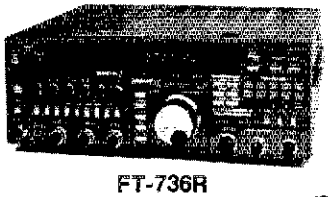

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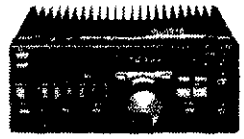

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FT-212RH/712RH



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FT-411

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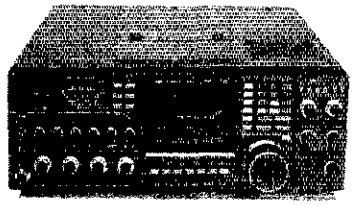
IC-781



IC-765



IC-735



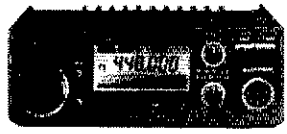
IC-725



IC-2SAT
IC-3SAT
IC-4SAT
IC-24AT



IC-28A/28H



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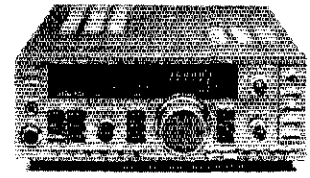

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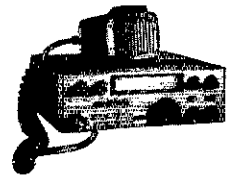

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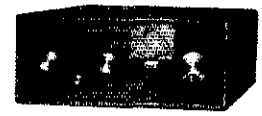

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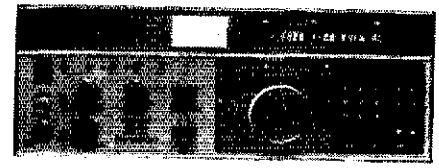

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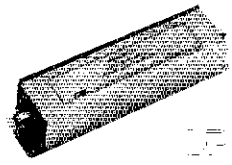

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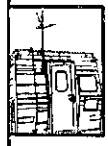

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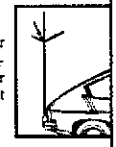

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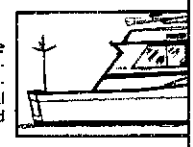



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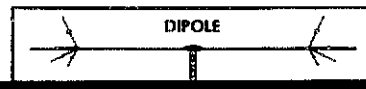

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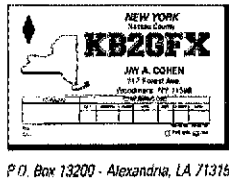

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SAN FRANCISCO: SM, Dick Wilson, K6LRN—SF ARES/RACES meets Wed at 0000 (local) on W6PW/145.15(-). VOMARC provided radio for July 4 festivities—ops included W6KEW, W6JFN, AA6GV, W6WXU, N6MYQ, WA6MGK, W6FPL, KA6ORF, WA2IDJ & WB6HZZ. WA6ACX, KF6FX, plus K6GEV & XYL vacationed in AK. Peter Harband passed Gen & awaits call sign. WB6SJR, KC6ITM, WB6EGW & WA6TVQ did comms for Ride-N-Tie. NX6G & WB6TOQ teaching Novice class in Gualala. NX6G, N6KIP, WA6RWM, WB6TOQ, N6OZP, N6MIV, WA6HGH & WB6MWZ of Anchor Bay Club provided radio for Pt Arenas's July 4. KJ6XB & WA6PAC taking intro video course taught by N6MCE. SFRC ops for SF Marathon were: WA6YYM, N6WRW, KB7IP, AB9B, N6BWS, KA6DBY, WD6DZS, KB6EJL, WA6FFV, KC6FGW, N6FW, KC6JAE, KB6JAW, WB6LRQ, K6OPG, W6QWK, N6RCG, N6TWY, WA6UHA, N6UUY, N6VHI, N6VIF, W6VV, AA6WP, N6XHC, KI6YK, N6UYC. Note: Many ops came from outside SF, many thanks to all. N6TPU is new vp of SFRC. N6LQB is Tech Chmn for Am Comm Soc (K6GWE/R). KA6DBY & N6XZU join WB6GWP as Asst EC-SF; Congrats!

SAN JOAQUIN VALLEY: SM, Byron Smith, WA6YLB—Hope to see you at Pacificon '90 Oct 12-14. It was nice last yr & this yr it looks even better. Call or write to: Pacificon '90, 481 Fenley Ave, San Jose, CA 95117, tel 408-243-8349. This section still needs an ACC & ECs. Please contact me for this or any other appointments. Also, if your club would like me to attend your club mtg, please contact me a couple of months in advance. Please let me know at least 2 months in advance of special annets for *QST*.

SANTA CLARA VALLEY: SM, Steve Wilson, KA6S—SEC: N6JQJ. TC: WA6PWW. STM: W6ZRJ. PIO: N6HMO. ACC: KB6ICQ. BM:(vacant). OOC: KB6FPW Aug: SPECS & SVECS held a joint mtg this month. Barbara, N6BPE & Winston, KB6OQS with CARDA (California Rescue Dog Association) gave a demo of how the dogs are employed in Search & Rescue operations. SVECS also recently held a competition for the design of a new logo. Tony, N6TYG, supplied the winning graphic design. The Naval Postgraduate School ARC held a successful equipment auction this month with Pat, WD6GCD, as auctioneer. The Santa Clara CDF ARES/RACES/VIP group saw quite a bit of activity this month. The VIPs were out on July 4 for the annual Red Flag Patrol & about a wk later saw their 1st activation of the yr for the "Long Gulch" fire. The VIPs provided voice & pkt comms between the Incident Base & Morgan Hill. The Los Cumbres ARC held a picnic this month; I hope everyone had fun! EMARC just held their Pizza Party...I'm curious as to whether Bob, AA6BT, got all the anchovies? Well, we're deep in the middle of public service season. Milpitas ARES did a great job providing comms for the annual July 4 FireCracker. For the 5th yr, Palo Alto ARES provided the July 4 Firewatch on behalf of the Palo Alto Fire Dept with WB6BCV, WA6NIL, N6OIM, AA6PA, WB5VUL and WA6VZZ participating. Tel 408-971-1424 for info on Amateur Radio classes offered around the section. If your club is going to be giving a class, please let me know about it so I can have the announcement updated with appropriate info. You'll find my phone no. on p 8 of this issue of *QST*. Now for tfc...W6VZT 19 (1) W6ZRJ 30 (10) NR7E 128 (52)

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—ASM: AB4S. SEC: N4MYB. STM: KI4YV. BM: K4WW. ACC: WC4T. TC: KM4OX. SGL: KE4ML. PIO: WA9NEW. NC ARES was put on alert in Aug by the State Emergency Mgmt Div. We were advised that the State Emerg Response Team (SERT) would be activated if American citizens were to be evacuated from a foreign country involved in hostile activities. This ARES involvement had been anticipated in the Oct 1987 "Tar Heel One" NC Repatriation Exercise held by the NC EM Div. WD4HTE, Wayne Co EC, had set up an amateur station (pkt) at Pope AFB. All "returning citizens" being processed in the exercise were encouraged to send a radiogram to a relative advising them of their return to the US & asking them to contact the rest of the family. This H&W radiogram, because of its extreme time value, was to be delivered via WATS or collect phone call by the 1st amateur who received it. Amateur Radio would also be used to coordinate activities at the repatriation ctr & between ctrs to assist in reuniting family members separated during the evacuation. Our emergency comms & public service activities are far more important to the continuing growth & existence of Amateur Radio than any other factor. If the decision makers are not aware of the our essential role in emergencies; if Amateur Radio is not believed to be a national resource, increasing the no. of licensed amateurs through changes in the licensing requirements will be of no effect. ARRL 1990 SET sched for Oct is an opportunity for you to assist. Please contact your EC & plan to be involved this yr; let's improve on last yr's excellent results. Johnston ARS JARS Fest in Benson, Sep 30. Maysville Hamfest, Oct 14. Triangle E ARA Hamfest in Smithfield, Oct 20. Concord Hamfest, Nov 11. Greensboro Hamfest, Nov 24-25. July tfc: KI4WW 171, KI4YV 125, N9CGD 90, K4NLK 81, KB7LX 71, W4EAT 62, AA4ZV 49, WB4WII 42, N4JTG 40, W4EHF 36, KA4EYF 35, WD4MRD 35, N4SSX 28, N4LST 27, N4UE 26, K4AIF 24, WA4MNR 24, KC4GCK 23, KC4JVW 21, N4VVX 21, AB4W 20, N4WFW 18, WD4LOO 18, KC4MWT 14, W4LWZ 14, WA2EDN 14, N4VUI 10, N4XUN 9, N4YRD 8, KA4KGZ 8, N4SVZ 7, N4ZUD 6, W8KLF 6.

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—Support the joint ARES/Nat'l Disaster Medical System (NDMS) exercise Thurs Oct 11-Sat Oct 13. Radio amateurs of SC will be key participants in this nationwide exercise. Contact SEC Gerald Hensley, K8AFP, or your EC for info on how you can participate. The Augusta Hamfest & Computer Fair is Oct 13-14. July ARES Acty: Berkley Co EC KF4EF reported 10 hams participated at the July 12 chemical spill exercise. On Aug 1, Aiken Co EC W4TUN & 6 hams provided comms for the FEMA Nuclear Exercise at the Vogel Nuke. They provided 2-mtr emerg comms link with SC EDP in Columbia. The Crescent Hill Amateur Op Soc was presented their ARRL club charter July 27. Your SM was the ARRL rep at the SC Volunteer Orgs Active in Disaster (VOAD) organizational mtg Jul 19. The Anderson RC & the Blue Ridge ARS received their Special Service Club renewals for 1990. Mail your SM ballot to ARRL HQ! Jul tfc: W4ANK 176, KA4LRM 44, W4DRF 20.

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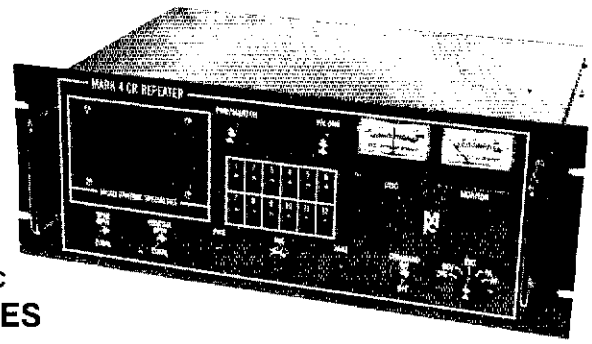

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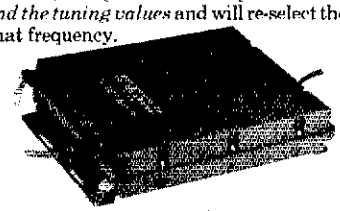

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VIRGINIA: SM, Ted Dingler, N4KSO @ KC4IH—SEC: WB4ZTR @ WB4D. STM: N4GHI @ WA3TAI. ACC: KA4YUY. OOC: W8IRT. TC: W4UMC. BM: W3ATQ. PIC: WB4QOJ. N4KSO now on pkt (N4KSO @ KC4IH, 145.09 MHz in Marion, VA). RACES provided comms for N Anna drill on Aug 7. WB4ZTR thanks you for participation & thanks to KA4ERP, N4EXQ, WA4YPV, WA4QNG for their special assistance. K4LMY new VA Deputy RACES Coord. RACES appts are WB4ZTR EC, K4LMY Deputy EC, N4EZQ EOC Radio Officer. KM4MP new EC for Louisa & Fluvanna Cos. KM4PW reports Roanoke EOC will have a new ARES/RACES station with VHF voice & pkt, thanks to work by N4MGQ & WA4MRJ. Thanks to KA4NWK for running ARES appointee net on 3rd Wed ea month @ 2130 hrs on 3947 kHz—nice job, Doug. Several cos are without ARES ECs, including Frederick, Clarke, Goochland, Westmoreland, Suffolk, Amelia, Allegheny, Wise, King & Queen, Sussex, Lynchburg & others. We still need a DEC for District 6 (cos surrounding Richmond). We have openings for OESs. See WB4ZTR if you're interested in these important leadership appointments. Nat'l Capital ARES being reactivated, thanks to N4CWP, N4SCK, N4EFJ, N4HCP & K3CUU. K4ADE & WA6AAI introduced the ARRL/Red Cross concept of "jump teams" at the Section mtg at Berryville Hamfest, followed by questions & discussion. Nice to see you there. Most VA major hamfests include a VA Section mtg at about noon with both ARES/RACES & NTS discussed. That's your chance to hear news & express your views on VA happenings. All appointees are reminded to report monthly. All who handle tfc should send STM N4GHI a monthly report so tfc trends can be tracked. ARES monthly reports, PSHR reports & public service activity reports go to WB4ZTR. If you put time into an activity, report it! SM N4KSO spent 5 wks in KL7-land climbing rocks; we expect a full report, Ted! WB4ZTR wants input & ideas for statewide ARES pkt network. Tfc: N4GHI 538, K4DOR 518, WBØTAX 422, W4JLS 354, N4EXQ 268, AA4AT 241, K4MTX 233, N4HOG 202, W3ATQ 164, W4LQF 122, WB4PNY 116, WB4KSG 115, WB4ZTR 69, WB4FLT 68, KJ4LQ 66, W4FRR 66, N6ANQ 62, KB4CAU 56, WD4MIS 55, K4BGZ 52, WD4MIZ 50, KJ4OJM 46, NW3K 45, KB2CEV 45, N4FZA 44, W4TZC 41, KB4OPR 37, AA4GL 35, WB4ZNB 30, KB4NGO 29, K4GR 24, WA4TVS 24, K4JM 23, KN4DV 21, KJ4EK 21, K4YVX 20, N4FNT 13, K4MLC 13, N4NIG 12, K4VWK 12, WA4DTE 12, WB4UHC 11, WB4KIT 10, N4JEO 9, NM4R 4, W4DM 3, K4MLD 3, KC4JGP 2, WA1VRL 1, N4JSP 1, N6GVG 1, WB4DQZ 1.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Edie Sheffield, KAØMQA—SEC: K4UBU. STM: KBØZ. ACC: WBØDUV. PIC: WBØFQB. OOC: KAØCDN/WØIJR. TC: WØLJF. SGL: WDØHNQ/WDØHNP. BM: KAØVKM. This will be my last column for Section News as your SM. As you may be aware, my elderly mother has been ill the past few months & I've found I'm not able to effectively carry out all of the duties as SM. Bill Sheffield, KQØJ, has been appointed to carry out my term of office. Most of you know KQØJ, because he was the Colorado SM for 6 yrs before being elected to Vice Dir of the Div & his term of office will shortly be over & allow him the time to represent the Section. Thanks for helping to make my job run smoothly these past 2 yrs & I know you will continue that same support for KQØJ. Congrats & tnx to the amateurs who helped provide comms for the Pikes Peak Hill Climb. The CO State Games, the CO Breathtaking & the Jerry Ford Golf Tournament, these events had amateurs from several communities involved from the E & W Slope & the CO Springs & Denver Metro areas. Nets: CWN: QNI 62, QNF 145, QTC 64, 31 sess. HNN: QNI 1951 QNF 808, QTC 74-95, 31 sess. HNN: QNI 1951 QNF 1087, QTC 122-616, 31 sess. NCTN: QNI 276, QNF 233, QTC 57, 30 sess. SCTN: QNI 241, QTC 18, 29 sess. CWXN (no totals) Tfc: WBØYNS 1244, NØHFZ 483, WTØG 319, WØLFJ 222, NØCYR 112.

[Note: Reference Sept *QST*, p 110. New Mexico's net reports were inadvertently placed in the Utah Section News column. We regret this error.—*Ed.*]

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. STM: ND5T. NMs: WA5UNO, K6LL & W5QNR. TC: W8GY. ACC: KA5BEM. Congrats to W5CSY as winner of the VCR at Ft Tuthill, AZ (Flagstaff) & to N4CHK, another winner. Everyone reported a grand time with the largest attendance ever. Good to visit with ARRL Field Services Mgr Rick Palm, K1CE; ARRL SW Div Dir Fried Heyn, WA6WZO; NV SM Joe Lambert, W8IXD; AZ SM Jim Swafford, W7FF & so many others. Good turnout from NM. So very sorry to report the passing of WD5HLZ; Reo & his antique radio collection will certainly be missed. SW Net meets dy, 3583 @ 0230 UTC, handled 87 msgs, 96 checkins NM Roadrunner Net meets dy, 3939 @ 0100 UTC, handled 79 msgs, 1090 checkins NM Breakfast Club meets dy, 3939 @ 6:30 AM, handled 141 msgs, 949 checkins. Yucca 2-mtr Net, 78/18, handled 7 msgs, 354 checkins. Caravan Club 2-mtr Net, 66/06 handled 14 msgs, 159 checkins. SCAT Net, 66/06 handled 9 msgs, 548 checkins. Info Net 12/72, 76 checkins. ZIA Sunday Noon Pkt Net, 36 checkins Tfc: KF5VF 136.

UTAH: SM, Rich Fisher, NS7K—SEC/STM: Jim Brown. PIO: Lon Stuart. I hope everyone had a good time at WIMU. The Basin helped with a triathlon. Davis Co helped with handcart parade July 24 & with Layton City July 4. Tfc: K7HLR 219, NS7K 63, WA7MEL 33, N7JLC 5. 73, Rich, NS7K, SM Utah.

WYOMING: SM, Jim Raisler, N7GVV. ASM: Steve Cochrane, WA7H. SEC: Jim Anderson, W7TVK. STM: Dan Ransom, K7MM. PIC: Wilson Sellner, WB7RRZ. The Cedar Mountain ARC hosts its 1st annual picnic in Cody Sept 23 at Hugh Smith Park—everyone's welcome; contact W7JIL, WA7NZI or K7MBJ for info. Date, WC7S, needs additional help with the WY Hamfest June 8-9 in Casper. Nice newsletter, Rev, or should I say Kathy? Next month will cover the net reports, as this was produced early so I could head N for the harvest. 73 'til next month.

SOUTHEASTERN DIVISION

ALABAMA: SM, Mildred Cullen, AA4XF—ASM: W4XI. OOC: KE8BP. ACC: KA4PKB. STM: W4PIM. SGL: WO4W. SEC: AB4EZ. TC: N4MOK. PIC: KB4KCH. BM: KA4ZXL. Bob Whitehurst, W4KDP, the TC has asked to resign. Bob says the time has come to shed a few of his activities & enjoy some free time. Thanks for your help, Bob. LTC Frank Field, N4MOK, volunteered for the TC appointment. He's a member of the Calhoun Co ARC & the PAO at Ft McClellan; thanks for your help, Frank. Congratulations to the Telephone Pioneer ARC on becoming ARRL affiliated & to the Huntsville ARC on becoming a SSC— thanks. Marc Molyneux, N4EX, of Mobile was awarded a 50-yr ARRL plaque—congratulations, Marc.

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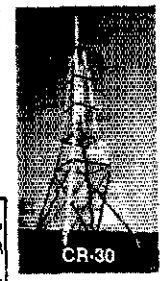

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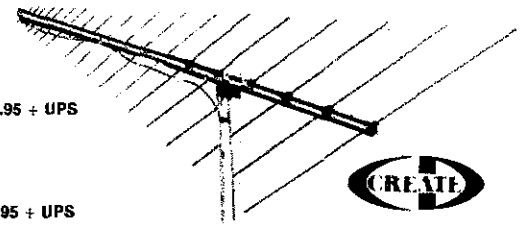

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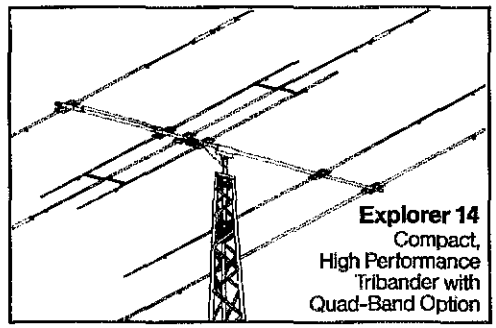
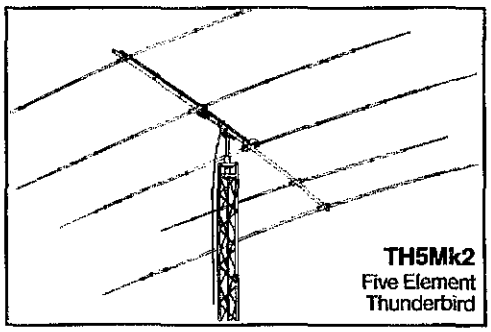


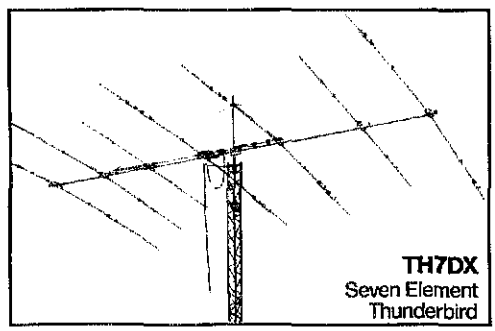
Explorer 14
Compact,
High Performance
Tribander with
Quad-Band Option



TH5Mk2
Five Element
Thunderbird

BROADBAND TRIBANDERS

Maximize the performance of your gear.



TH7DX
Seven Element
Thunderbird

Explorer 14
Unique PARA-SLEEVE design achieves exceptional broadband performance. Forward gain and front-to-back ratio outperforms other antennas of the same size. With a 14 ft. (4.3 m) boom, the turning radius is only 17 ft. (5.3 m). The ideal choice where space is limited. Optional kit for 30 or 40 meters available.

Five Element
Thunderbird TH5Mk2
Broadbanding is achieved with our unique dual driven element system. The 19 foot boom (5.8 m) has four active elements on each of the three bands. Turning radius is a manageable 18.4 ft. (5.8 m).

Seven Element
Thunderbird TH7DX
Five active elements on 10 meters and four elements on both, 15, and 20 meters. The TH7DX represents the ultimate in high-performance arrays whether you're comparing other large tribanders or stacked monobanders.

FEATURES COMMON TO EX14, TH5Mk2, AND TH7DX:
• Handles maximum legal power • All three bands below 2:1 SWR • Unique broadband beta match assures efficient energy transfer and places the entire antenna structure at dc ground • Top quality stainless steel hardware • Unique Hy-Gain die cast aluminum boom to mast bracket. Accepts mast diameters up to 2½" (6.3 mm) • Twist and slip proof die formed heavy gauge aluminum element to boom brackets. • Designed to survive winds of 100 mph (160 km/hr).

For detailed information, write to Telex/ Hy-Gain RF Consumer Department, 9600 Aldrich Avenue South, Minneapolis, MN 55420, or call 612-887-5528.

