QST

January 1994 $3.00

devoted entirely to Amateur Radio

Collecting Radio Stamps

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Kenwood's TS-50S: Awesome HF Versatility

TS-50S
HF TRANSCEIVER

Features
- 500kHz-30MHz general coverage receiver
- DDS[Direct Digital Synthesizer] with fuzzy logic control
- Large LCD panel with digital bar meter
- Auto-mode capability
- Menu system
- AIP [Advanced Intercept Point]
- Switchable AGC Circuit [SLOW/FAST]
- All-mode squelch
- CW reverse mode
- Full break-in and semi break-in
- 20dB attenuator
- Multi-function microphone supplied
- RF output power control [100W, 50W, 10W]
- Optional 500Hz CW filter [YK-107C]
- Optional external antenna tuner[AT-50]
- Optional computer interface [IF-10D]

For the Amateur Radio enthusiast, going "beyond bounds" is what it's all about. That's why Kenwood created the TS-50S, the world's smallest and smartest HF transceiver. The choice is yours: you can mount it in a vehicle, take it on a DX-pedition, or even install it permanently as a base station transceiver. Yet despite its size, the TS-50S provides a maximum output of 100W and the sort of sophisticated features normally found only inside a shack. Take for example the 100 memory channels for independent storage of transmit/receive parameters, the microprocessor-controlled DDS with innovative "fuzzy" control, and Kenwood's own AIP for superior dynamic range. There's also a powerful menu system, IF shift and CW reverse mode for interference reduction, TF-SET, and a noise blanker--plus everything you need for split-frequency operations. So, if you want HF operation beyond bounds, check out the TS-50S at your favorite authorized Kenwood Amateur Radio Dealer today!

93ARD-0807

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. BOX 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario L5T 1S8

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pacesetter in Amateur Radio

NEW

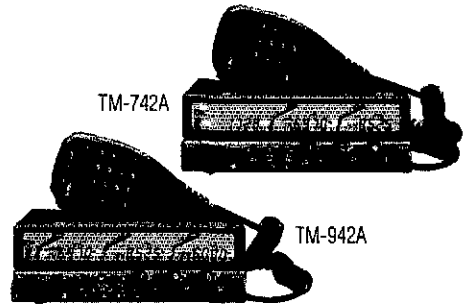
3-Way Split

Mobile transceivers with stylish sophistication

Kenwood's new TM-742A (144MHz/440MHz) and TM-942A (144MHz/440MHz/1200MHz) FM multibanders offer prime performance plus unparalleled freedom of choice for installation (optional kit).

- **High power**
  Maximum RF output is 50 watts (144MHz), 35 watts (440MHz), and 10 watts (1200MHz).
- **Wideband receiver coverage**
  The TM-742A receives from 118 to 174MHz and 410 to 470MHz; transmit ranges are 144–148MHz and 438–450MHz. The TM-942A adds the 1240–1300MHz range.
- **New & improved detachable front panel**
  The display and control sections can be separated for 3-way convenience. (with DFK-3,4,7)
- **100 memory channels**
  The 100 multi-function memory channels (all available for split operation) can be grouped into 5 banks for added convenience.
- **Multiple scan modes**
  Choose from 8 scan modes per band, plus CO (carrier-operated) and TO (time-operated) scan stops.
- **Tri-band receive/display**
  The TM-942A can receive/display all three bands (144MHz/440MHz/1200MHz) simultaneously. For the TM-742A there are four optional band units: 28MHz (50 watts), 50MHz (50 watts), 220MHz (25 watts), and 1200MHz (10 watts).
- **Cross-band repeater, dual-in repeater, fixed-band repeater**
- **Single-bander simplicity**
  Independent SQL and VOL controls for each band enable rapid response.
- **S meter squelch and auto squelch**
  Weak signals can be shut out. Noise squelch is also available.
- **Supplied multi-function microphone**
  Enables direct frequency entry.
- **Clock and timer**
  Includes stopwatch, alarm and on/off timer functions.
- **Wireless remote control function**
  A DTMF transceiver can be used to control various settings on the TM-742A/942A.
- **Built-in DTSS and pager function**
  The TM-742A/942A offers DTSS (Dual-Tone Squelch System) for selective calling and paging using standard DTMF