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Richard, the SEC, has appointed Ken, KM4JD, as the AL ARES/RACES Net Coord; the net meets Sat on 7260 @ 1630 UTC & Tues on 3965 @ 0130 UTC. The SET is Oct 20-21—check with your DEC or EC for details on participating. For an eyeball QSO & ragchew, plan to be at Noble Park in Sylacauga Oct 7. The time is, "Can 'til can't." Bring a picnic lunch. Contact Mac, WA4OSB, for details. The Montgomery *Hamfest will be Nov 24. Nets—ADN: QNI 609, QTC 173. ATN:* QNI 133, QTC 27. ASN: QNI 352, QTC 94. ATNM: QNI 3112 QTC 110. BPL: WA4JDH. PSHR: WA4JDH W4PIM W4QAT W4CKS WB4MMD WB4IDB W4IBU AB4EZ KM4JD WA4RNP AA4XF. Tfc: WA4JDH 574, W4PIM 259, W4IBU 142, W4CKS 107, W4QAT 95, AA4XF 79, WB4MMD 68, KC4IVI 67, KM4JD 60, WA4RNP 45, WB4IXA 38, N4ZWK 24, N4XFX 15, W4DGH 14, WB4IDB 12, W4XI AB4EZ 6, WB4TVY 6. 73 Mildred.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM: *AA4UA. SEC: NC4E. STM: WB4WOL. ACC: KM4IH. OOC:* W8BLA. Pkt: W4QO. SGL: WB4UVW. TC: W4TZL. This month is SET month. The GA section was in the top elite group in '89, so let's do it again. After you have run your scenarios, get the proper forms to our SEC, NC4E, so he can tabulate them & get them in to ARRL HQ. Our own SE DX Club is one of the outstanding in the world & their membership is 100% ARRL; officers for 1990-91: pres KC4MJ, vp K4ODL, secy/ed K2UFT, treas WA4CUG & act KM9P. If you're interested in *joining their FB organization, contact any of the preceeding.* 2 more section clubs can now display the ARRL Special Service Club logo. Congrats to the Athens & the MATPARC clubs on this achievement. Plenty of section hamfests this month. Rome Oct 7, Warner Robins Oct 13 & Augusta Oct 13-14; take your pick. Columbus ARC 1990-91 officers: pres WB4TOM, vp WB4IUX, secy WA4GRW, treas KD4NZ & act KA4NKT. PSHR honorees have dwindled down to 3: WB4DVZ, KC4BHX & KA4HHE. This is 1 of the months that can produce rough WX; if needed, let's help our neighbors. We've had many sick hams & spouses recently; let's remember them in our prayers. If you're having trouble getting a tower ordinance passed, keep me posted. Tfc: WB4DVZ 127, KC4BHX 103, KA4HHE 69, W4AET 46, N4MWR 22, WD4DSS 14, K4JNL 8, K4BAI 7, N4UZ 3.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM: N4ADI. SEC: W4MLE. STM: KB9LT. SGL: KC4N. TC: N4SS. BM: N4GMU. PIC: KB4LB. OOC: WB4GHU. ACC: KI4BI. Digital: K4CY. NFARS FD report scores most contacts since 1983. Al, WA4RGO received Special Award at JAX ARES Forum for outstanding leadership in the JAX area. Fred, W4FI, is NM for the new ARES net on 7253.3 at 1300Z. Jax Hamfest was great; attendance at forums was the largest ever—some had to sit on the floor. NFPN NM K4UBR thanks net reps WA9VND, N4JAQ, KB9LT, WX4J, AA4CH, KC4FL, N4DY, WA4PUP, KM4RQ, WD4JPN N4OZD, WB4DNT, N4CTM, KC4IYO, W7YWF; net certificates to all. KJ4UW reports more than 1550 contacts on FD with 16 ARES members participating. *QFN Bulletin* getting glowing comments as to new format. AA4HT is the new QFN NM, succeeding N4SS. ARES members in Ft Walton Beach participated in NDMS drill, testing new software with laptop computers. K4LPT, W4IPM & others succeeded in getting it to work. Several disaster teams were involved with about 75 "casualties." I'll appreciate clubs sending me their newsletters. Anyone desiring or interested in ARRL programs in NFL, contact the staff members or me. 73, Rudy. Tfc: KB9LT 335, N4SS 270, WD4IIO 203, N4JAQ 185, K4UBR 182, WA4GYR 117, N4GMU 103, WB4GHU 98, WA4EYU 84, WC4D 61, KC4FL 61, N4ADI 49, AA4FG 49, WB3AVZ 46, KB4RTG 46, N4JHI 43, N4DY 43, N4QYS 39, WB4DNT 37, W4KIX 37, KI4CQ 37, WA4PUP 35, W7YWF 29, WB2GNZ 27, WA4NDA 23, NF4O 14, W8IM 14, N4YHE 11, *KC4KWN 10, K4UTY 6, WA4QZT 6, KI4BI 4.*

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—STM: K4ZK. SEC: W4SS. Asst SEC: WB4WDK. TC: KI4T. BM: WD4KBW. PIC: N4PBF. AA/OOC: Open. ACC: K4EUK. SGL: KC4N. Pkt Mgr: K4CY. Congrats to the S Brevard ARC, officially renewed as an ARRL Special Service Club. Received a nice 4½-page report on the Racal Milgo Field Day Activities, sent in by AB4BC. A quote from it—"At exactly 2:01, the 1st contact to go into our logbooks was W1AWI Joe, KB4FO, a QCWA member who's been chasing W1AW for more than 30 yrs, was sitting right on top of W1AW's 15-mtr CW signal when the action broke loose! As soon as he logged the contact, Joe jumped up & ran around our site shouting, 'I did it! I did it...'" Joe commented to me that it wasn't done under his call sign, either! WC4D sent a 10-yr summary of activities for the FL Medium Speed Net—well done & I hope the net has a historian to maintain a record of activities over the yrs. WC4D was NM for the past yr. A number of nets are trying to *reconstruct their history; maintaining the continuity of records* is an important part of being an NM. These records should be passed on to the next NM. I know that, in several instances, well-maintained records just vanished into oblivion. Ask WA4HDH about the difficulty of writing the history of a 30- yr-old net! He's the author of *QFN, The History of the All- Florida CW Net.* The Ft Myers ARC *Modulator* indicated in a letter from K4FQU that he was going to step aside & make way for the younger people come the end of the yr. He says he'll be around to advise & assist forever, but after serving as president 5 times, vp that many times, secy/treas about 3 times, hamfest chairman 3 times, FD chairman 3 times, picnic chairman & *cook at least 6 times & more, he has forgotten...well, you get* the idea. Congrats on your efforts, Earl, it certainly shows when we look at the caliber of activities in Lee Co (he forgot to mention that he's been NM of the SW FL Tfc Net for the past several yrs, in addition to operating one of the BBSs in Lee Co. The S Brevard ARC *Spark* stated that radio classes are planned to start in Oct at the Science Ctr. N4PBF, reporting for the Dade Co ARPSC mtg, wrote that KI4T has resigned as RACES Officer for Dade Co, FD reports were given by K4RBR for Fellowship ARC, WB4CKY for the Hollywood ARC & also a report from the Everglades ARC. W4FQM reported about Broward's plans including a 4-zone plan, ea with a rptr tied to ea other. N4XMD sent a copy of an ARES/RACES emergency plan for St Lucie Co provided by the Ft Pierce ARC. The ARA of SW FL bulletin featured KC5YD in their amateur profile for July. The FL Keys ARC bulletin is considering the WAKEY Award, an idea of KD5JZ—it stands for Worked All Keys. The Ft Pierce ARC *Scatter Splatter* had a great account of their FD activities. The IBM ARC, WB4QNX, had several interesting articles—all too long to describe here—but a great bulletin. The Englewood ARC *Newsletter* included pertinent SW FL emergency info. KD4GR reported

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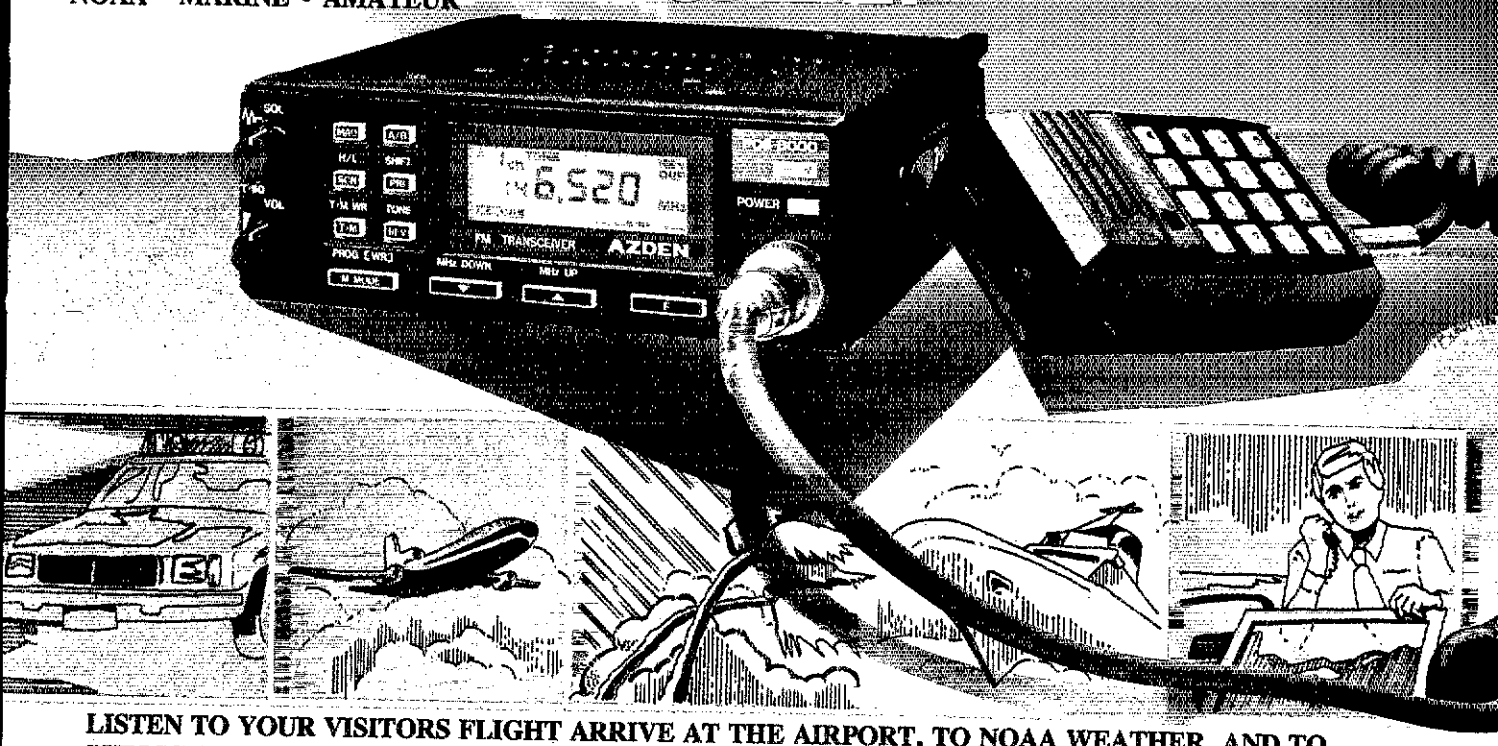

LISTEN TO YOUR VISITORS FLIGHT ARRIVE AT THE AIRPORT, TO NOAA WEATHER, AND TO PUBLIC SERVICE, POLICE, FIRE, FORESTRY AND MARINE FREQUENCIES

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 FREQUENCY 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.

OTHER FEATURES: Rugged dynamic touchtone DTMF microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses and hardware are included.

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KENWOOD Newsletter

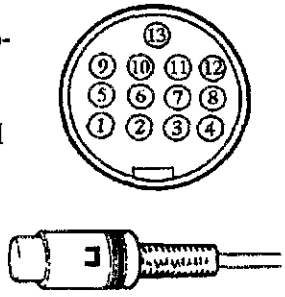
KENWOOD U.S.A. CORPORATION Vol. 1 Issue No. 3

Accurate and timely information for the active Amateur Radio Operator from Kenwood U.S.A.

Interfacing Digital Communications Equipment (Part 1)

This issue of the Kenwood Newsletter will begin a 3 part article on interfacing Data Communication devices to your transceiver. This would include Packet TNC's, RTTY, AMTOR, SSTV, etc.

Most modern KENWOOD transceivers have been provided with a terminal labeled ACCY2. This terminal provides an easy method of connecting your digital communication device to the transceiver. The physical layout of this connector is shown in the accompanying diagram. The table below details the use of the various pins provided on this connector. The table lists the connections for the TS-950S(D), but with minor changes can also be used for all of the present KENWOOD transceiver line.



13-Pin DIN Plug (E07-1351-05)
Viewed from the rear panel

ACCY2 Pin Assignments

Pin Number 1	SANO	Available on TS-950S(D) only. Stands for SUB receiver audio at a fixed level of 300 mV @ 4.7K ohms.
Pin Number 2	NC	No Connection
Pin Number 3	MANO	Main Receiver audio at a fixed level of 300 mV @ 4.7 K ohms.
Pin Number 4	GND	Ground for shield of coax cables attached to pins 1 and or 3.
Pin Number 5	PSQ	For TS-950S(D) This pin is used for connecting a TNC for use with packet radio. It is the Squelch Control line and will not allow packet communications while squelch is off. (Not used on some radios)
Pin Number 6	S-Meter	DC control voltage that varies in proportion to the S-Meter deflection (TS-950S(D) only).
Pin Number 7	NC	No Connection
Pin Number 8	GND	Chassis Ground
Pin Number 9	PKS	This pin is used to disable the front panel microphone during data communications. You should ground this pin whenever you are using any form of data communications.
Pin Number 10	NC	No Connection
Pin Number 11	PKD	This is the microphone audio or AFSK IN jack. The input level should be approximately 20 mV.
Pin Number 12	GND	Connect the shielded wire from the coax cable you attached to pin 11 here.
Pin Number 13	SS	This is the PTT line. Ground this pin to cause the radio to transmit.

Wiring the Cable

We have found the easiest method of assemblying the cable is to first determine which pins you will need for your hookup. Identify the pins using the drawing above and then cut off the pins you don't need. This will give you a little extra room when soldering the wires to the connector.

Before you solder the connecting wire slide a thin piece of heat shrinkable tubing over the wire so that you can push it down over the pin after the solder cools. Then after you are done soldering you can shrink it to help provide a good mechanical connection on the pins.

That's all the room we have for this month. Next month we will look at alternative hook up methods for your favorite data device.

Coming Next Month

Next Month: Part 2 of Interfacing Packet TNC's, etc. to Kenwood Equipment.

If you have a comment about a column, or have a question about any ham radio subject please let us know. We will select topics for the newsletter that have the widest appeal.

73 Craig (KR6T)

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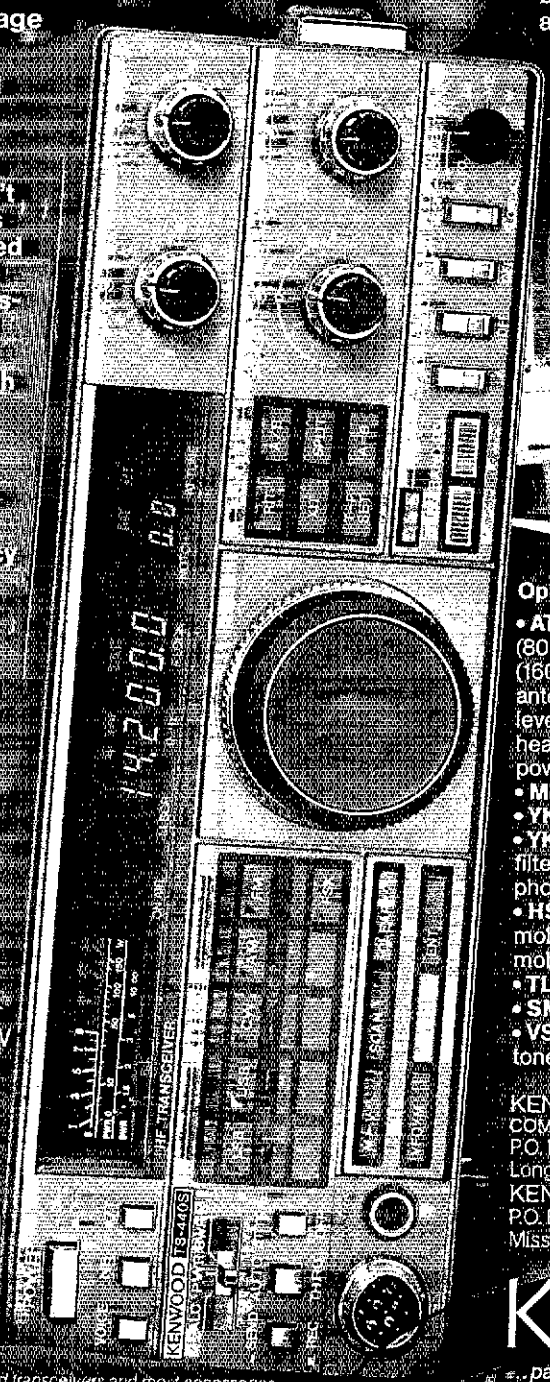
Portable reliable performance and ease of use makes the TS-440S your obvious "low bands" choice. It is "Every Ham's" rig to go – ham shack, portable or mobile. But don't let the small size fool you – there's lots of "big rig" performance packed into this package. Built-in antenna tuner option. Continuous duty transmitter. Super DynaMix™ front end. Five filter functions. The TS-440S is at your service wherever you wish to operate.

- **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)**
- **Built-in automatic antenna tuner (optional).** Covers 80–10 meters.
- **5 IF filter functions**
- **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.)
- **Computer interface port**
- **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)**



- **MC-43S UP/DOWN mic. included**
- **Superb interference reduction** IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and opt. filters fight QRM.
- **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.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**



Optional accessories:

• **AT-440** internal auto. antenna tuner (80 m – 10 m) • **AT-250** external auto. tuner (160 m – 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** 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-41/50B** 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.

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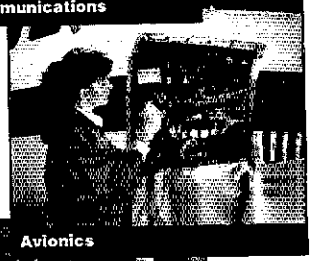
Data Communications



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that he participated with the Sunrise July 4 parade. KB4KXV said he uses pkt & voice to relay tfc while he is mobile on the W coast. K4ZK had a good trip to Scandinavia & Leningrad. The Sarasota ARA *Amplifier* said arrangements are underway to install pkt stations in various schools that operate as shelters. K4CY, Pkt Mgr for FL, does an outstanding job of helping coordinate the various PBBSs & the NTS. Of course, pkt is one of the important modes used by NTS with CW & SSB. Many NTS msgs move from mode to mode & it's important that proper NTS formatting is used when originating the msg. The text should normally not exceed a check of 25 words & actually this is pushing it—if longer, send a letter...HI. The following active PBBSs reported to K4CY this month, their report includes total msgs, bulletins, SP-type msgs & NTS msgs. The following list shows PBBS & the NTS tfc handled: W2TKU 207, W4DPH 246, N4QWN 14, W8DUV 65, WB2WPA 73, K4CY 123, WD4HIM 59, N4QWN 14, W8DUV 65, WB2WPA 73, K4CY WD4HIM 59, N4GXX 27, K4GBB 34, K4OZS 26, KB4PLH 122. The ARRL Info Net has been experimenting with the use of 40 mtrs instead of 75 to facilitate comms throughout FL. Accordingly, look for us at 8 AM Sat morning on 3940 or around 7248—it's a bit harder to fit in on 40 on a Sat morning! Congrats to WA4PUP, the new NFL SM, who held his 1st mtgs at the Jax hamfest—it was great being there. 73 de WA4PFK. Tfc: W3CUL 3081, W3VR 1377, K4FQU 405, WA9VND 335, KB6ECH 271, WA4PFK 208, K4SCL 200, KB4WBY 186, KD4GR 186, AA4HT 180, WA4EIC 153, WX4J 141, KA4FZI 125, WT4F 120, K4IA 118, K4ZK 106, KB4KXV 102, WB4WYG 99, AA4CH 94, K4EUK 93, N4KFU 80, AA4BN 71, W4DWN 69, W3TLV 59, K3KT 58, WA4RUE 56, KB4MON 53, WD4KBW 50, KN4CM 46, N42AN 38, K4JI 34, WB4GCK 33, KC4VK 29, KA4NXF 27, AB4WQ 25, KB4HAY 17, N4XPP 16, W4VQE 15, N4MFE 15, WA4NBE 15, N4YQU 10, KBØBDL 9, W3IJR 9, W4WYR 8, NØABC 7, KI4ZW 7, W4MPV 7, W4NSY 7, N4MFD 5, N4RHJ 5, WA4PIL 5, N4YWC 4, KB4TIU 4, N4PSV 4, WA8EXA 3, N4OIA 2, KAØGYF 2, N4XZR 2, KA4GDU 1. (Jun) WB4GCK 26, KB4MON 12, N4OIA 1, W4MFD 1.

VIRGIN ISLANDS: SM, Ron Hall, KP2N—ASM: KV4JC. SEC: NP2E. NM: VP2VI. Thank you all who supported by nomination for another term as SM. If you'd like to hold a position such as EC, SGL, OBS, etc, please let me or the ASM know. KV4JC reports that St Croix had 5 upgrades at last sess. KP2O reported that 9 attended last VE sess on St Thomas & all went home happy. The St Croix club is moving the 147.250 MHz rptr to the QTH of KV4II. They also participated in a simulated emergency that was a mock fire at the power company. NP2CM is sporting a new TS-950. KP2AH was on island for a visit, as Vince now lives in FL. KP2BI active on pkt. NP2CY, St Thomas EC, reports ARES drills are going well & 2-mtr coverage of the island on simplex is possible from station WVWI. Nice to have W2AAF on St John for the summer. W2IBJ has the remote receiver working on St John for the 146.630 MHz rptr. Mitsu, JH4IFF, operated from Tortola for a wk & visited VIARC for the wkly luncheon mtg at Sugar Reef restaurant. 73 de paradise de KP2N.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—ASM: K7OMR. STM: W7EP. NMs: K6LL, K7POF. Ft Tuthill hamfest at Flagstaff was a big success with more than 4000 estimated attendees, making it the biggest ever—congrats to ARCA, who makes it all happen. Our Div Dir, WA6WZO, who attended says this event is maturing into a full-fledged ARRL State Conv. Next yr we hope to have more plans for formal programs & mtgs & a printed program handout for the 3-day event. ARRL Field Services Dept Mgr Rick Palm, K1CE, from ARRL HQ attended & was impressed with size of the crowd. WØYOY reported 112 applicants were tested by the VEs. Granite Mtn Fire NW of Prescott area gave ARES members an opportunity to serve the community in providing comms in support to the fire crews. Responding to the call from Prescott area were: N7MPN, Emergency Services Dir for Yavapai Co; WF7J, EC; K7OFG, N7NBK, W3CKU, N7OBK. Responding from the Verde Valley area were WI6S, DEC; N7EBT, EC: W7DC & W7EI. Viola, KA7MVK, provided the mobile crew with sandwiches & soft drinks. The US Forest Service presented a commendation to all these ARES volunteers involved: good work, congrats. KJ6OZ visited us at the ARRL booth in Flagstaff & reported a new club in Yuma area. It's called Yuma ARC & has elected the following officers: pres NL7TY, vp N6RTV, secy KE8GE & treas N6RTT. Please put me on your FB NL mailing list. OPRC once again is sponsoring their ARRL-sanctioned Swaptest, 1 day only, Oct 14 at the DeAnza drive-in, Oct 22 & Alvernon in Tucson. Talk-in is 146.82(-). Ray Van Skiver, W7LQM, of W Valley ARC can validate QSL cards for ARRL awards WAS, 5BWAS & VUCC. Club membership not required, but ARRL membership is; call him at 974-1322. As part of their continuing promotion of their club's RFI committee, the W Valley ARC has selected Bill Johnson, W9WFV, as their liaison rep between your SM & the FCC Douglas office. Bill applied for & has been appointed ATC—congrats. They also printed 2 pp in *Short Skip* on amateur interference reduction techniques—FB work. Coconino ARC's newsletter *Hi-Country Static* is now edited by Jess, KL7JEA. The latest issue contained several pp of good dope including a report on ARES public service activities coordinated by Janet, N7JWM—FB work; keep it up. Superstition ARC will host their annual Swapmeet this yr on Sat, Dec 1. It's an ARRL-sanctioned 1- day affair; details later. EC/DEC reports received from KA7JLV, WI6S, N7JWM, showing 130 ARES members participating in regular wkly nets/drills. Things are growing in ARES— keep up the good work. See you on the same street corner next month. GL es 73. Jim.

Net	*QNI*	*Tfc*	*Sess*	*Liaisons*
ATEN	913	81	31	TWN
SWN	96	83	31	TWN

Tfc: W7EP 160, W7OIF 68, K7RLL 61, K7POF 27, N7ETP 12.

LOS ANGELES: SM, Phineas J. Icenbice, W6BF—We have a new record for a 1-op tfc total of 861 for the month of July 90, W6UYK—Congratulations Ted! N6NYK reports 202, N6TFS reports 78, K6IDU reports 42, KC6BCC reports 26 & N6AHT reports 24. Good News from TASMA (2-mtr Area Spectrum Mgmt Assn) We now have a mgmt team that will respond to your interests; Ray Spikes, KB6DFH, is the new pres; tel 818-443-6835 home & 213-532-3211 for Ray's office). Mtgs will be held at various locations so call or write to Ray or Karl Paget, N6BVU, Sec OK inCB 714-772-5451, for the latest info. As a result of long-range planning at a recent SM mtg with our Dir Fried & our ARRL Field Services Dept Mgr Rick Palm, we unleashed the following key info: Work on important items for the long- range good of ham radio. 1) SM need to be heard; they represent the folks who are active on the bands! SM should be able to represent their section. In Congress, the House of Reps is organized so that each elected official represents a section of the country. We have responsibility without authority! 2) ARRL SM are experiencing apathy in our electorate. We need more vitality. We need more real grass roots interest in the items of real importance. We need to be interrogated about new agenda items before they are cast in concrete & published. We have about 55 clubs in LA Co & we need more RFI committees. 3) RFI is a major problem & getting worse. My requests for help from the FCC have increased in the past 6 months. I've been giving lectures & seminars for the past 3 yrs. We need the clubs to select a few capable members & set up a series of seminars for the understanding & cure of RFI. Each club in the LA area needs to establish a RFI working group of 4-5 technical doers. (This is also a good way to get new members for your club.) 3) Antenna ordinances need more attention before they hit the fan. Each club must assign personnel to this problem before it happens in their city or co. We need training literature from ARRL HQ. Without antennas, how can we communicate? Good antennas also reduce RFI & QRM. 4) We have only a few exclusive bands & we have illegal intruders by the dozens just on 20-mtrs every day. We have enough data recorded on intruders to choke a horse—now we need action. Who's interested in taking action? Above all, our ARRL clubs must take the ball & start running after these important goals if we expect to maintain the Amateur Radio service as we know it today. If you can help, call one of the ASMs or our Tech Coord, N6AHU, Joe, N6AHU, 818-983-0555; Ken, KF6NC, 213-803-6045; Edgar, N6OU, 818-367-6588.

ORANGE: SM, Joe Brown, W6UBQ—ASMs: Riv Co Bob, W6LKN 714- 686-3823; Org Co Ralph, WB6JBI 714-776-9272; SB Co Ken, WA6ZEF 714-983-1272; Inyo Co Steve, WV6T 619-872-1199; ASM/PIC for Section News Jerry, AD6A 714-351-8824 New Citrus Belt ARC (C-BAR-C) 1990-91 officers: pres John, KB6QGQ; vp Mark, KJ6H; secy Inez, KA7FMV; treas Ken, WA6FRC; act Steve, N6SRE; cust Gloria, KC6JZR; Ed Bert, N6YJA. C-BAR-C notes the passing of Lonan Zane, K6SBR. New officers of the Golden Triangle ARC: pres Julie, KB6DRB; 1 vp Mike, WB6CUB; 2 vp Dale, KB6DRA; 1 vp Mike, WB6CUB; 2 vp Dale, KB6DRA; secy Rob, KC6JDW; treas Sue, KC6CRS—congrats to all! Buena Park ARC newsletter ed Bob, WA6PLM, states "Deliberate interference is wrong. There is no justification for it." (in any form—that includes rptr tampering—Ed.) The Moreno Valley ARA thanks AM broadcast station KHPY (K-Happy) for the spot announcement about the club. Thanks to ASM Mike N6KZB, KA6GND-1 is a new PBBS in Moreno Valley on 145.03 MHz; SysOp is Larry, KA6GND—congrats Larry! Huntington Beach (HB) RACES welcomes the following new members: Jim, WD6EGS; Joanne, KA6UMX; Milt, KB6OTY; Glen, W6SAU; Tom, WA6UPP; & Ron, WB6ZEI. The following HB RACES members were recognized for helping with July 4 events: N6DEF, KA6MNQ, KA6MLH, KA6LPO, WD9IRV, KF6ZB, N6PBW, WB6OSM, K6RUB, KA6ZTO, KI6BV, KA6UMX, KB6OTY & K6DAA. Well done, gang! Org Co RACES RO Ken, W6HK, says, "Never accept an assignment for something you may not be capable of doing, such as manning a pkt station alone & you've had little or no pkt experience." (Get training ahead of the event—Ed.) Art, W6XD, reports highlights from the SW Div cabinet mtg May 24. The ARRL emphasizes improving disaster comms regarding control of incoming vs outgoing msgs; cabinet support for no-code was evenly divided, with the "no" proponents most vocal. Ham radio needs better marketing; ham radio needs more political support/activism—develop more congressional pro-Amateur Radio advocates. Remember the SET Oct 20-21; contact your EC or WA6ZEF for participation. Congrats to Dan, WF6O, on being designated SW Div NTS Coord. All Org Sec Clubs should add PIC Jerry, AD6A, to their newsletter mailing lists. His address is 5505 Golden Ave, Riverside, CA 92505. STM WF6O reports: New PBBS on line supporting NTS is KA6GND, Moreno Valley, with N6RKY PBBS 220 port becoming operational soon. Nets: SCNV sess 31, QTC 164, QNI 371, PSHR: WF6O KA6HJK W6RE. Tfc: WF6O 511, K6ZCE 124, W6SX 120, KA6TND 56, AD6A 48, N6VEV 47, KA7HJK 45, W6RE 32, W6CPB 18, KA6JOB 14, KA6GND 11, N6DEO, K6PGG 2.

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6JZE. SEC: W6INI. STM: N6GW. SCN/1 NM: KI6ZH. Ramona Outback ARS meets 4th Wed in the Sr Community Ctr at 1900. The club's 1st Field Day saw KA5FVT, KK6IL, WR6J, KB6LEC, WB6NJY, W6NVH, AA6PC & N6TMP participating. SANDRA now has a 900-MHz link from Mt Otay to the 147.885 (-) autopatch on Sharp Hospital, thanks to N6EBL, N6PHA & W6RHV. Escondido ARS mtg place is now the New Life in Christ Church, 300 N Broadway, Escondido; the club meets at 1930 ea 4th Wed & operates a digipeater (N6ATQ-1) on 145.07 MHz from Mt Whitney in San Marcos. ARC of El Cajon has a new rptr on 224.08(-) MHz (CTCSS 107.2 Hz TB); it's in test mode for 90 days on Rattlesnake Pk Santee. S Bay ARS reports working 68 ARRL sections on Field Day, lacking only Puerto Rico. K6HAV is retiring as VE team leader for the Palomar ARC; AA6OM will take the position. Call sign changes: N6SYF to AA6WS, N6WBO to AA6UU, N6MVZ to KK6LX, KC6BSS to N6WVZ. AA6WS is SysOp for the Sabaline BBS, 692-1951. SDCTN: 31 sess, QNI 345, QTC 107. ARES/CW: 5 sess, QNI 12, QTC 2. Tfc: KI6ZH 452, KT6A 135, N6RVO 63, WA1ZEN 52, N6GW 7, WA6IIK 2.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—ACC: KB5AH. ASMs: N Vntra N6MA, S Vntra W8AKF, Sbar WB6BYU, SLO WB6IIY. BM: N6TNG. STM: N6NLW. OOC: W8AKF. TC: W6KFV. DECs: Vntra WB6RVA, S Sbar KA6KGF, SLO W7AZF. Belatedly, we report that N4SEQ, WD4FGV & N6AZJ represented Amateur Radio & the Santa Maria Amateur Radio Telegraphy & Telephony club by accepting Santa Maria Mayor George Hobbs' Proclamation of June 18-24 as Amateur Radio Week in the city. That week was chosen to coincide with Santa Maria Radio Swaptest & ARRL Field Day. This item was reported in the SMARTT club's newsletter, postmarked Aug 3, which illustrates the reason I can't depend on newsletter data for this column. This is another reminder: If something happened or is scheduled in your club or area, please get the word to me as soon as possible! The Conejo Valley ARC is helping Thousand Oaks H S RC set up a station. If you have rigs, accessories, test equipment or books to donate, please contact a CVARC officer. We can do nothing more important for Amateur Radio than to foster interest

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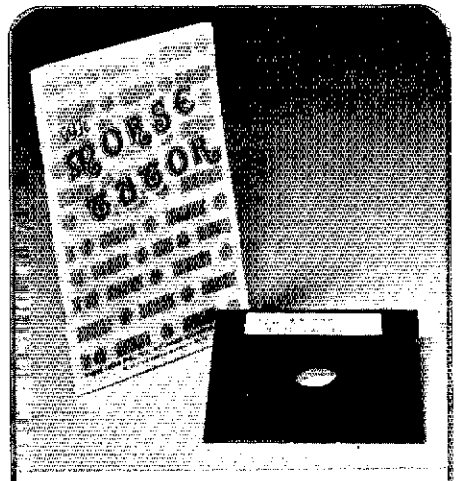

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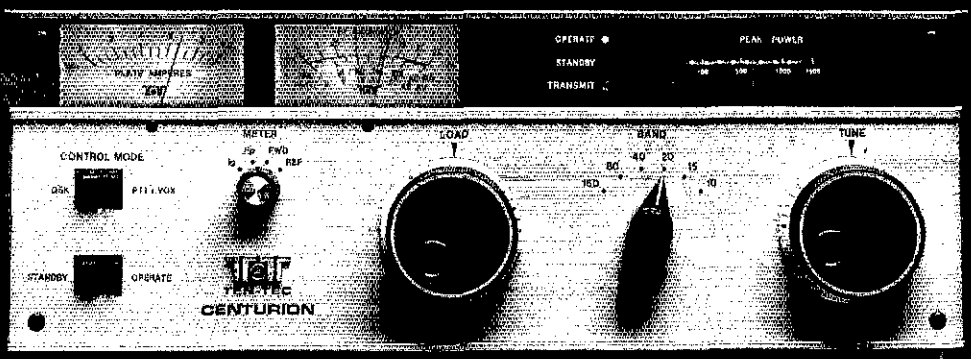
among the next generation! Our intrepid OOC, W8AKF, reports that he now has 15 (yes, 15!) pkt TNCs & transceivers operating in support of tfc handling & general digital comms. In addition to supporting all this hardware/software, Mike still finds time to deliver hundreds of NTS msgs by phone ea month. In July, he handled 91 pieces of H&W tfc following the earthquake in the Philippines— congratulations, Mike & thanks for all the effort. A brush fire at Eagle Ranch, W of Atascadero, resulted in ARES activation in San Luis Obispo Co. K6BWJ & N6BUY handled staffing, KI6QE, K6KAX & W6ZEK operated from CDF HQ, while W7AZF, WA6LJO, KK6DC, KI6LA & N6OFH took turns at the Comm bus. KB6J & AA6CT were held in reserve. The ECs & CDF were pleased with a job well done—another Amateur Radio public service effort. Testing successes for July: Satellite ARC, Vandenberg (GLAARG) Amateur Extra Class N6NMH, Adv N6ZIM, Gen N6TWT, Tech KC6HJQ (Sorry, participating VEs not reported this month). Santa Barbara ARC (ARRL) Amateur Extra Class KC6GBP N6UNX David Retz (uni), Adv N6ZJX N6WIY N6YMO KC6DEA K6ATX, Gen KC6GRW KC6BVE, Tech KC6HHF KC6HHE KC6LGK KC6HHZ KC6LZB, Nov Hubert Stamps, VEs KB5AH AA6MX WR6V AA6VH AA6JG WD6ETK. Congratulations to all who upgraded & especially to David Retz who made the giant leap in 1 sitting! Thanks to the VEs who contribute so much time & effort to make this program possible. 73 for now. Tfc: W8AKF 6857, W6NOR 80, N6NLW 65.

WEST GULF DIVISION

NORTH TEXAS: SM, Dan Dansby, W5URI—ASMs: W5GPO, W5IWE, KG5SC, K5MXQ, KO5I, WD5IVD, KF5BL. ACC: KA1CWM. STM: W5VMP. SEC: N0AJP. OOC: WA5YKO. TC: K5SXK. PIC: WW5L. Dan is in NM working with the Boy Scouts & getting everyone fired up for the big wknd of Oct 20-21 Jamboree On The Air (JOTA), so Don, KA1CWM, is writing the column this month. Hopefully, K2BSA/7 will be operating from all call areas & each will be responding with QSL cards. Let's try to work all of the K2BSA stations & help introduce Amateur Radio to the Scouts (see Dan's article "JOTA Needs You," p 52, Sept QST). I visited as many Field Day sites in the N TX Section as my body would take ending up at 1 AM on Sun morning. I was impressed with the site selections, activity resourcefulness & good food not to mention the many contacts made by the clubs. We should welcome the NE Tarrant Co ARS to the Section & the Hurst ARS to the Section & the Hurst ARC. This yr all of the Hurst Club officers are ladies. Good going gals, keep up the good work. Additional thanks go to the Hurst Club for providing comms for a bicycle race & the Lake Area Club for helping with Aerobatic Competitions Flights all on Field Day. Congratulations to WA5OPO, the Cedar Creek ARC president who had his picture taken in front of ARRL HQ. Everyone enjoyed their visit to W5IWE's at Cedar Creek. I'm looking forward to visiting Longview, Irving, Collins/Rockwell, Nacodoches, Red River Valley, Navarro Co, Palestine-Anderson Co, Irving as well as E systems & the SW Seminary Clubs during the month. The Irving Club is to be congratulated for attaining their SSC designation & the E System-Garland Div, SW Seminary & NE Tarrant Co Clubs for thier affiliation. Antenna ordinances continue to be a major topic of discussion at many club mtgs. We continue to stress the need for more local gov't liaison appointments within the N TX section so that any action taken by local gov'ts that will affect amateurs can be reported promptly. We also stress the need for each club to have an official bulletin station to report on ARRL bulletins & happenings at club mtgs. It was good to see many N TX folks at the OK State Conv & don't forget the Wichita Falls Hamfest Sept 15 & the Texoma Hamorama Oct 27-28. They will be here before you know it & I look forward to seeing you there. Don, KA1CWM. Tfc: KF5BL 593, K5UPN 428, W5YQZ 336, N5PGZ 218, W5TOO 126, NK1N 112, KD5RC 97, AC5Z 59, KC5NG 29, KB5ADE 26, KB5BNU 22.

OKLAHOMA: SM, Joe Lynch, N6CL—K5CPZ. ASM: WB5CDW. ACC: W5ZTN. SEC: W5NZS. SGL: W5QMJ. TC: K5CXP. STN: K5WG. OOC. Ham Holiday was another great success, with many participants at the flea mkt & the new dealers making great deals. The seminars were well-attended & many of the participants met ea other in person for the 1st time. Special thanks to QCWA Chapter 63 for their hard work in manning the ARRL booth. Also, special thanks to Frank, AA5GI & the members of CORA for the hard work put forth by all. Your SM attended the Central States VHF Conf in Wichita & while there, saw many OK hams active in VHF & UHF. If you're tired of the HF bands, you might check out getting on VHF or UHF. The activity is different & fun & the operators are courteous & helpful of their fellow hams. Now is the time to register for Texoma. You should receive a registration form in the mail any day. This hamfest is always well-attended, in spite of the ever-present threat of rain during the open- air flea mkt. That's it for this month. 73 for now, de N6CL. Tfc: K5CXP 333, WB5OHK 223, N5IKN 154, WA5OUV 139, K5GBN 118, WA5ZOO 44, W5RB 43, AA5GI 39, WA5OGC 31, NQ5Y, 12. PHSR, K5CXP, 1/30, 2/30, 3/12, 5/12, 6/144, 7/178.

SOUTH TEXAS: SM, Arthur R. Ross, W5KR— SEC: K5DG. STM: WD5GKH. ACC: WB5YDD. PIC: WA5UZB. BM: WA5WCY. TC: NZ5U. SGL, K5KJN. ASM, all of above plus N5TC. Houston ECHO Soc had a great FD90 at Ant-Hill Estates near Cut & Shoot, with call NZ5V; 18 ops helped make it work; ECHO participated in "Clean Houston" for the World Economic Summit. PIO KA5EEQ, Brenham ARC, rprts latest club Novice licensee is KB5CNU. DRN5 NM WB5YDD rprts 566 msgs in 62 July sess; STX represented 100% by W5KLV, W5CTZ, KE5ZV, N5NAV, KG5TL, W5SHN, WB5YDD. PIO NZ5J rprts Seguin Freedom Fiesta Parade had good help from KB5IW, WA5DYN, KI5EF, N5KEI, W5MTO, K5TJA, AA5DF, K5TK, KB5GST, NZ5J, WA5UFL, W5FFG, KB5FUH; KG5GST got fast EMS action when he rprtd a horse falling on rider; W5EXY had tfc handler's nightmare: constant busy signal; he hand-delivered the msg, learned it was quite important & addressee learned his telephone was out of order; new Tech/Gen calls on CTTN: N5QYE, N5OGY, N5QYZ, N5NYN, N5RAQ, N5QZZ, N5PSW, N6OTQ, N5OWD—Welcome aboard! KI5EF works CTTN & reaps hay as "combine/mobile." 7290 Tfc Net Secy NF5T rprts 318 msgs in 48 July sess; 2926 ck-ins; NTS liaison 2 per sess; NM KD5RC/W5YQZ. Clear Lake ARC's Radio Amateur *Gazette* rprts club used FD90 to simulate Hurricane OMEGA emergency; logged over 1000 contacts in 24- hr prd on emgcy pwr only; Sagemont's June 30th Fourth of July Parade had help from KA5UGW, KB5AWM, KA5FIL, N5PNP, WD8KUJ, N5PWL, N5OLU, WB5WOW, KG5GNA, KG5U. Brazosport ARC NEWS rprts club had big FD90; usual thunderstorm slowed activities a bit,



Now, A Choice of Three Great Amplifiers– One is Ideal for Your Operating Interests!

NEW!

Centurion ... The Classic Kilowatt!

The Model 422 Centurion uses the classic pair of Eimac® 3-500Z tubes. The RF deck and power supply are combined into a single, attractively styled, desk top cabinet. The power output is rated at 1300 watts on ssb, 1000 watts cw and 650 watts using "key-down" modes. Drive required for full power ssb operation is 100 watts. The duty cycle is 50%.

Semi-break-in cw is achieved using a fast acting, non-vacuum, relay and the excellent QSK electronics used in the Hercules II. This system is also suitable for the fast switching digital modes. (For the "heavy duty" QSK cw operator, an accessory board is available incorporating a Jennings vacuum relay.) VOX ssb operation is silky smooth and virtually noiseless. This versatile control system assures compatibility with all exciters with amplifier control provisions.

A tube-axial fan is used for forced air cooling. Air flow is routed through the power supply as well as the upper and lower sections of the RF compartment. Air inlets and outlets are in the sides and top of the cabinet to optimize low pressure, low noise, air movement.

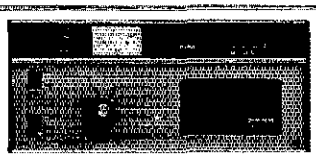
A dedicated meter for plate current, a multi-meter for plate voltage, grid current and forward or reflected power. A full time 10 element LED bargraph instantly displays peak power output.

The Centurion operates on all bands from 1.8 to 21.5 MHz. 21.5 to 29.7 MHz is enabled with the installation of an expansion board, supplied no-charge upon proof of licensed authority.

A tough, easy to handle, amplifier that doesn't really mind a little abuse. The Centurion is a great value.

SPECIFICATIONS

Band Coverage: 1.8-2.0, 3.2-4.7, 6.5-10.3, 13.4-19.6, 17.6-21.5 MHz. 21.5-29.7 MHz after authorized modification.
Input Power: 2000 watts, maximum.
Power Output: 1300 watts ssb, 1000 watts cw. RTTY and SSTV 650 watts, 50% duty cycle.
Drive Power: 100 watts for full rated output.
Efficiency: 50-65%, depending on frequency and load impedance.
Input/Output Impedances: 50 Ohms, unbalanced. SWR ◄2:1.
Distortion: –35 dB from 1 kw rf output level.
Harmonics: –50 dB typical.
CW Break-In: QSK capable. Relay switching.
Tube Compliment: Two Eimac® 3-500Z.
Power Amplifier Circuit: Class AB2, grounded grid.
Plate Voltage: 3100 volts, no load. 2600 volts, full load.
Cooling: Forced air with full chassis air flow.
Metering: Dedicated plate current meter. Selectable multi-meter for plate voltage, grid current, forward or reflected power. Ten element LED bargraph display for peak power indication.
Front Panel Status Indicators: Standby, operate, transmit.
Primary Power: 220-250 Vac @ 15 A. 110-125 Vac @ 30 A, 50/60 Hz. For full power operation, 220-250 Vac is strongly recommended.
Circuit Protection: Primary line fuses. Plate transformer primary interlock and high voltage shorting bar.
Front Panel Controls: Power on/off, standby/operate, control mode select (QSK - PTT/VOX), plate TUNE and LOAD, band switch, meter switch.
Tune and Load Controls: 6:1 vernier drives with calibrated dial skirts.
Construction: Aluminum chassis, front and rear panels, interior partitions and top and bottom covers.
Size: HWS 8.25" x 15.25" x 18.5". (20.3 x 38.7 x 46.9 cm).
Weight: 47 lbs (21.3 kg).



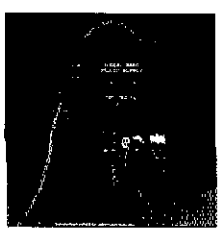
Hercules II Solid State, No Tuning!

High tech simplicity, base or mobile. A compact, lightweight HF amplifier that offers a unique combination of virtues that can only be achieved using modern, solid state technology. Instant on, 12 - 14 Vdc operation, general coverage from 160 through 10 meters, no-tune operation and compact size. Add to that, lightning fast QSK cw, remote control, superb linearity and a low drive requirement. Outstanding!

The Hercules II is attractively styled to match our HF base station transceivers and will interface nicely with virtually all transceivers. The front panel includes an analog multi-meter for collector current, voltage, forward power and SWR. A ten element LED bargraph instantaneously displays peak power output. Band selection is either with the front panel switch or remotely via a rear panel connector. A front panel speaker is built in.

The internal heat sinks are air cooled by a temperature controlled tube axial fan. Whisper quiet in ssb operation, yet enough air capacity for cool operation in the key-down modes. The Hercules II is compact, good looking and generates a signal that is within one S-unit of the mighty Titan.

MODEL 9420 115/230 VAC POWER SUPPLY



Housed in a separate utility enclosure and remotely controlled through the 6 foot power cable. 100 amperes at 13.7 Vdc is provided. 80 amperes for the amplifier and 20 amps for the exciter. An alternate power supply can be a heavy duty, deep cycle, lead acid battery and an automatic 10 amp charger. This low cost alternative power source will support the Hercules II during sustained amateur service.

The Mighty Titan ... Simply Unbeatable!



The Titan has it all! Maximum legal power with ease, all full power bands 160 through 15 meters (10 and 12 meters after authorized modification), lightning fast QSK for break-in cw and the digital modes and a two speed blower for quiet operation. This awesome performance from a desk top amplifier is made possible by the remote power supply and a pair of Eimac® 3CX800A7 ceramic triodes. The heart of the power supply is our own four core, tape wound Hypersil® transformer. This 41 lb behemoth is conservatively rated at 2.5 kVa CCS (9.2 kVa IVS) and is nearly noiseless, even at 1500 watts output!

Other features include a front panel, peak reading wattmeter using an instantaneous ten element LED bargraph display. PTT/VOX or QSK control line select switch, built-in SWR meter and an "over-drive" warning LED. 3:1 vernier TUNE and LOAD controls in combination with an outstanding RF deck design, make the Titan a real "pussy cat" to load and operate.

The Titan is styled to match our transceivers but it interfaces beautifully, no matter what exciter you are using. If you are ready to choose your dream amplifier, the Titan has it all! Check it out.

...America's Best!

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(615) 453-7172
Fax: 615-428-4483
Customer Service: 615-428-0364

Keyers

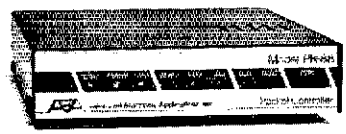


The Morse Machine has all the features you need in a memory keyer, including 2 to 99 WPM speed selection and over 8,000 characters of soft-partitioned memory. Twenty memories store your messages...as short or as long as you like. Memory can be expanded to 36,000 characters. All memory is backed up by an internal lithium battery.

Comprehensive Morse training facilities are built-in. **A Proficiency Trainer** for random code group practice. **A Random Word Generator** which generates four-letter words and **A QSO Simulator** which allows you to call stations, answer a CQ or listen to realistic on-the-air QSO's.

The MM-3 also features automatic serial number insertion and incrementing in any memory message. Use the front panel knob to adjust your sending speed or enter a precise speed with the keypad, toggling between the two at any time. Exchanges can be expedited by having parts of your message sent at a higher speed. You can even add remote switches for four of the memories to send your response or call CQ. The MM-3 can also be programmed for automatic beacon use. The RS-232 compatible serial I/O port provides computer control of the MM-3 and monitoring of the Morse training features.

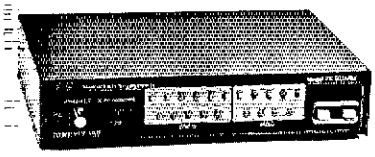
Packet



Unique operating features with a proven hardware and software design make AEA's PK-88 your best choice in packet radio--now with MailDrop, an 8KByte efficient personal Mailbox. The PK-88 also allows multiple single frequency QSO's, digipeating and networking. It's a superb value, packed with all the most needed packet radio features such as direct interface capability with NET/ROM and TCP/IP. In addition to all the features of a "standard" TNC, the PK-88 offers features not found in any other TNC:

- WHYNOT command - Shows reasons why some received packets are not displayed.
- "Packet Dump Suppression" - Prevents dumping unsent packets on the radio channel when the link fails.
- CUSTOM Command - Allows limited PK-88 customization for non-standard applications.
- Enhanced MBX command- Permits display of the data in I- and UI-frames, without packet headers and without packet headers or retried frames.
- Enhanced MPROTO command - Suppresses display of non- ASCII packets from Level Three switches and network nodes.

Multi-Mode

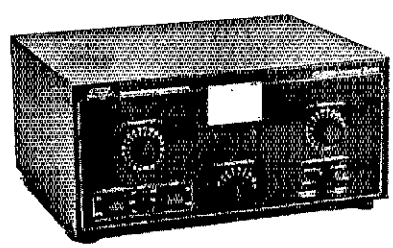


With over 40,000 units sold worldwide, the PK-232MBX is the world's leading multi-mode data controller. Combining all amateur data communication modes in one comprehensive unit, the PK-232MBX offers Morse Code, Baudot, ASCII, AMTOR/SITOR 476 and 625, HF and VHF Packet, WEFAX receive and transmit, TDM, as well as commercial standard NAVTEX automated marine information services.

All software is on ROM.

- 20 front panel status and mode LED indicators
- RS-232 compatible
- Exclusive SIAM™ Signal Identification and Acquisition Mode
- TDM Time Division Multiplex decoding
- PakMail™ mailbox with selective control of third-party traffic
- FAX printing - supports most printers
- Two radio ports
- Host mode for efficient program control of the PK-232MBX
- KISS mode for TCP/IP networking protocol compatibility
- 32K RAM lithium battery-backed
- Many features for the digital SWL

Antenna Tuners



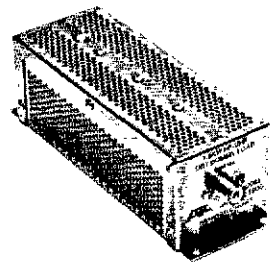
For tuning perfection, choose AEA's AT-300 (300 watt) or AT-3000 (3 kW) antenna tuners. Quality and exceptional engineering are built-in for maximum performance and long operating life.

The low-pass design provides more harmonic attenuation for lower TVI and allows matching to a much wider range of antenna impedances than common high-pass designs.

The AEA tuners feature a frequency compensated dual-movement SWR meter for ease of tuning with a front panel power range switch. Minimal SWR is achieved by inductors with 18 (AT-300) and 20 (AT-3000) taps. AEA's exclusive patent pending CAM switch design on the AT-3000 provides accurate tuning. The built-in front panel antenna switch allows you to easily select two unbalanced (coax-fed) antennas, a dummy load or a balanced antenna.

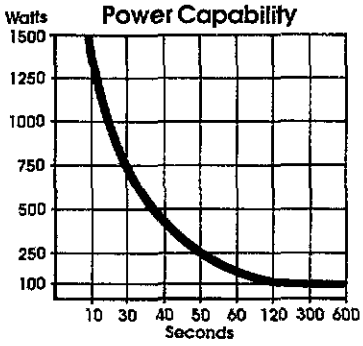
Advanced Electronic Applications, Inc. 2006-196th St. SW/P.O. Box 2160 Lynnwood, WA 98036 206-775-7373

Dummy Load

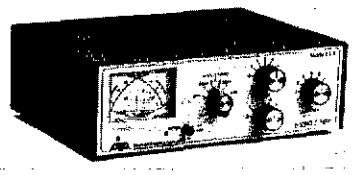


AEA's dry dummy load simulates a perfect 50 ohm antenna up to 650 MHz so you can test your transmitter without radiating a signal on the air.

- DC-650 MHz
- Simulates matched 50 ohm transmission line to test your transmitter
- Handles short-term RF power up to 1500 watts
- VSWR of less than 1.3:1 at 650 MHz
- Compact and lightweight
- Air cooled dry load



Econo Tuner



Meet your match with AEA's new ET-1 Econo-Tuner™. A quality, economical antenna tuner for under $150, the ET-1 Econo-Tuner is designed to match virtually any receiver, transmitter or transceiver from 1.8 to 30 MHz with up to 300 watts of RF power.

Compatible with almost ANY antenna including verticals, dipoles, inverted vees, beams and mobile whips that are fed by coax cable, balanced lines or a single wire. For easy connection to balanced lines, a 4:1 balun is built-in.

A front panel switch control allows you to switch between two coax-fed antennas (direct or through the tuner). You can also switch to a balanced line or wire antenna. The BYPASS position allows you to switch to a dummy load (such as AEA's DL-1500 dry dummy load) or a direct connected coax antenna. In the BYPASS position, COAX 1 OUT or COAX 2 OUT can be selected so that the tuner is bypassed, but not the meter circuit.

The ET-1 features a precision dual-movement meter to simultaneously monitor power and SWR.

Unique engineering designs have made AEA one of the leading innovators in the amateur radio industry. That same quality and superior technical support make the ET-1 your best deal for an antenna tuner.

Antennas

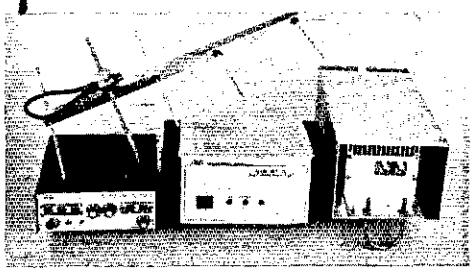


An outstanding mechanical and electrical design make the IsoPole the best choice for an economical omni-directional VHF or UHF base station antenna. All IsoPole antennas yield the maximum gain attainable for their respective lengths and a zero degree angle of radiation which puts the most signal on the horizon. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Decoupling cones offer great efficiency over obsolete radials which radiate in the horizontal plane. The IsoPoles also have a broader frequency coverage than any comparable antennas. Typical SWR is 1.4 to 1 or better across the entire band!

All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion-resistant aluminum alloys. Aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast, not supplied).

IsoPoles are ideal for packet radio. The decoupling cones stop computer hash picked up by the outer shield of the coaxial cable from being passed to the receiver.

Amateur TV



Add a new dimension to your amateur radio communications with AEA's Amateur Television (ATV) system. If you hold at least a technician-class license, you can transmit and receive live or taped audio and video Fast-Scan TV (FSTV) information that rivals broadcast quality. Now you can share more than conversation over the air with this new mode of "personal communications."

It's Easy and Inexpensive. If you have a video camera or camcorder and a standard TV set, you may already own the most expensive components of an ATV system. AEA's ATV system includes a transceiver and antenna. Simply connect the camera, TV and the antenna to the transceiver, and you're on the air LIVE with one watt P.E.P.! If you want to broadcast with more power, AEA also offers a 50 watt mast-mounted linear amplifier and GaAsFET preamp with power supply. Your TV set will monitor your transmitted and received pictures.

Specifications subject to change without notice or obligation. Dealer inquiries invited. Copyright 1990.

but all went well. The BEXAR WIRE (bare wire), San Antonio ARC, rprts big FD90; the new 12 & 17 mtr bands helped the pt total; 20-mtr CW crew made 429 contacts. S TX Amateur Rptr Soc (Rio Grande Valley) STARGRAM rprts new digipeater at Falfurrias (FAL) commissioned by WU8H, W0OMV, WA5ZPR, N5PVL, N5OGQ, with tech support from N5JKH, N5IUT, K5DYY, will allow 24-hr connects in & out of the RGV; the 147.12 rptr has been relocated to S Padre I atop a condo (at 140 ft) thanks to total dedication from WU8H, N5HOU, KA5WGZ, KB5ABH, N5PVZ, N5OCG, KD9CO, KB5GFD, N5QIF, K0DEG, KA5OIW, KA5ORT, K5RAV; AD K5RAV, presented Certificate of Marit Award to NA5C for his pioneer pkt work. NW ARS, Houston, *NARS News* rprts big & successful FD90; the satellite effort produced 36 contacts, including one on RS-10. Matagorda Co ARC bulletin rprts KA5MWD upgraded to Tech; congratulations; FD90 was a fun success. B-VARC Bulletin, Brazos Valley ARC, (Ft Bend & Harris Cos) rprts upgrades: KA5AKG, KB5HAB to Adv; KB5MVK, KB5MRD, KB5MRN & 5 unlicensed to Tech; others passed various elements; proudly rprts that in 1989 B-VARC held 13 exam sess, administered 581 exams to 275 candidates; that's a great record!

WEST TEXAS: SM, Milly Wise, W5OVH—News from the July & Aug *Relay*, the bulletin of the W TX ARC of Odessa, TX: Nov 3-4 will be the dates of the Odessa Hamfest. Committee members are Robert, N5KUC; G. B., NG5R; Martha, KE5BQ; Ray, K5LZ; Edie, KA5L; DJ N5FRN; Potts, WB5IBE; John, KF5NI; Jim, WU5N; & Robert, KB5HPG. The W TX DX club pkt is coming soon to Odessa; it will operate on 144.91 MHz & will serve Midland & Odessa. From the *Oscillator* the monthly newsletter of the Amarillo Panhandle ARC, we learned that during a recent citywide exercise, the DPS was supposed to demonstrate their comms capabilities with the passing of tfc on HF, voice & other modes. Due to equip problems in Austin, the only mode avail was HF voice, so Amarillo amateurs were able to use the TexNet pkt radio network to contact an Amateur in Austin who was monitoring & placed the call to the DPS. When all else fails, call an amateur. Here in W TX, we are proud of one of our young hams: Jennifer Doerrie, KA5WMI (Gen), of Booker, TX, daughter of ACC Jerome, K5IS, because she won a college scholarship from the Dayton ARA & is going to attend Odessa College. Newly appointed Tech Coord Clay Ernert, K5TRW, would like to have an Asst TC in every area covered by clubs in the W TX Section. If you'd like to help on RFI committees or other tech problems, get in contact with Clay at 915-859-5502 or write him at 109 Pasodale, El Paso, TX 79907. Congrats to the San Angelo ARC for being officially renewed as an ARRL SSC. The Big Spring ARC W5AW will be conducting their Novice classes as a continuing educational program. KB5GXW will teach the class. EPARC, W5ES, will start their Novice class again on Sat, Sept 29. On Oct 19-21 El Paso-area clubs K5WPH, WTRA, W5ES, OCWA & Bilingual ARA are putting on an El Paso/Juarez Internat'l Hamfest. Flyers should have reached hams in the W TX area by now. For info, call 915-751-4160.

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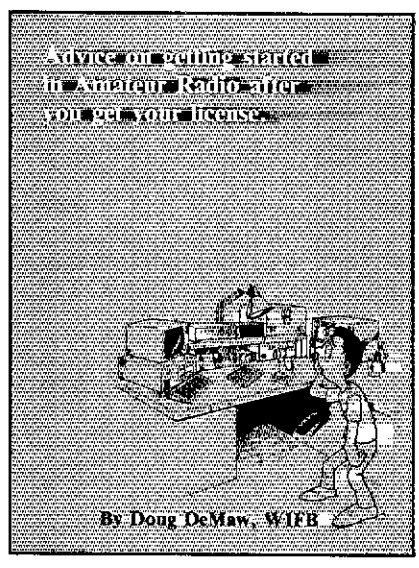
W1FB's HELP FOR NEW HAMS
New From ARRL

"Where do I begin? The license I worked so hard for is in my hands, and I want to get on the air!" Let W1FB tell you how to setup and operate your first station. Watch your apprehension be replaced by confidence as you get on the air and make contact after contact. This book answers basic questions about selecting equipment, laying out your station, constructing and using antennas, and operating. It also describes station accessories, logging and safety concerns. In this 155-page soft cover book, Doug acts as your personal consultant — your "Elmer" in ham radio jargon. A must for the new ham! Available at your dealer or from ARRL for $10 (add $2.50 for postage and handling, $3.50 for UPS).



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ETO/QRO

IT SHOULD BE EASIER
but comparing amplifiers is tough, because so many claims range from vague to absurd.

CONTINUOUS DUTY?
The term lost its meaning in the 70's, so **ETO** switched to ***locked key, no time limit.*** Unequivocal, right? A brochure I saw recently used the phrase "continuously, no time limit..." then defined duty cycle as "full output in amateur service". What does ***that*** mean?

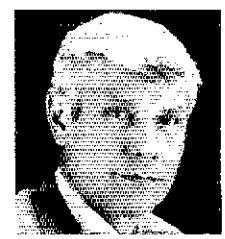
WHAT'S HIPERSIL® ?
It's a brand of grain-oriented, high-silicon steel used in transformer cores. It can make a transformer smaller and lighter than common transformer steel. ***Tape wound*** cores fully exploit its potential, "E-I" cores don't. How much difference does it make?

WHICH TUBE IS MORE RUGGED?
Glass tubes such as the 3-500Z are susceptible to breakage, seal cracks, and filament failure. The newer 3CX800A7 is more rugged, except for the grid structure that *makes possible* its superior linearity and gain. Amplifier protective features can ensure excellent tube life expectancy. Which ones are crucial?

"FACTS AND CAVEATS"
ETO's new pamphlet is designed to help amplifier buyers evaluate the major issues - power ratings, duty cycle, transformers, tubes, meters vs. LEDs, QSK techniques, and warranties. Call, write, or FAX **ETO** for your free copy.

THEN REMEMBER, ONLY A NEW *ALPHA* CARRIES A MONEY-BACK GUARANTEE AND A *FOUR YEAR* LIMITED WARRANTY!

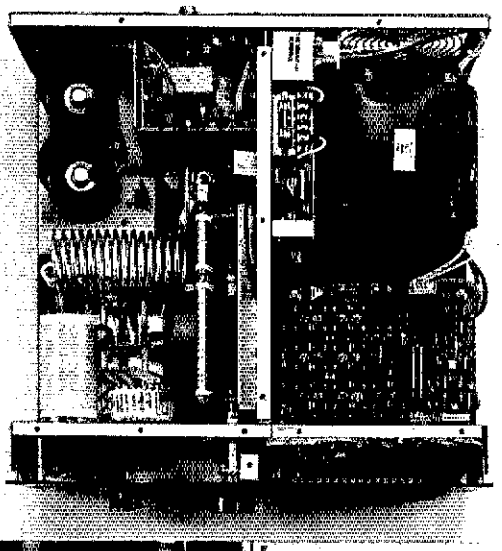
73,



Dick Ehrhorn
W4ETO

Standards of Excellence

The Inside Story...



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DR-590T(NEW)

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440-449. 995Mhz(RX410—469. 995Mhz)
45W Hi, 10W Mid., 5W Low on VHF
35W Hi, 8W Mid., 5W Low on UHF
Cross Band Repeater Function Simultaneous Receiving and Scanning on both Band
Front Control Panel is detachable. Remote Control will be available (Option)
MARS and CAP Modifiable (permit required)

DR-110T & DR-410T

Tiny 2M Power From Alinco!

DR-110T, this 2M Alinco, enters the nineties a proven winner with the "reputation" of best value. The DR-110T packs a powerful 45W on 2M and sports all the features you expect in todays transceivers. Tuning is a snap with the multi-functioned easy-to-see keyboard. 14 memory channels, subtones, scan, multi-colored LCD readout, reverse, are a few of the many features of the DR-110T. The mobile of the future-today! DR-410T available for 70 cm.





DR-570T

Set your sights for dual!

The Alinco DR-570T "Twin Bander" has dual LCD readout, volume, squelch and tuning controls. Double barrelled power with 45W on 2M and 35W on 70 cm, plus simultaneous receive on both bands or intermix with four modes of scan. The DR-570T will win the "battle" with its illuminated front function panel and LCD readout, readable in any lighting conditions. Don't let the "Tiny" DR-570T fool you! It's fast, and leaves the competition in the dust with many standard features you expect. Cross band repeat with the flick of a switch. Full duplex, 20 memory channels, call channels, 16-key DTMF Microphone, and subtones are just a few.
"Reach" for the DR-570T today!



DR-510T

Best Dual Value on the Market!

The Alinco DR-510T has most of the outstanding features of it's sister the DR-570T, including 14 memory channels, cross band duplex and cross band repeat. The multi color LCD display, and simple tune control panel makes simplicity the key word. The DR-510T with 45/35 watts is the best, featurepacked dual bander on the Amateur market today. See the DR-510T along with the other Alinco "Magnificent" ones at your favorite dealer today!



DR-112T(NEW)

Full Featured 2M Power Pack!

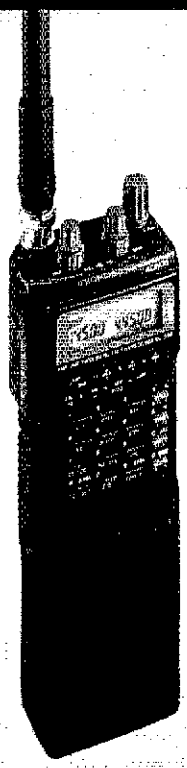
The DR-112T is a "True FM" full-power(45 watts) transceiver. The back-lit LCD display is ideal for bright or dim lit conditions. And, as with most Alinco products, the control panel is engineered to be "User friendly" and still offer a full range of features.

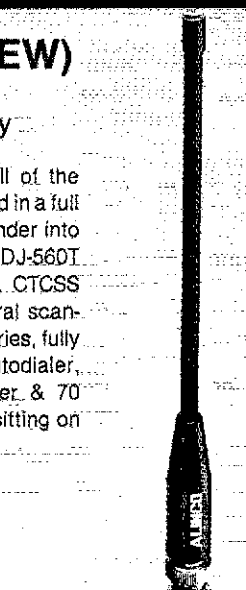
ALINCO ELECTRONICS INC.

DJ-560T (NEW)

Full Featured Twin Band Handy

We packed almost all of the features you would find in a full sized mobile Twin Bander into this compact HT. The DJ-560T has key board entry, CTCSS encode built in, several scanning modes, 40 memories, fully programmable, Autodialer, Dual Display (2 Meter & 70 Cm). The DJ-560T is sitting on top of the mountain.





DJ-100T & DJ-120T & DJ-200T

Best 2M Micro Value

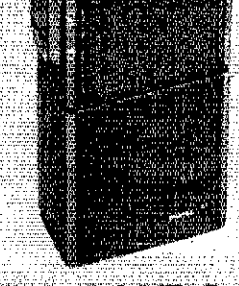
The Alinco DJ-100T/DJ-120T is "Magnificent" for its tiny size, but stands up to the competition with power and capability. 10 memory channels store offsets and subtones. Has LCD readout with call channels and reverse at your fingertips. 500 mah battery with direct DC to DC is standard. 3W on standard battery, 6W on optional battery leaves the competition in the dust! DJ-200T for 220 MHz.

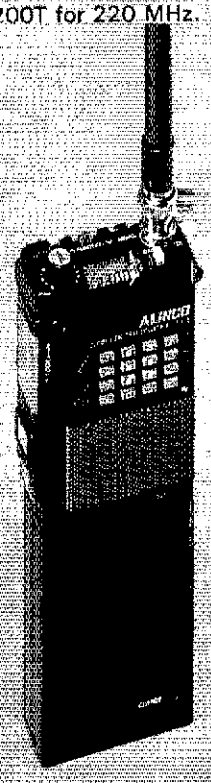


DJ-500T

Power-Packed Dual Handi!

20 Memory channels, subtones, built-in DC to DC, 700 mah nicad battery, LCD readout with 6W on 2M and 5W on 70cm (with optional battery) call channels, DTMF Touchtone, and direct keyboard entry, are just the few winning features of the Alinco DJ-500T Dual Band Handheld. Easy to use, and Value Priced at your Alinco Dealer.

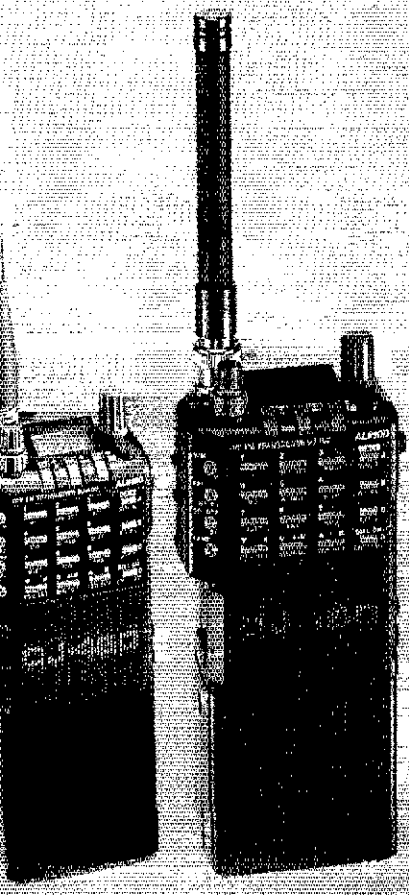




DJ-160T & DJ-460T

2M H/T is here! And wow!

"Bells & Whistles" is a tame word to use for the new DJ-160T, newest "Magnificent" one from Alinco. Keyboard entry is just one of four ways to enter a frequency in the extended receiver (137-173.995 Mhz) of the DJ-160T. You can store duplex /simplex pairs in any of 20 Memories, or Call Channel, with offsets, and any of 38 encoding subtones. Choose one of 3 scan modes, "Band" "Program" or "Memory" and one of five step ranges in VFO. Priority mode can be used in VFO, Memory or Call. "Dual Watch" allows the DJ-160T to scan 3 seconds alternately on CALL, VFO or one MEMORY. "Pager" is for group or single person alert. Other features include: Auto "Battery Save", Auto "Power Off", and 2-Memory Autodialer. Get 3-watts on standard 700 mah battery, or increased power from built-in DC to DC, or optional 12V battery. The Alinco DJ-160T, now the "Top Gun" with the competition today! DJ-460T for 70 cm.



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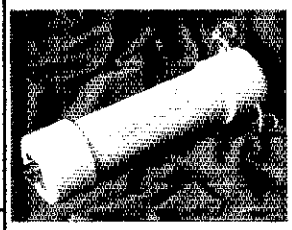

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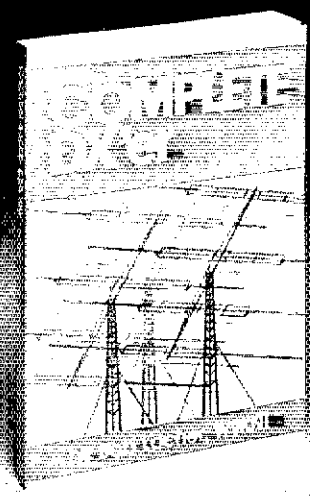

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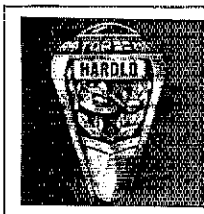

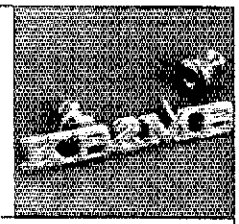

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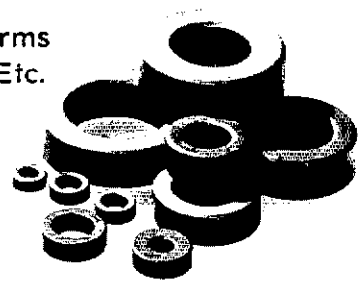

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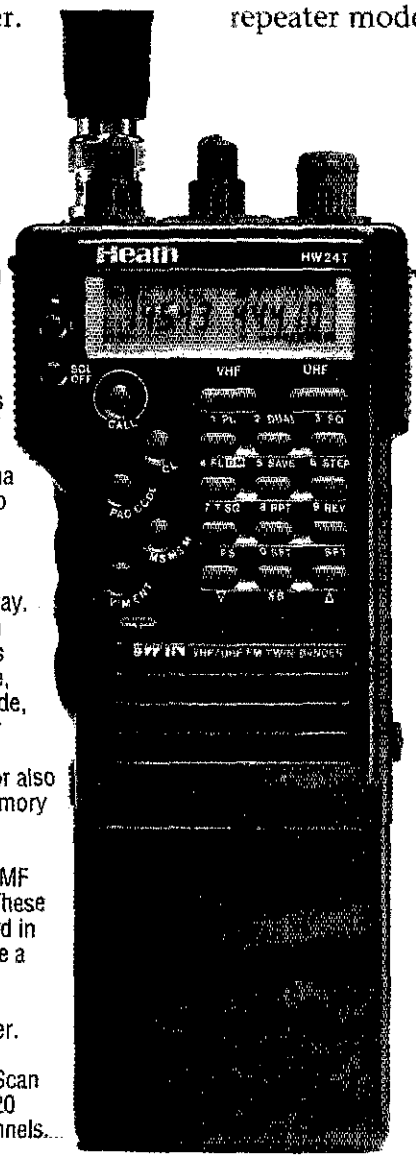
A true TWIN band (not just dual)!

The new Heath HW-24-T is a true TWIN band (not just dual band) handheld transceiver. Receives VHF and UHF at the same time and even includes a built-in cross band repeater mode.



Extremely sensitive at .158 μV for 12 dB SINAD, this receiver is a big plus when you're using a rubber duck antenna. Superb out-of-band sensitivity and frequency coverage from 130 MHz to 174.995 MHz and from 400 MHz to 469.995 MHz. The HW-24-T can even be modified for MARS and CAP TX, provided you show proof of participation.

Highest efficiency gives longest battery life. Heath HTs require less power on receive — and far less power on transmit. At full 5 watts Tx output, this HT requires only 1100 ma VHF or 1300 ma UHF. Compare this with the major competitor's HT which requires 2000 ma VHF and 2200 ma UHF for the same 5 watts to the antenna! You get a substantially longer battery life with your Heath HT.

Plenty of memory — and an impressive display. 22 memories (20 memory & 2 call memories) expands to 40 memories plus 2 call memories with up to 20 offsets and CTCSS tones. Large, easy-to-read twin display gives VHF on one side, UHF on the other. Just enter a new frequency directly via the keyboard or with the rotary frequency selector. (Rotary frequency selector also doubles as a quick channel selector in the memory mode.)

New industry standard paging — includes DTMF encoded code Squelch and Paging modes. (These new modes are becoming an industry standard in Japan!) Call a friend at a busy hamfest or page a friend through a repeater. DTMF tones are automatically sent at the beginning of each transmission which unlock the desired receiver.

Heath has more and better scanning modes. Scan the first 10 memories or the last 10, scan all 20 memories or scan only selected memory channels... Use the selected memory scan to block out a channel that you still want to keep in memory. Scan a 1 MHz segment of the band, all except 1 MHz, or scan the entire band. You can pause scan or busy scan in any mode — doubling the number of scanning modes. Pause scan stops on an active channel, but resumes after a few seconds — so you can hear everything that's going on. Busy scan stops on an active channel and holds it until the frequency goes clear. Dual watch lets you monitor two frequencies at the same time. It causes the HT to hold on to the alternate channel as soon as it goes busy. Great for listening to two repeaters at the same time, especially when you don't want to miss anything on either one of them!

Unique clone mode lets you program a friend's new HW-24-T from yours. Quickly copy all memory contents including frequencies, offsets and CTCSS tones over the air, from one HT to the other, in less than a minute!

Extremely fast switching times make the HW-24-T ideal for packet radio operation. The wide (6V to 16V DC) power requirement lets you operate the radio directly from your automobile's battery system without regulation. Full 16 key DTMF pad and VHF/UHF full-duplex operation allow telephone calls through equipped repeaters.

Includes 700 mAh, 7.2-volt NiCad battery pack and charger. High efficiency base-loaded antenna outperforms other antennas, plus works great out-of-band. Add the HWA-502 CTCSS encoder/decoder to work repeaters using tone decoders. Use tone squelch mode to ensure you hear only the desired signal — no matter how busy the frequency.

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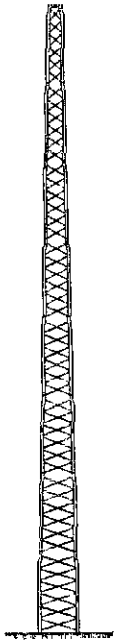

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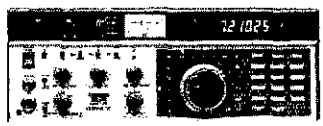

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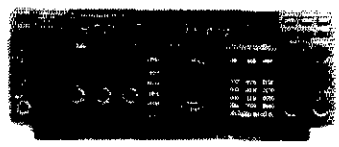

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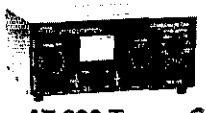

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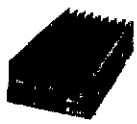

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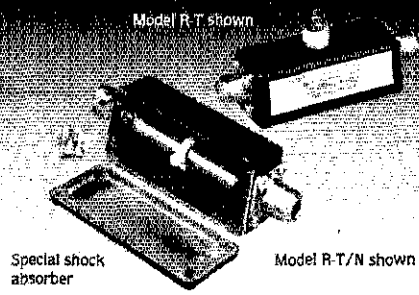

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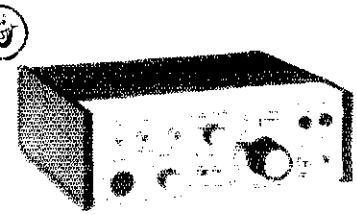

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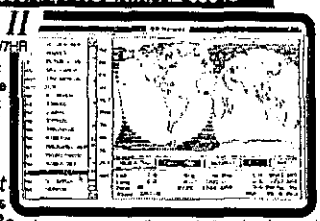

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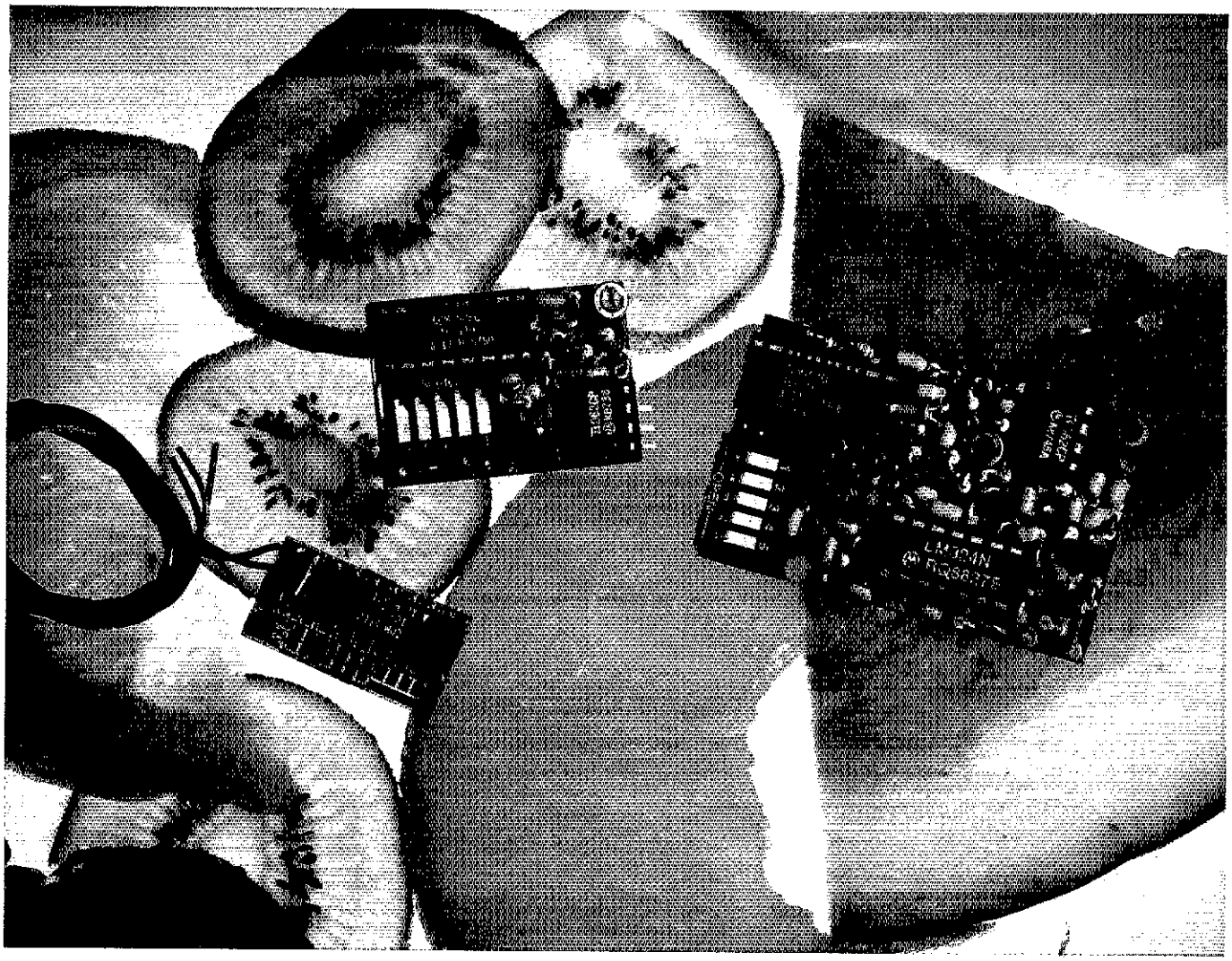

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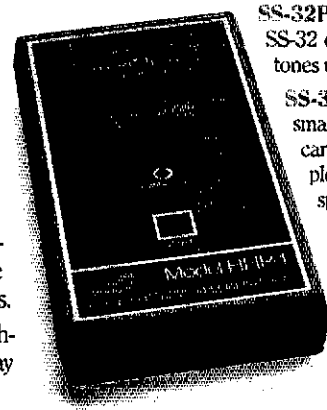

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TECH TALK from ICOM

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SPEC VARIATIONS IN MODERN TRANSCEIVERS

An attractive aspect of ICOM's Tech Talk series is sharing information on amateur radio topics with you. Recently, we discussed technical specifications related to HF and VHF transceivers. We pointed out, literature specs do not guarantee a transceiver's performance. This time we'll look at several design and circuit characteristics that make one unit "average" and another "excellent." The more you understand what is inside your rig, the better you can appreciate its capabilities...and look to ICOM for better ideas!

Overviewing a transceiver's block diagram is a surprisingly easy way to visualize its performance. If you can follow a roadmap you can read a block diagram. Disregard power supply, control, and PLL/injection oscillator sections and trace only incoming and outgoing signal paths.

Begin by tracing the receiver's signal path from the antenna and on through the RF filter, IF, detector and audio stages to the speaker with one color pencil. Next, trace the transmit path from the mike to the balance modulator, IF filter and RF output stages with another color pencil. Now, return to the antenna connection and let's focus on some special points while following your traced receive path. Most incoming signals in modern HF transceivers go through bandpass filtering directly to a first mixer stage. This Direct Feed Mixer concept is popular for copying fairly weak and strong signals alike, plus achieving wide dynamic range, and it is a big improvement over older designs.

While that concept is a good "happy medium", ICOM's HF transceivers go a significant step further with a front panel-selectable RF preamp between the antenna and Direct Feed Mixer. You can switch in additional sensitivity for noticeably better reception of weak signals during quiet band conditions, or bypass the preamp during strong signal activities. Advantageous? You bet! Further, this 10dB gain preamp uses dual FETs in a balanced circuit design, noted for high sensitivity and low noise characteristics.

Continue through the mixer/frequency converter and IF stages, and notice the extensive use of bandpass filters in ICOM transceivers. Trace through ICOM's deluxe noise blanker section and notice its special filtering plus a separate AGC loop just for the noise blanker! Can't find those blocks? Better get an ICOM!! Bandpass filter counts and their strategic points may seem elaborate but they are the hidden magic that makes ICOM units world famous for strong signal immunity and superb adjacent channel rejection.

Now look at the block diagram's PLL/Local Oscillator section. Notice the Direct Digital Synthesizers with lavish filtering in ICOM's new generation transceivers. They are responsible for ICOM's ultra-clean and low noise mixer injection/L.O. signal. Since those mixer stages are used during transmit and receive, the results are a spectrally-pure transmitted signal with low phase noise and minimum receiver blocking from strong off-frequency signals.

ICOM extends this idea in the UHF transceivers with Helical Resonators. These items employ tuned coaxial lines to resonate and peak only signals within their transceiver's tuning range while rejecting all others. Those Helical Resonators are often labeled as bandpass filters between the antenna connector and the first RF amplifier/mixer on a block diagram. They are ICOM's invisible advantage for outstanding intermod immunity.

Since ICOM's VHF transceivers sport wide range frequency reception (138 to 174 MHz), use of narrowband Helical Resonators is not logical. Varicap tuning is thus incorporated as an electronic and self-adjusting preselector to peak a desired MHz range. These varicaps are located in RF amplifying stages of all ICOM base, mobile, and handheld transceivers.

Comparing technical specs and circuit diagrams is beneficial for evaluating and comparing new transceivers, but any unit worthy of its circuits must also be a true pleasure to operate. ICOM HF transceivers are designed with heavy emphasis on operating enjoyment and dependability. All of their memories, for example, are front panel selectable, tunable across the rig's full range, and reprogrammable independent of VFO use. Dual VFOs in ICOM's new generation transceivers incorporate Band Stacking Registers for single button return to favored frequencies and modes on each band. ALL ICOM transceivers include very effective heat dissipating systems, and are easily computer interfaced with ICOM's CT-17/RS-232 adapter. Your total enjoyment is assured by the industry's most impressive customer support program. ICOM: Amateur Radio At Its Best!

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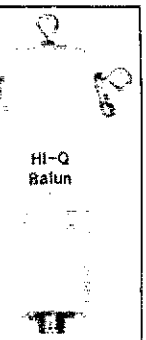

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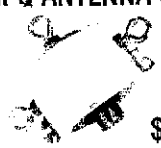

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D-80	80/75	130'	$31.95
D-40	40/15	66'	28.95
D-20	20	33'	27.95
D-15	15	22'	26.95
D-10	10	16'	25.95
Shortened dipoles			
SD-80	80/75	80'	35.95
SD-40	40	45'	33.95
Parallel dipoles			
PD-8010	80,40,20,10/15	130'	43.95
PD-4010	40,20,10/15	66'	37.95
PD-8040	80,40/15	130'	39.95
PD-4020	40,20/15	66'	33.95
Dipole shorteners — only, same as included in SD models			
S-80	80/75		$13.95/pr
S-40	40		12.95/pr.

All antennas are complete with a HI-Q Balun, No. 14 antenna wire insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V, and may also be used by MARS or SWLs.

Antenna accessories — available with antenna orders	
Nylon guy rope, 450 lb. test, 100 feet	$4.49
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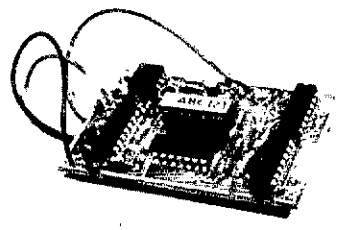

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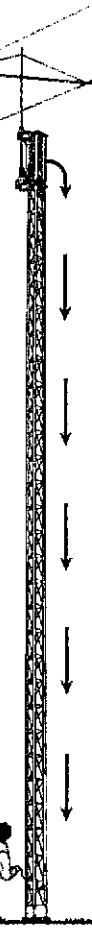

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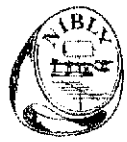

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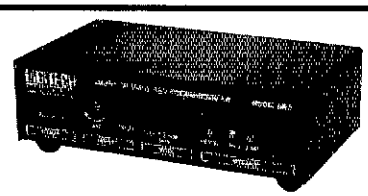

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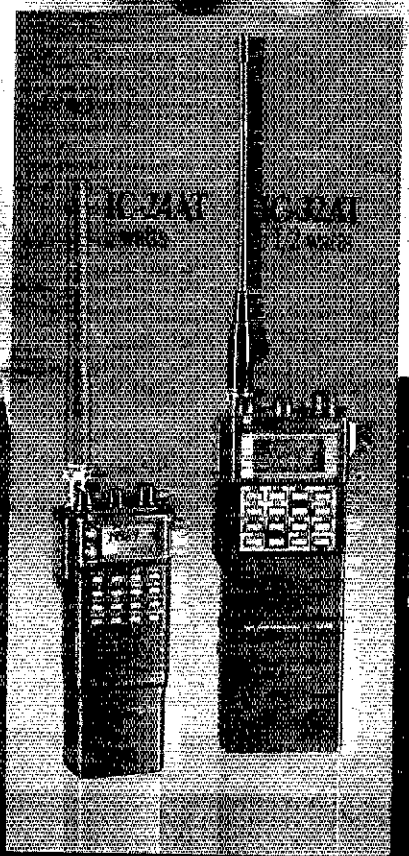

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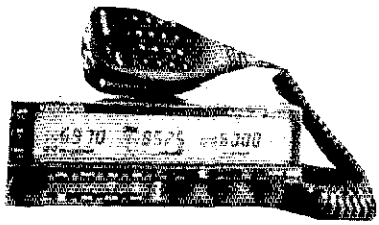

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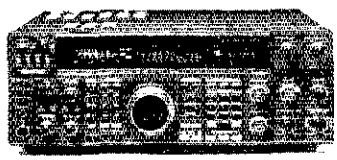

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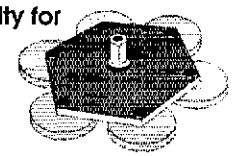

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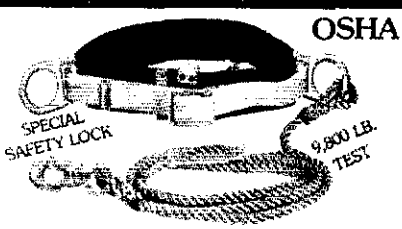

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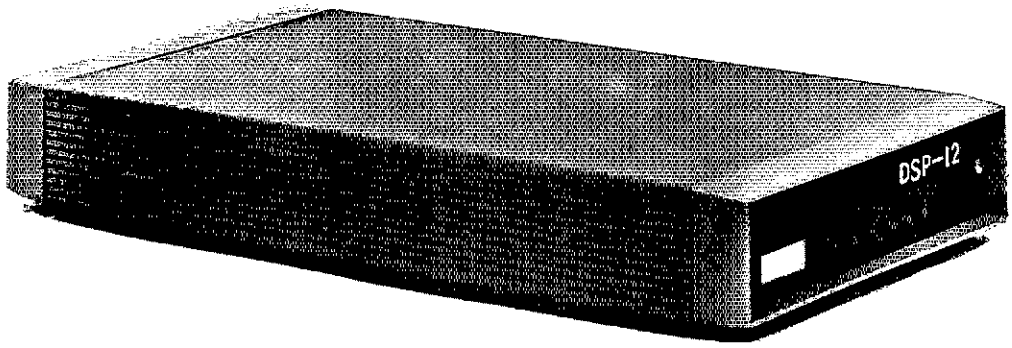

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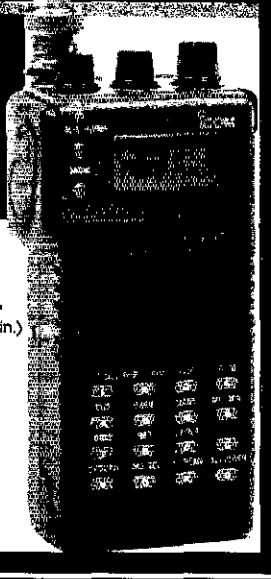

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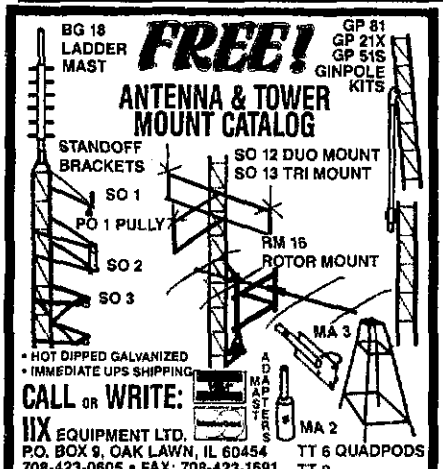

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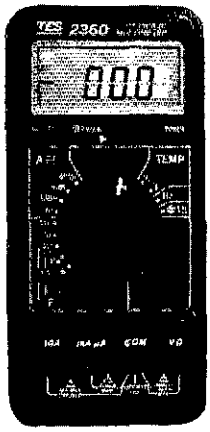

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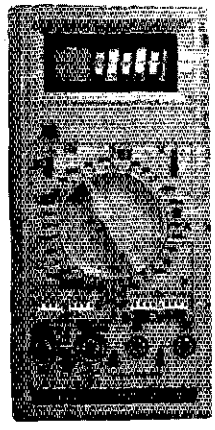

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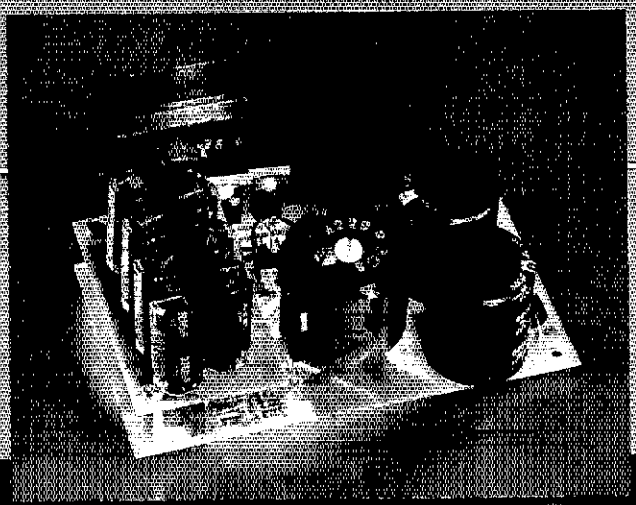



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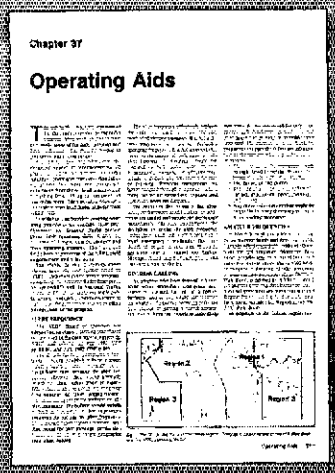







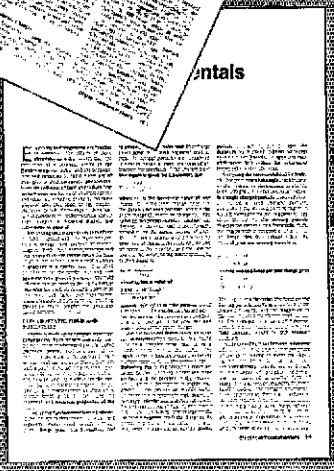

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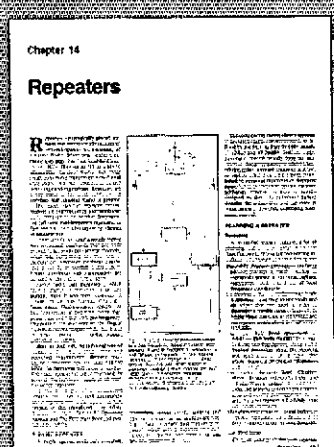

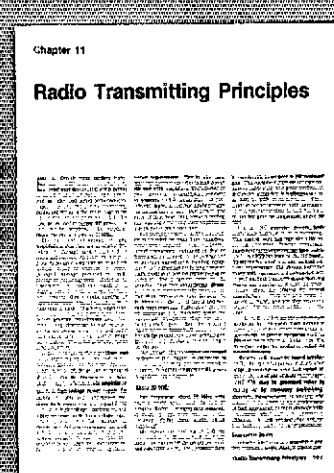

Shipping in mid- to late-October

The ARRL Handbook for Radio Amateurs, 1991 Edition, is available in hard cover at your favorite dealer or directly from ARRL for $25. Order number 1689. Please add shipping and handling charges of $3.50 for surface mail, $4.50 in the US for UPS.

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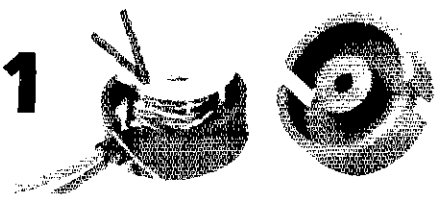
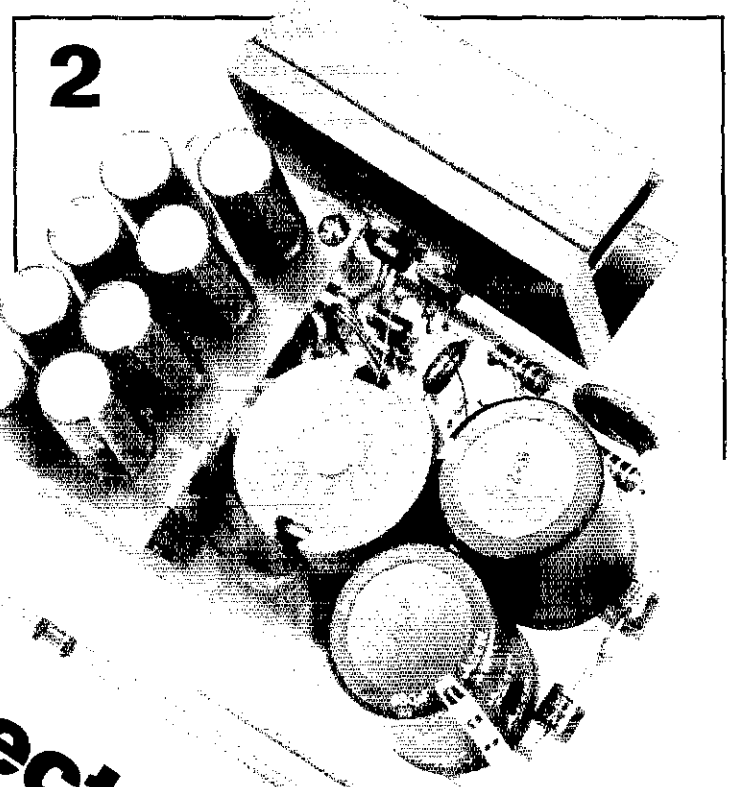
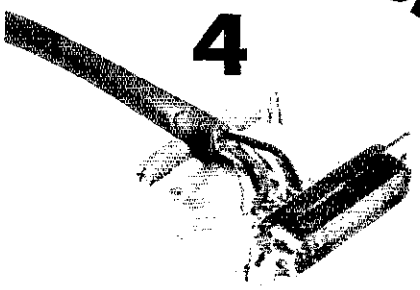
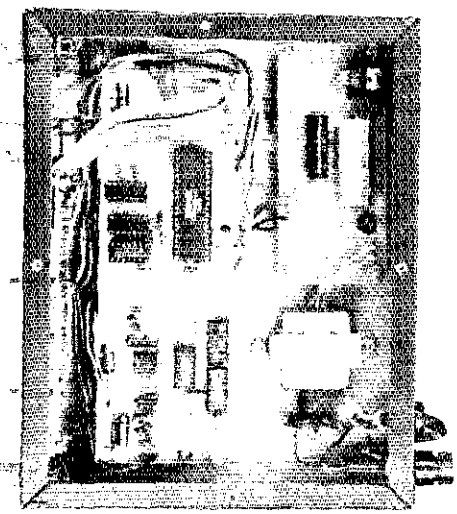


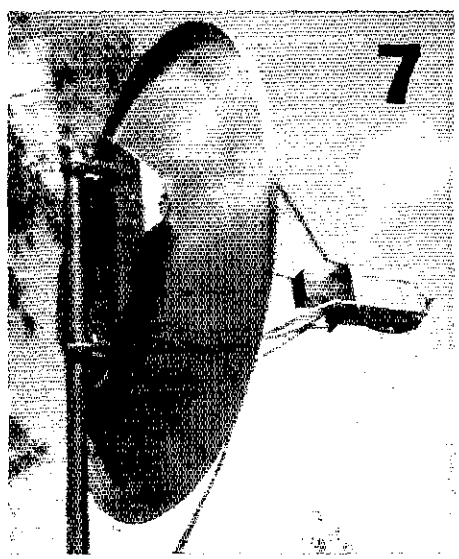


Projects! Projects! Projects!









Just a few of the projects in the *1991 Handbook!*

(1) Flyback transformer for the Switched Mode Power Supply shown in **(2)**. **(3)** 70-cm and 2-m J-Pole Satellite Antenna. **(4)** EIA Pin Connector Assignments. **(5)** Mobile RDF Setup. **(6)** Updated Frequency Counter. **(7)** 2-Mbit/s Microwave Data Link.



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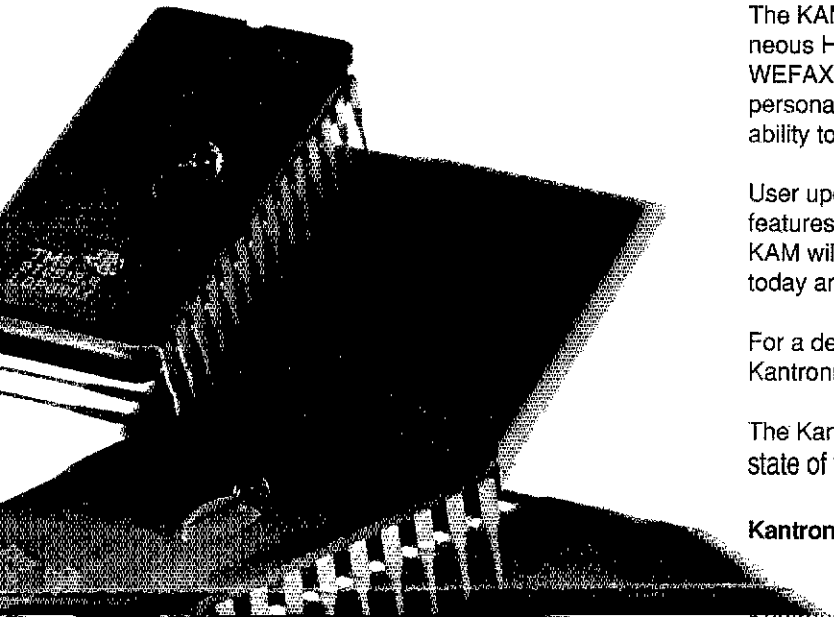

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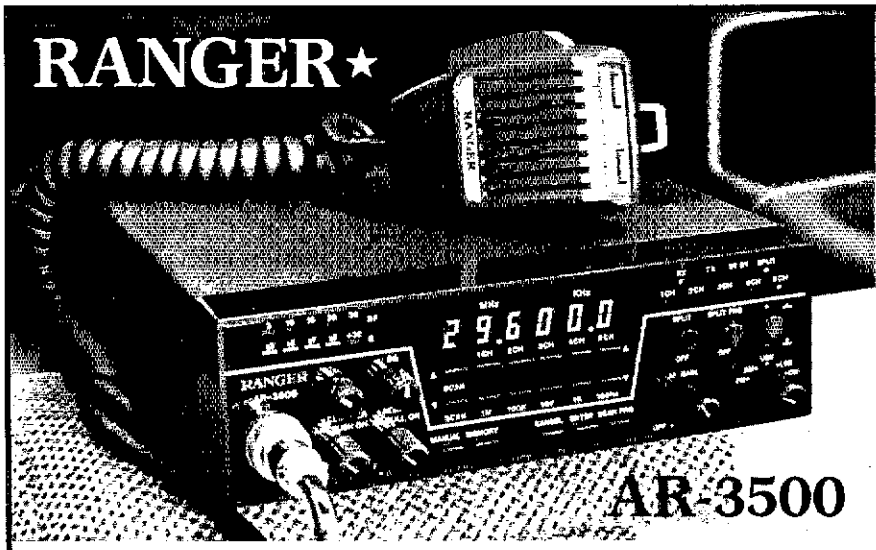

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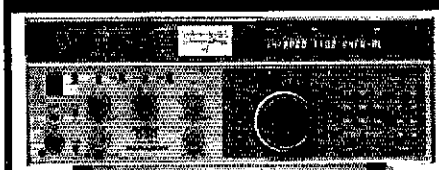

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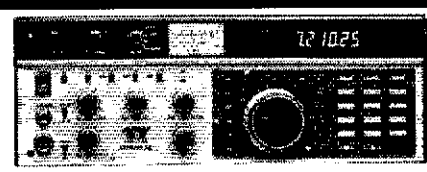

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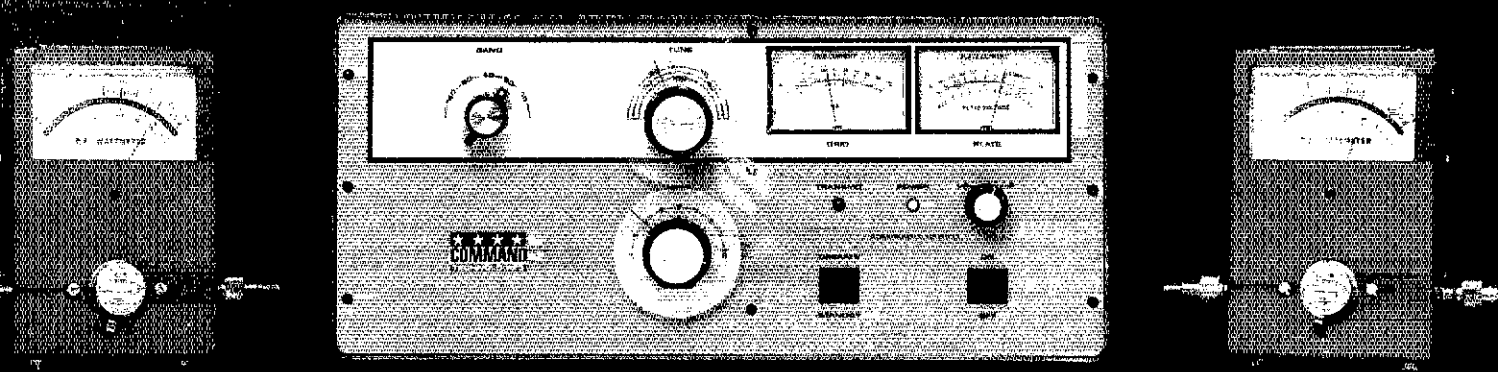

We listened.

At ham show after ham show we appreciated the oo's and ahh's about the quality and performance of the Commander HF-2500 hf linear amplifier. The only negative comments heard were about its appearance. So, we have changed that and you can see the results above.

New Contemporary styling.

We have taken your comments to the drawing board and now the two-tone gray colors of the HF-2500 fit in with the rest of the world's amateur radio equipment for a better looking station. Accents and nomenclature are in contrasting black for a clean look with better visibility. And here's a "first" in amateur radio styling...

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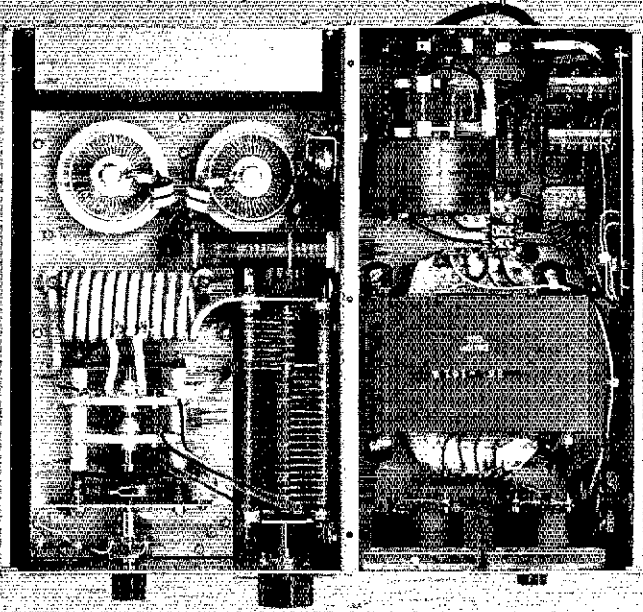

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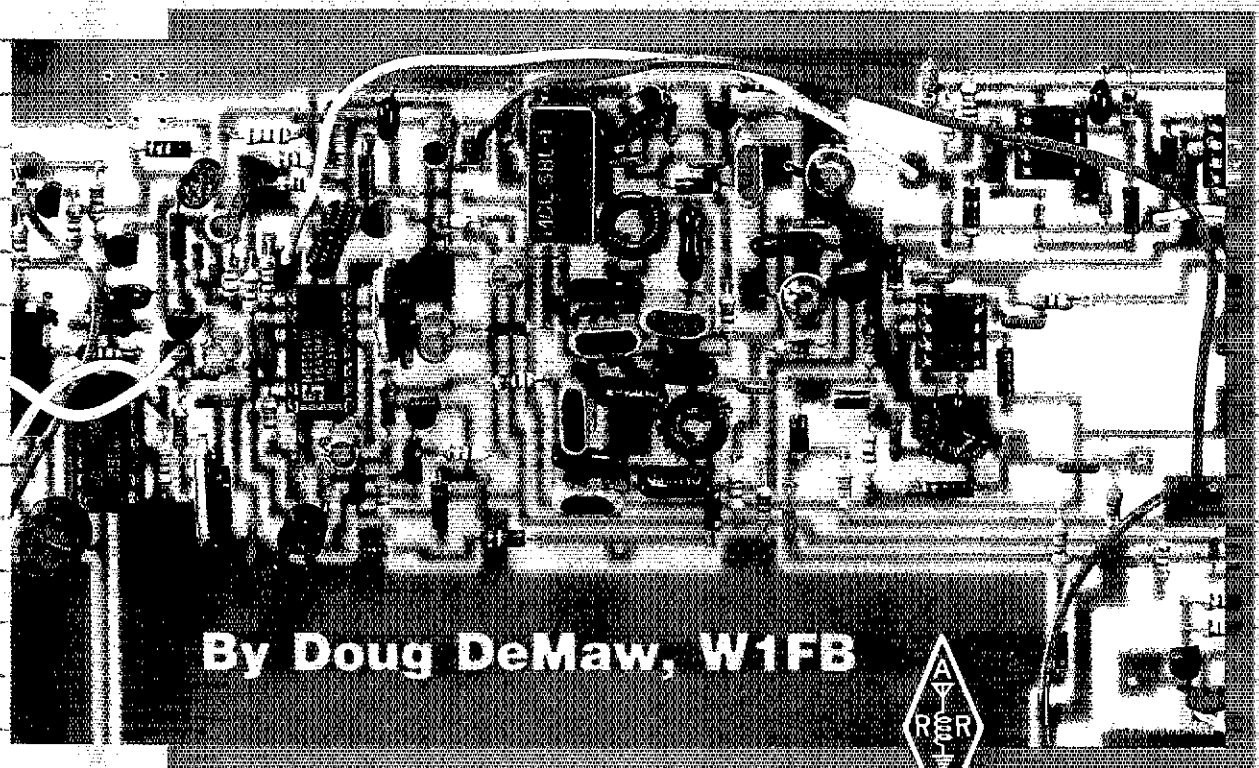

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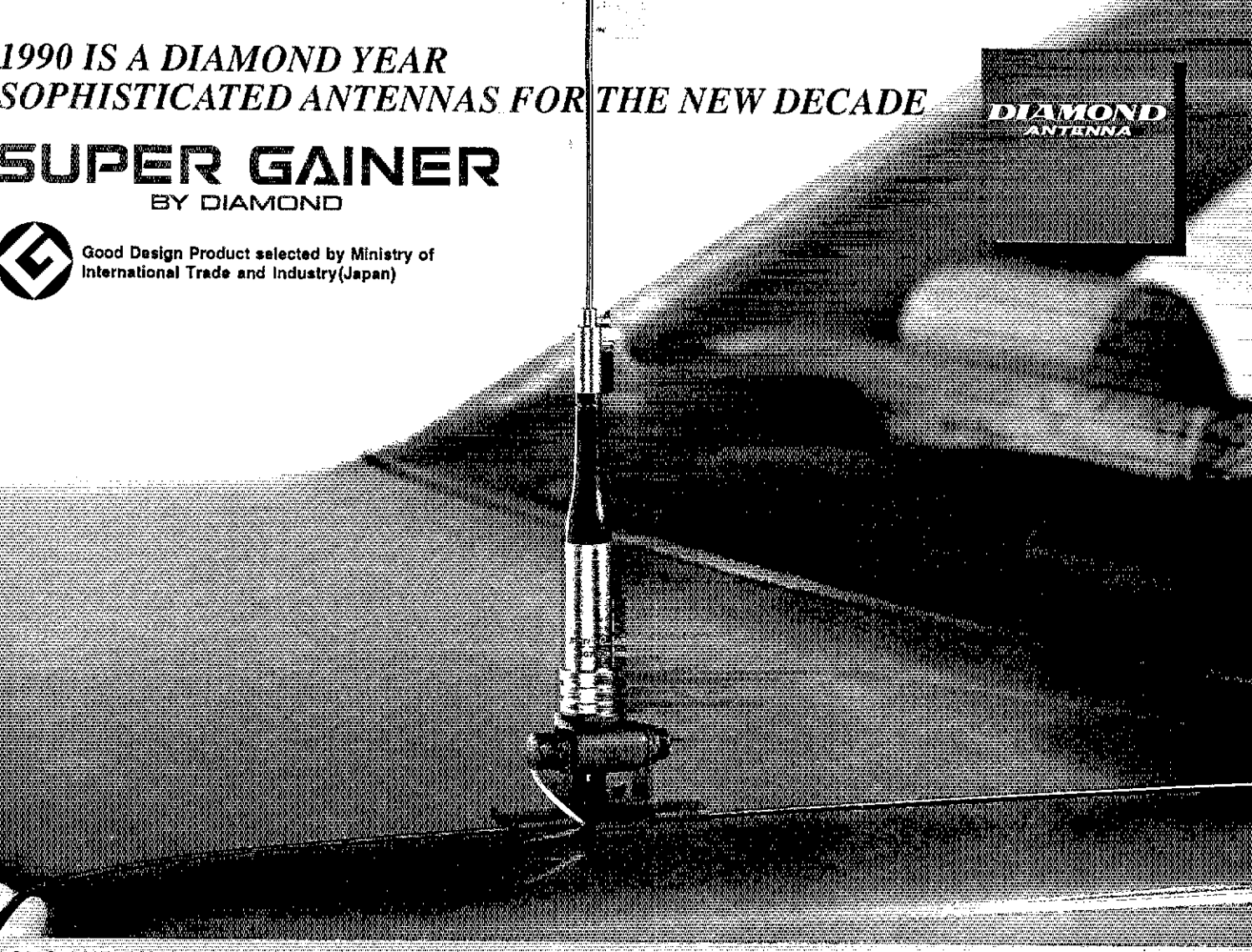

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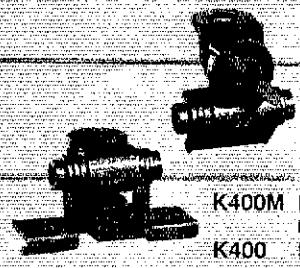

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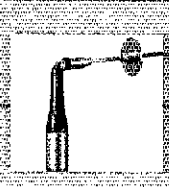

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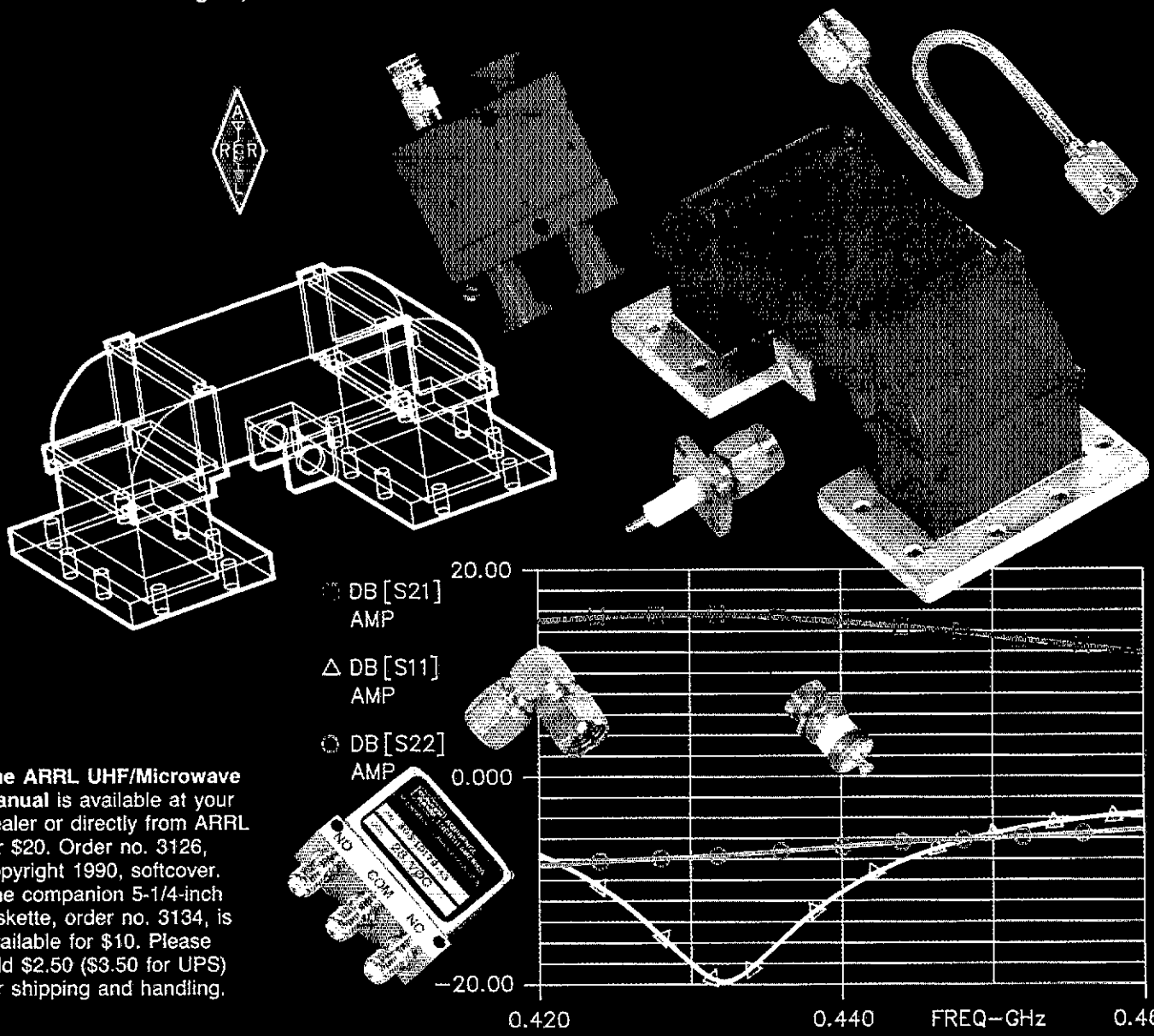

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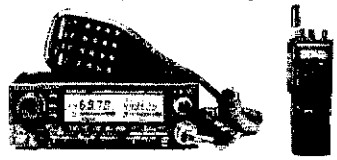

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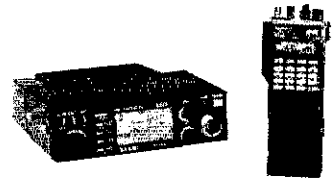

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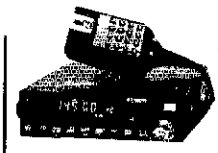

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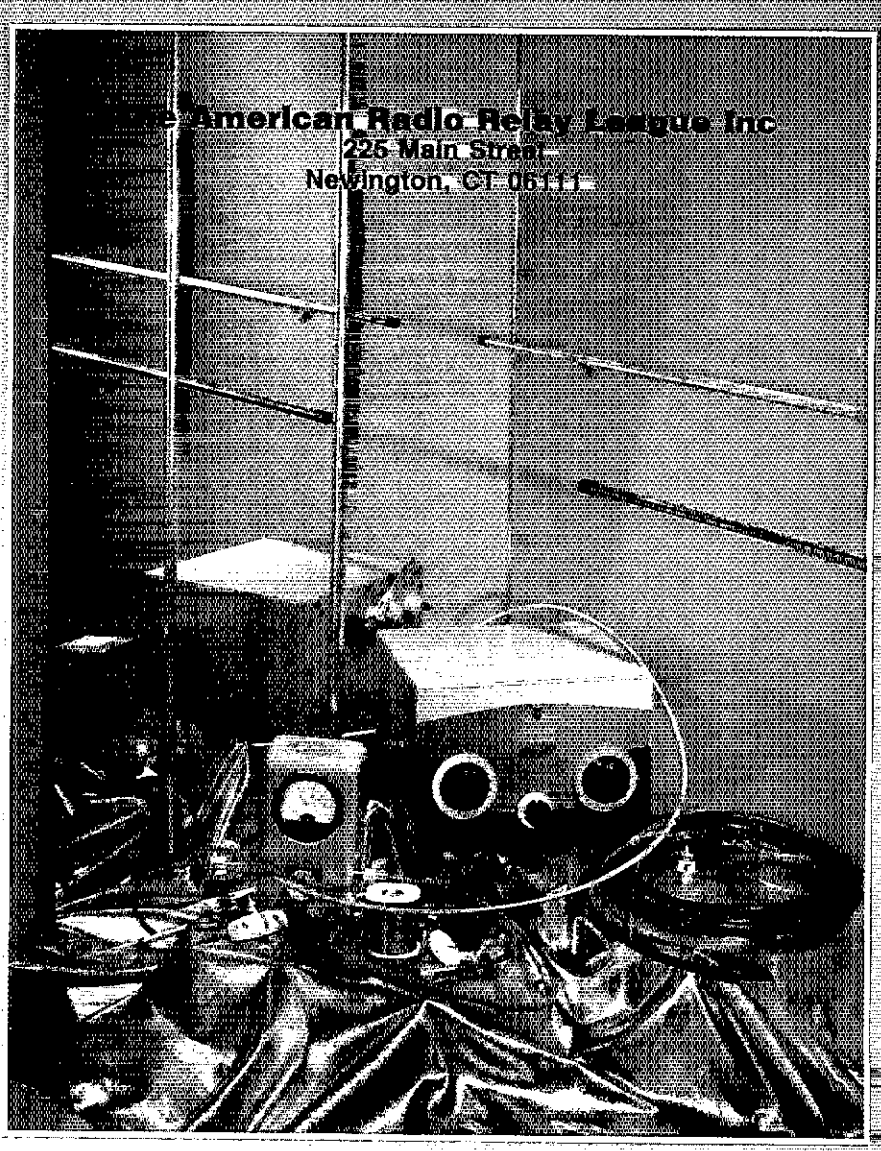

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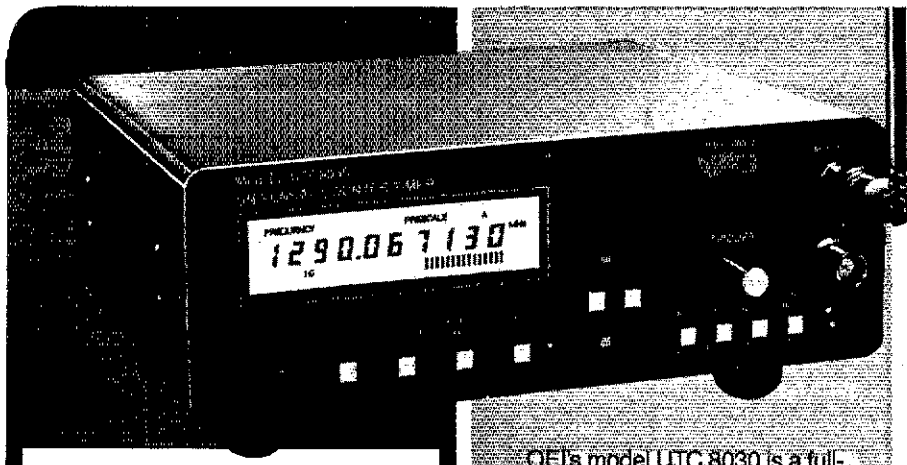

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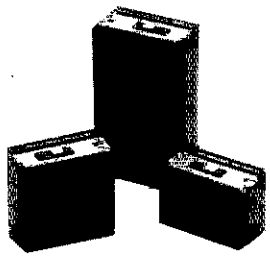

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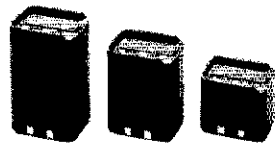

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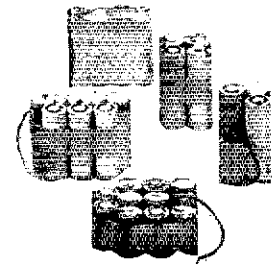

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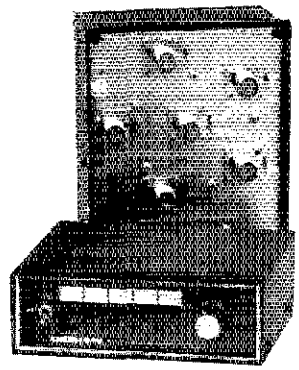

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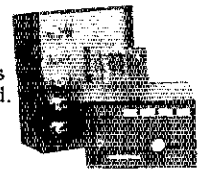

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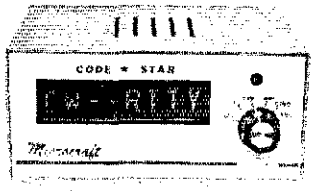

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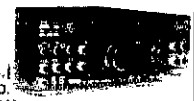

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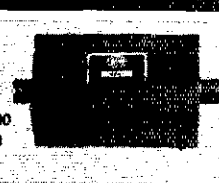

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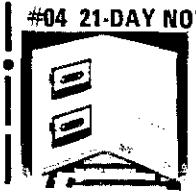

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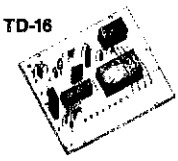
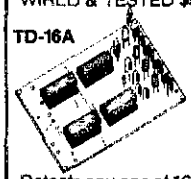


TD-16A



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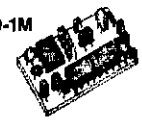

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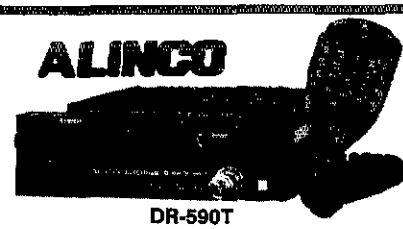

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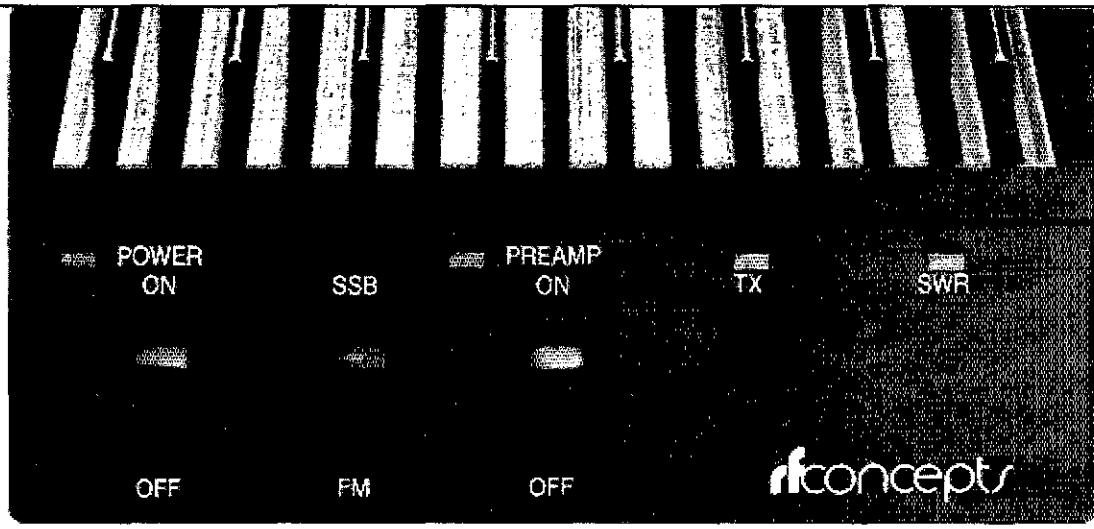

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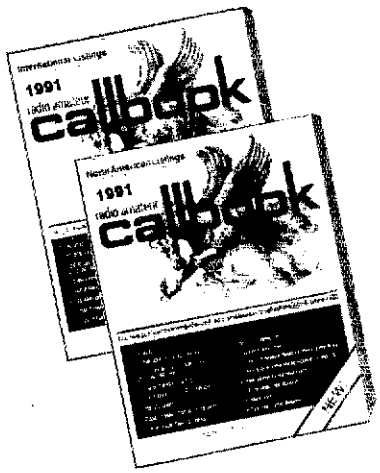

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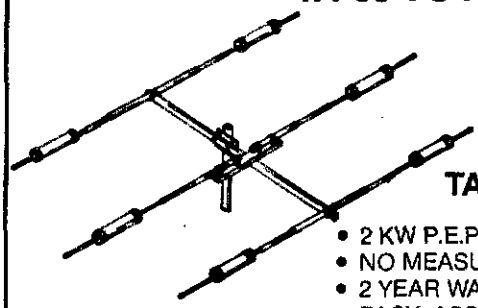

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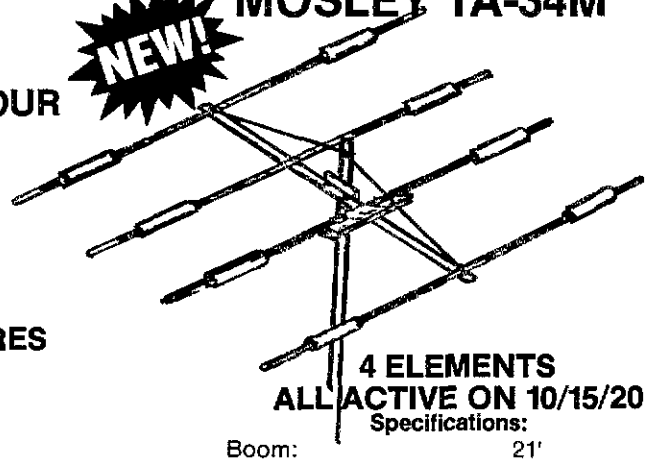

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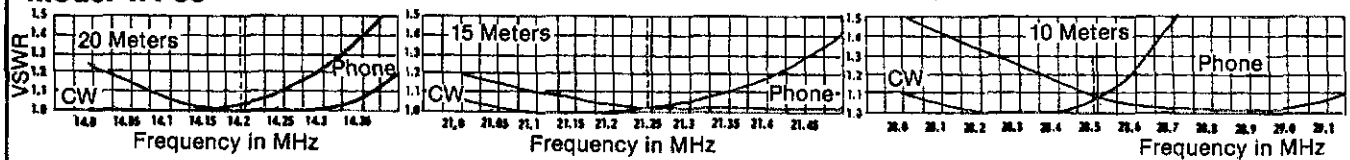

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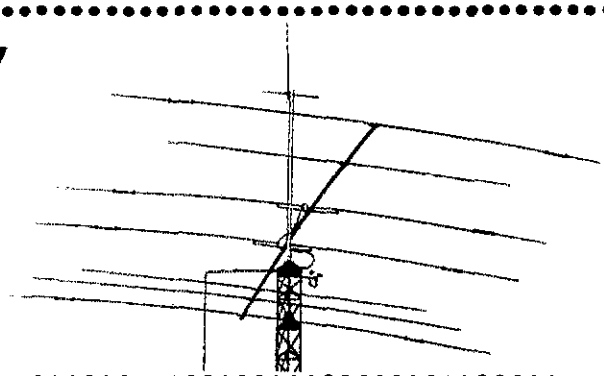

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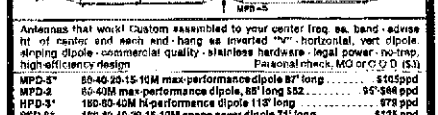

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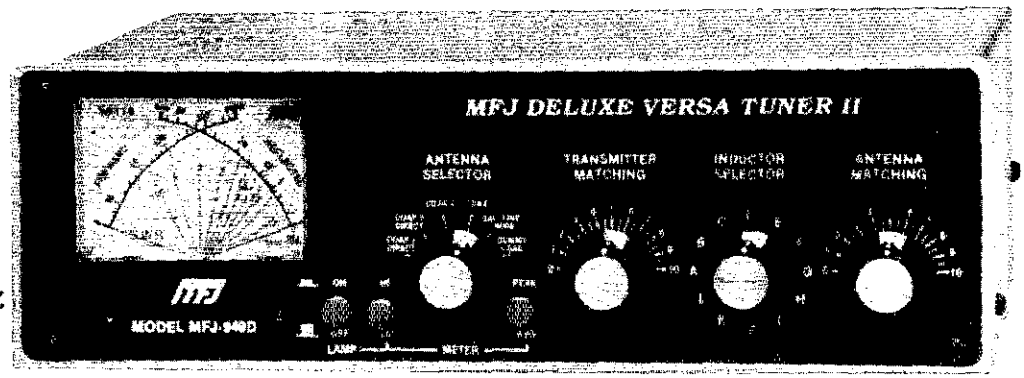

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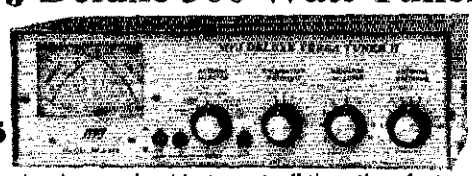

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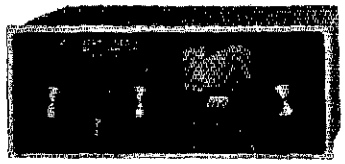

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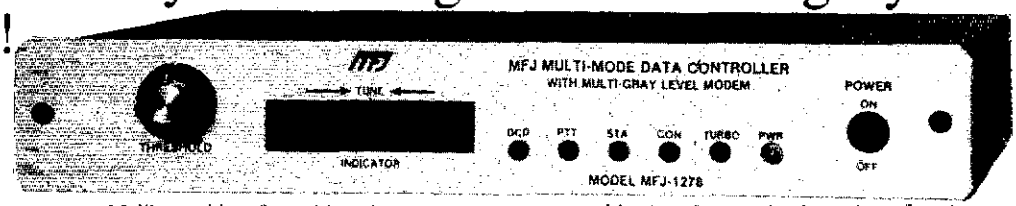

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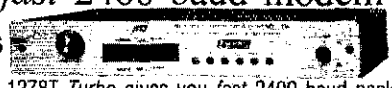

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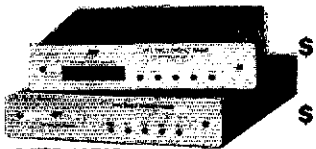

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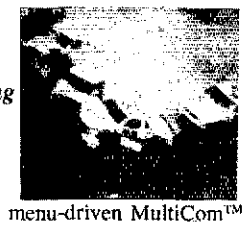

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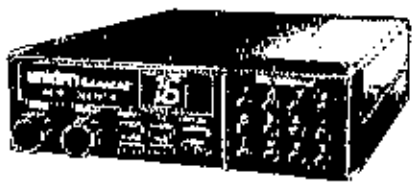

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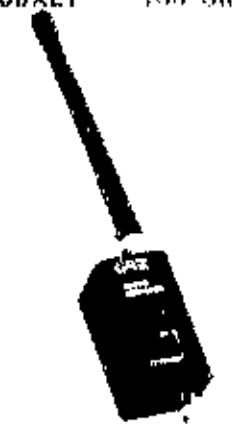

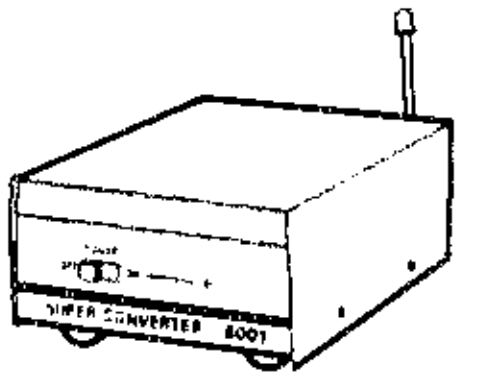

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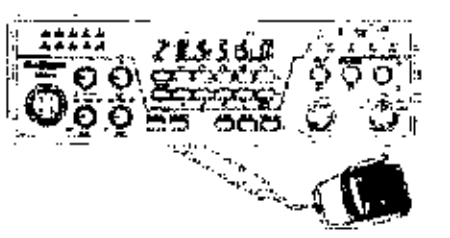

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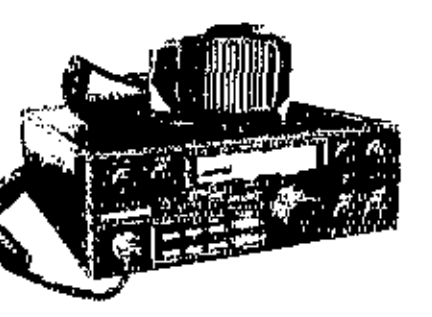

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The MFJ-989C is a compact 3 KW PEP roller inductor tuner with a new **peak** reading Cross-needle SWR/Wattmeter. The roller inductor lets you get your SWR down to absolute minimum.

With three continuously variable components - two massive 6 KV capacitors and a high inductance roller inductor - you get precise control over SWR and the widest matching range possible. It covers 1.8 to 30 MHz.



MFJ-989C **$349.95**

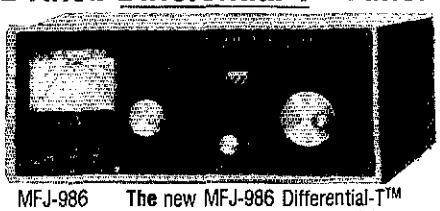
You get a **new** lighted **peak** and average reading Cross-needle SWR/Wattmeter with a **new** more accurate directional coupler.

You get a giant two core balun wound with teflon wire for balanced lines and a 6-position antenna switch with extra-heavy switch contacts.

The compact 10¾ x 4½ x 15 inch cabinet fits right into your station.

You get a 50 ohm 300 watt dumy load for tuning your exciter, a tilt stand for easy operation and a 3 digits turns counter plus a spinner knob for precise inductance control. Add $10 s/h.

2-Knob Differential-T™ Tuner



MFJ-986 **$289.95**

The new MFJ-986 Differential-T™ 2-knob tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only **one** best setting. Covers 1.8-30 MHz.

The roller-inductor lets you get your SWR down to absolute minimum. 3-digit turns counter lets you quickly return to your favorite frequency.

You get MFJ's new **peak** and average reading Cross-needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

A **new** current balun for balanced lines reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced for a more concentrated, stronger signal. Add $10 s/h.

MFJ'S Fastest Selling Tuner



MFJ-941D **$109.95**

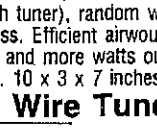
The MFJ-941D is MFJ's fastest selling 300 watt PEP antenna tuner. Why? Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.

It matches dipoles, vees, verticals, mobile whips, random wires, balanced lines and coax antennas.

SWR/Wattmeter reads forward/refelcted power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. 4:1 balun. 1000 volt capacitors. 10 x 3 x 7 inches.

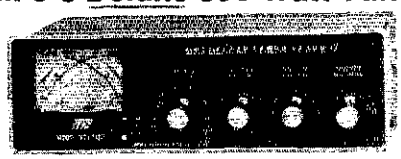
MFJ's Random Wire Tuner

MFJ-16010 **$39.95**



You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Install a wire anywhere! Covers 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 in.

MFJ's Deluxe 300 Watt Tuner



MFJ-949D **$149.95**

The MFJ-949D gives you lower SWR and more power out than **any** tuner that uses two tapped coils. **Why?** Because you get two **continuously** variable capacitors that give you infinitely more positions than the limited number on two switched coils.

This gives you the **precise** control you ned to get your SWR down to a minimum. After all, isn't that why you need a tuner. It covers **1.8-30 MHz.**

You get MFJ's **new** lighted 2-color **peak** and average reading Cross-needle SWR/Wattmeter, **dummy load,** antenna switch and 4:1 balun - all in a compact 10 x 3 x 7 inch cabinet that is appropriately **smaller** than your radio. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

With MFJ's **deluxe** 300 watt PEP tuner you get an MFJ tuner that has earned its reputation for being able to match just about anything - one that is highly perfected and has years of **proven** reliability.

MFJ's Mobile Tuner

MFJ-945C **$89.95**



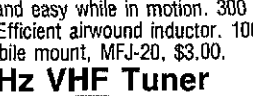
Don't leave home without this **mobile** tuner! Have an uninterrupted trip as the MFJ-945C extends your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

You can operate anywhere in a band and get low SWR. You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

Small 8 x 2 x 6 inches uses little room. SWR/Wattmeter and convenient placement of controls makes tuning fast and easy while in motion. 300 watts PEP output. Efficient airwound inductor. 1000 volt capacitors. Mobile mount, MFJ-20, $3.00.

144/220 MHz VHF Tuner

MFJ-921 **$69.95**



MFJ's new VHF tuner covers both 2 Meters and the 220 MHz bands **plus** you get a built-in **VHF SWR/Wattmeter.** Measures 8 x 2½ x 3 in. 2-knob tuning convenient for mobile or base.

MFJ

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MFJ's Artificial RF Ground

MFJ-931 **$79.95**



You can create an artificial RF ground and eliminate RF "bites", feedback, TVI and RFI when you let the MFJ-931 resonate a random length of wire and turn it into a tuned counterpoise.

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MFJ's Barefoot/1.5 KW Tuner



MFJ-962C **$229.95**

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You get two husky continuously variable capacitors for maximum power and minimum SWR. And lots of inductance gives you a wide matching range.

You get MFJ's **new peak** and average reading Cross-needle SWR/Wattmeter with a **new** directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Plus . . . 6-position antenna switch and teflon wound balun with ceramic feedthru insulators for balanced lines. 10¾ x 4½ x 14-7/87 in. $10 s/h.

MFJ's smallest Versa Tuner

MFJ-901B **$59.95**



The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner -- when both your space **and** your budget is limited. Good for matching solid state rigs to linears.

It matches whips, dipoles, vees, random wires, verticals, beams, balanced and coax lines from 1.8-30 MHz. Efficient airwound inductor. 4:1 balun.

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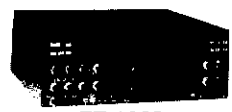

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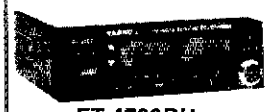

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PRODUCT REVIEWS — Planning on buying a used rig? Here's a booklet that shows where to find reviews of all the popular gear appearing in *QST*, CQ, Ham Radio and 73 magazines between 1945 and 1988. Reviews from RSGB's RadCom between 1979 and 1988 also appear. This bibliographic listing is in alphabetical order by manufacturer (from A&A Engineering to Zycomm) then by model. Shows publication, issue and page number. "Product Reviews" is copyrighted by Didah Publishing and is available for $12 plus $2.50 ($3.50 UPS). Order no. 3347 from ARRL, 225 Main Street, Newington, CT 06111.

HOMEBREW Components Catalog SASE. KA7QJY, Box 7970, Jackson, WY 83001.

K1EA CT logging program CW interface, links computer (via serial port) to any transmitter, electrically isolates, adjustable weighting, just plug into rig/computer, $59.95; CYRIL IBM-compatible program that sends Russian and/or Roman characters in Morse via the serial port and displays text on screen, $29.95; CYRIL and keying interface, $79.95. (Add $3 shipping.) Jim Talens, N3JT, Box 19345, Washington, DC 20036.

WANTED: Collins KWS-1 Transmitter, Hammarlund HQ-180 Receiver. Carter Elliott, WD4AYS, 1460 Pinedale Road, Charlottesville, VA 22901, 804-979-7363.

WANTED: Yaesu FT-101B in good condition. Tom, 7914 Ray Bon Drive, #115, San Antonio, TX 78218, 512-590-6920.

WANTED: NJ's Ballooning in Bloomsbury blank QSL cards. Will pay original cost and shipping. Write WB2REM, 23 Pennroad Avenue, Trenton, NJ 08638.

STAMP COLLECTORS! SASE brings ham stamp price list. WB4FDT, 411 Sparta, Ruston, LA 71270.

ANTENNA TUNER, Dentron MT-3000A, 3KW 1.8-30 MHz, $180. W2GJJ, 717-253-6320.

ICOM, KENWOOD, YAESU, DRAKE, COLLINS & HEATH OWNERS: 8 Pole & 10 Pole Crystal Filters. Ask yourself these questions! Are you continually being interfered with during QSO? You can't seem to pull out a weak signal in the QRM? Yes, to either, purchase our SSB or CW Filters! Monthly ICOM, Kenwood & Yaesu separate newsletters. 10 to 13 yrs. of back issues. High tech Service Dept. Authorized Kenwood Service Center. Send 45 cent SASE for free 20 page catalog to: International Radio & Computers Inc./Fox Tango, 751 S. Macedo Blvd., Port St. Lucie, FL 34983, 1-407-879-8868. (This issue see our display ad.) Order now for Christmas.

1380 DX CERTIFICATES from 113 countries described in K1BV's comprehensive directory. $16.10. Ted Melinosky, 525 Foster Street, South Windsor, CT 06074-2936.

DON C. WALLACE, W6AM. This book describes the history of amateur radio, as experienced by Don Wallace. By Jan D. Perkins, N6AW. Hardbound, 350 pages. Prepublication price $19.95. Available from Wallace & Wallace, 11823 Slauson Avenue, Suite 38, Santa Fe Springs, CA 90670.

WANTED: Yaesu FL-101 Transmitter, with Processor Control on front panel. Serial #308001 and up. Ten-Tec KR-50 Keyer. Joe Locastro, 183-1/2 Lake Avenue, Auburn, NY 13021, 315-252-6107.

WANTED: KT-34A, TH7DXS or TH5DXS Beams; HDX572 or larger, HG70HD or larger crank-up towers. Price in first letter. Will pick up anywhere near I-40 Lexington to Albuquerque. K4RN, 9500 Tasco NE, Albuquerque, NM 87111, 505-821-5615.

WANTED: Arizona Ham Operating QTH. January 1st through April 30th, 1991. Need 3 bedroom home (minimum) with all amenities. Prefer North Scottsdale or vicinity with minimum antenna restrictions. Local references, highest professional care and financial integrity. Jim Moran, KA1KZ, 53 Austin Street, Leominster, MA 01453.

1991 CALLBOOKS. "Flying Horse". Published, printed in Illinois. North American $23.95. International $23.95. S&H $4 per order. 11-30-90 delivery. Discount on ARRL, other books. Extra charge COD, Visa. Burk Electronics, 35 North Kensington, La Grange, IL 60525, 708-482-9310.

WANTED: Collins R/E S-Line Station or just the Transmitter. Also want Hallicrafters SX-28A, SX-42, SX-88, SX-100. All above wanted for my own station. Lee Bahr, W0VT, 914 Golden Bear Lane, Kingwood, TX 77339.

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WANTED: Millen Grid Dip Meter and Antenna Bridge. Must be in very good condition with all coils. W2AWS, 914-331-9019.

WANTED: manual or circuit for Navy Transceiver Model CAY43007. J. Cadrecha, 292 S. Prospect, Burlington, VT 05401.

FREE. COME GET IT. Disassembled tower: three ten foot sections, one five foot section containing integral rotator, tiltover base plate. W4KSL, 407 North 33rd Avenue, Myrtle Beach, SC 29577.

WANTED: Osborne-1 Computer in working condition, or with working display section. Bela Banyasz, 3705 Emily Street, Kensington, MD 20895.

FOR SALE: Alpha 374 ETO automatic all band amplifier with 10 meters and Yaesu FT-101E and seperate digital frequency read-out, includes cables, service and instruction manuals. Also Collins KWM360 with all modifications $2200 and Collins 30 L-1 amplifier $800. Sell either pair as complete station. Sandy, WB5RNC, Box 5566, Corpus Christi, TX 78465, call days 512-883-8511, evenings 512-991-6722.



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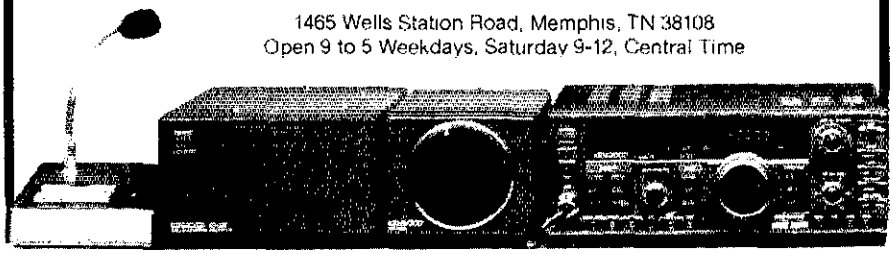

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COLLINS: 5181, (late w/e), rack-mount, $750. 75A4, 800 Hz, 3.1 KHz, $350. KWM2 (new), 516F2, (r/e), $1500. W1FBG, 603-964-8658.

KENWOOD TS-830S $695. TS-120S $395. R1000 Receiver $375. TR-7950 $295. Heath SB220 $595. All in nice condition with manuals. John Korona, WA2V, 1117 Dewitt Terrace, Linden, NJ 07036, 201-486-0039.

COLLINS 75A4 and KWS1 w/manuals, $790. Al, K9ECG, 414-822-5416.

WANTED — a Knight Kit R-100A, DX-100, DX-200, DX-302, FRG-7, FRG-7700, R-600, R-1000 or similar. Also recent mfr SSTV station minus xcvr. All good-vg. Need schematic for Trans-Oceanic M-8600. Send reasonable price to-Tony Stalnaker, WA4LPJ, 2358 Old Alabama Road, Thomaston, GA 30286.

WANTED: Maintenance and Operating manuals for General Electric Transceiver MT-33N VHF. Write Gordon Rolston, KB5GVO, P.O. Box 2147, Deming, NM 88031.

WANTED: Vacuum Variable Capacitor 25/2000 pf, 5KV new or used. KG5B, 4966 Paseo Del Rey Drive, Brownsville, TX 78521, 512-541-5651.

REPEATER: from estate, never on the air. Hamtronics REP100 and Micro Control Specialties PA100 Linear in small rack. $1800 or best reasonable offer. Picture available. Mark Evans, 203 Cactus Street, Tallahassee, FL 32304, 904-575-7122.

WANTED: Collins 310B. Must be in very good condition with all final amp coils. W2AWS, 914-331-9019.

COLLINS 30L-1 Ampifier, Round Emblem, excellent original condition with box, manual and cables, $850. KB4SS, 404-623-0163.

KENWOOD TS-930 S/AT with MC-60 Mike $1,000. TL-922 A Linear. Less than 30 minutes air time. New condition. Extra 3-500-Z $1,200. Have shipping cartons and manuals. W3LPN, 215-543-3220.

COLLINS S-LINE: 32S-3, 75S-3, 312B-4, 516F-2, manuals, extra tubes, $875. Mike Decerbo, N1FYO, 203-261-4221.

AUTEK WM-1 SWR-Powermeter, $75. K6XZ, 707-539-1693.

WANTED: manual and/or schematic for Amcomm S2-25 2 meter FM Transceiver. Call W5JWL after 5PM, 501-353-4435.

WANTED: copy of "Transistor Radio Servicing Made Easy" by Wayne Lemons. R.S. Baker, K6UFZ, 9368 Balcom Avenue, Northridge, CA 91325.

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 WB2JKJ and The "22 Crew" on The Classroom Net, daily, 1100-1230 UTC, 7.238 MHz. Then from 1230-1900 on 21.395. Celebrate The "22 Crew" Tenth Anniversary by working our special event station, October 17-19 on our regular frequencies and times, get an incredible QSL. Write us at: P.O. Box 1052, New York, NY 10002. Round the clock hotlines: voice 516-674-4072, FAX 516-674-4072.

KWM2A, round, mint, 516F2, $795. W9ZR, 1-614-389-4960.

WANTED: Drake "C" Line in excellent to mint. Also need Filters, Noise Blanker, W4. WB8QYT, 216-644-1315.

YAESU 767GX, mint, $1195. W2GCW, 518-828-9860.

TUBE WANTED: 8005. Mr. Kao, HQ USEUCOM Box 1163, APO, NY 09128.

FOR SALE: Transceivers, 2M Yaesu FT720RVH-$125, 450 MHz Yaesu FT720RL-$150, 450 MHz ICOM IC45A-$225. P. Marquis, K6HSV, 543 Bayview Avenue, Millbrae, CA 94030.

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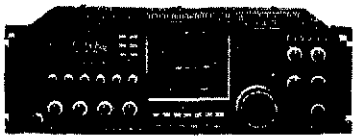

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IC-725 New Ultra-Compact Xcvr	949.00	Call $
IC-726 HF/50 MHz All Mode	1299.00	Call $
Receivers		
IC-R9000 100 kHz to 1999.8 MHz	5459.00	Call $
IC-R7000 25-1300 + MHz Rcvr	1199.00	Call $
IC-R71A 100 kHz - 30 MHz Rcvr	999.00	Call $
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IC-901 New Remote Mount Mobile	1199.00	Call $
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FT-757 GX II Gen. Cvg. Xcvr	1280.00	Call $
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FL-7000 15m-160m Solid State Amp	2279.00	Call $
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UHF		
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FT-4700RH, 2m/440 Mobile	996.00	Call $
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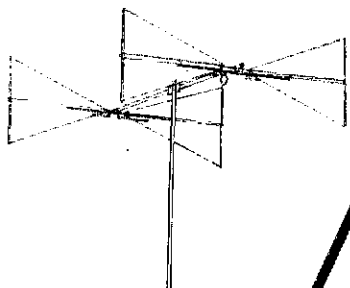

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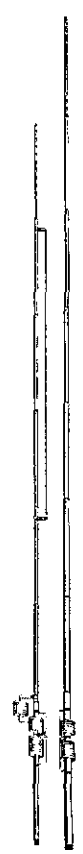

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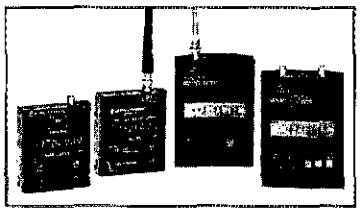

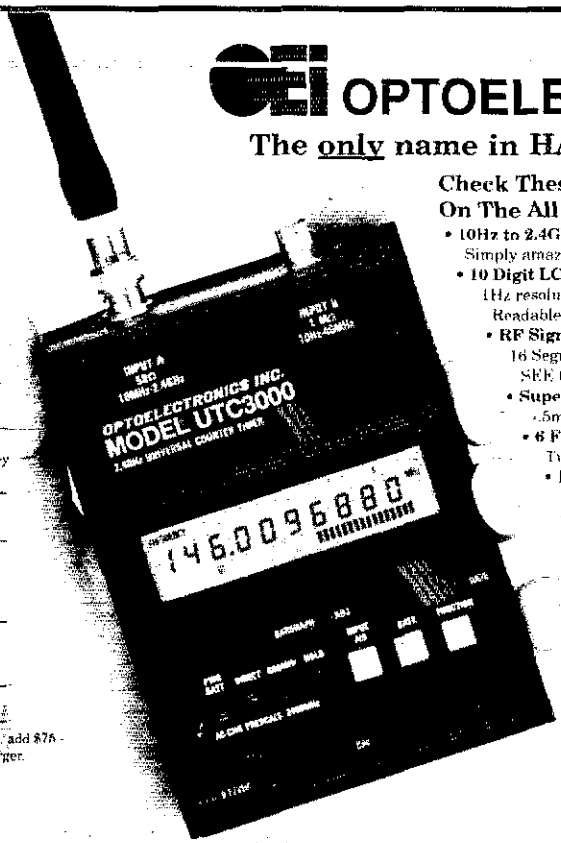

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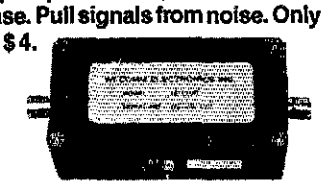

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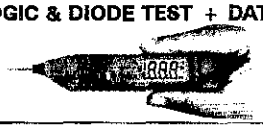

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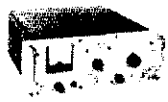

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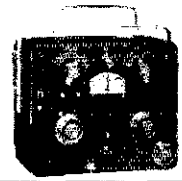

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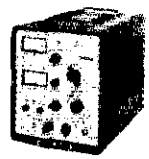
Military TS621/U Signal Generator 3.87.0 GHz
Military TS622/U Signal Generator 7.0-11.0 GHz



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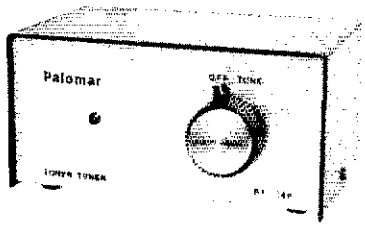

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12 VDC POWER SUPPLIES

MODEL	AMPS	ICS	PRICE
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RS20M	16	20	119
RS35A	27	35	159
RS35M	27	35	179

Models With "M" Suffix Have Meters.

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D40 - 40M Rotatable Dipole.
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230WB - 30 Element, 2M Beam.
4218XL - 18 Element, 2M Beam.
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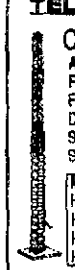

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Accessories For Hygain Towers Are Also Available For Immediate Delivery. CALL FOR PRICE!

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7-2 Discoverer - 2 El., 40M Beam.
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V2S - V3S - V4S - VHF/UHF Vert.
TH5MK2S - 5 El., Triband Beam.
TH7DXS - 7 El., Triband Beam.
205BAS - 5 El., 20M Beam.
155BAS - 5 El., 15M Beam.
105BAS - 5 El., 10M Beam.
204BAS - 4 El., 20M Beam.
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ROHN
GUYED TOWER PACKAGES

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50	849	1229	1549
60	939	1389	1939
70	999	1719	2159
80	1199	1869	2369
90	1289	2039	2579
100	1369	2199	2969
110	1449	2459	3209
120	1669	2619	3429

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Model	Height	Load Cap.
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FK2558	58 Ft.	13.3 S.F.
FK2568	68 Ft.	11.7 S.F.
FK4544	44 Ft.	34.6 S.F.
FK4554	54 Ft.	29.1 S.F.
FK4564	64 Ft.	26.4 S.F.

GGK25GII - Double Guy Kit $ 299.
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The Above Specifications Are At 70 MPH, With The Above Double Guy Kit Properly Installed. ROHN Foldover Towers Are Drop Shipped Freight Paid; Cost 10% Higher West Of The Rockies.

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55G - Extra Heavy 18 Inch 197.50
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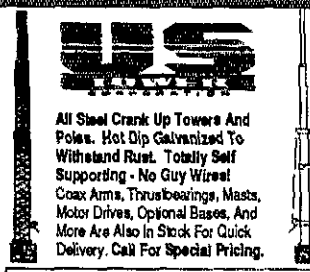

Model	Min Ht.	Max Ht.	Load	Price
MA40	21 Ft.	40 Ft.	10 Sq.'	629
MA50	22 Ft.	50 Ft.	10 Sq.'	999
TX438	22 Ft.	38 Ft.	18 Sq.'	919
TX455	22 Ft.	55 Ft.	18 Sq.'	1385
TX472	22 Ft.	72 Ft.	18 Sq.'	2279
HDX555	22 Ft.	55 Ft.	30 Sq.'	2079
HDX572	22 Ft.	72 Ft.	30 Sq.'	3559

Shipping On US Tower Models is Collect From Visalia-California. Calif. Residents Please Add 6% State Tax.

ROHN SELF SUPPORTING BX TOWERS

Model	Height	Load	Weight	Price
HBX40	40 Ft.	10 Sq.'	228	$ 449
HBX48	48Ft.	10 Sq.'	303	589
HBX56	56 Ft.	10 Sq.'	385	699
HDBX40	40 Ft.	18 Sq.'	281	569
HDBX48	48 Ft.	18 Sq.'	363	689

All ROHN BX Series Towers Are Shipped Freight Prepaid In The Continental United States. These Towers Come With The Base Stubbs At No Additional Charge As Well As The Rotor And Top Plates. The Above Antenna Load Ratings Are At 70 MPH. Please Note That ROHN Does Not Reccomend Using This Tower With Antennas That Have A Boom Length Exceeding 10 Foot.

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3/16 EHS Guywire (3990 Lb. Rating)	.15 / Ft
1/4 EHS Guywire (6650 Lb. Rating)	.18 / Ft
5/16 EHS Guywire (11,200 Lb. Rating)	.29 / Ft
5/32 (7X7) Aircraft Cable (2700 Lb. Rating)	.15 / Ft
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502 - Guy Insulator (Up To 1/4)	3.49
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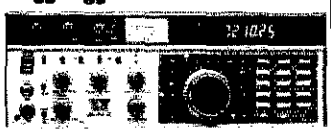

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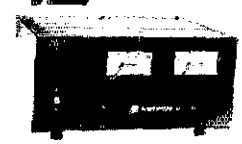

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- The FT-767GX features SSB, CW, AM and FM modes. Optional 2 meter, 6 meter and 70 cm plug-in modules (10 watts per band) provide that extra flexibility. Built-in accessories include AC power supply, antenna tuner with its own memories and iambic keyer.
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Optional external speaker (SP-767) and desk microphone (MD-1B8) shown.

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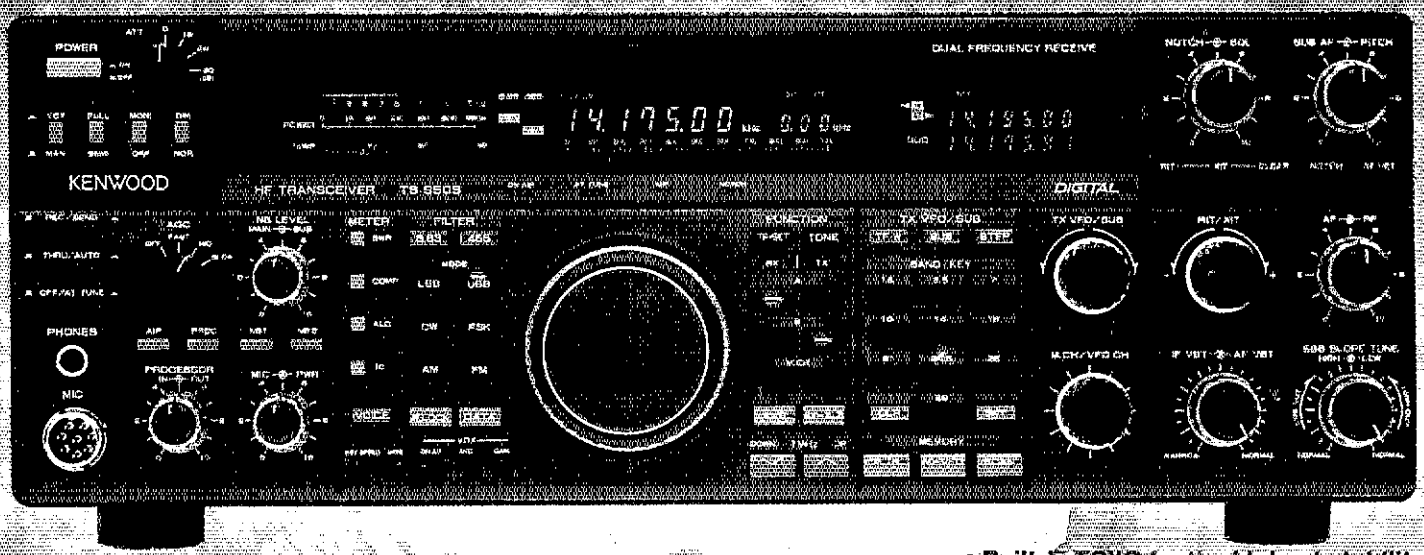


TS-950SD

"DX-clusive" HF Transceiver

The new TS-950SD is the first Amateur Radio transceiver to utilize Digital Signal Processing (DSP), a high voltage final amplifier, dual fluorescent tube digital display and digital meter with a peak-hold function.

• **Dual Frequency Receive Function.** The TS-950SD can receive two frequencies simultaneously.

• **New! Digital AF filter.** Synchronized with SSB IF slope tuning, the digital AF filter provides sharp characteristics for optimum filter response.

• **New high voltage final amplifier.** 50 V power transistors in the 150-watt final section, resulting in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.

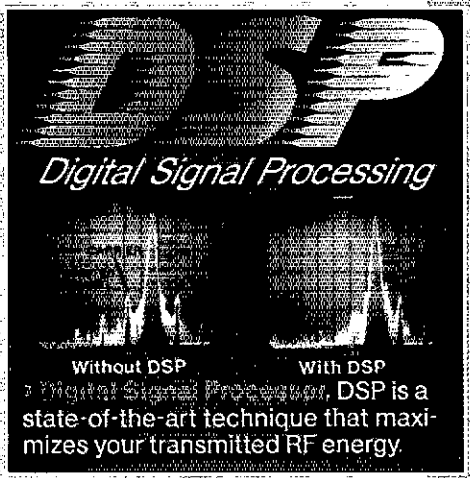
• **New! Built-in microprocessor controlled automatic antenna tuner.**

• **Outstanding general coverage receiver performance and sensitivity.** Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides incredible performance from 100 kHz to 30 MHz. The Intermodulation dynamic range is 105 dB.

• **Famous Kenwood interference reduction circuits.** SSB Slope Tuning, CW VBT (Variable Bandwidth Tuning), CW AF tune, IF notch filter, dual-mode noise blanker with level control, 4-step RF attenuator (10, 20, or 30 dB), switchable AGC circuit, and all-mode squelch.

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

The Ultimate Signal.



Digital Signal Processor, DSP is a state-of-the-art technique that maximizes your transmitted RF energy.

• **High performance IF filters built-in†** Select various filter combinations from the front panel. For CW, 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!■

• ***Multi-Drive Band Pass Filter* (BPF) circuitry.** Fifteen band pass filters are available in the front end to enhance performance.

• **Built-in TCXO for the highest stability.†**

• **Built-in electronic keyer circuit.**

• **100 memory channels.** Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.

• **Digital bar meter.**

Additional Features: • Built-in interface for computer control • Programmable tone encoder • Built-in heavy duty AC power supply and speaker •Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

Optional Accessories

- DSP-10 Digital Signal Processor *
- SO-2 TCXO* • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF*
- YG-455C-1 500 Hz CW filter for 455 kHz IF*
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF*
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF*
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)

* Built-in for the TS-950SD
† Optional for the TS-950S

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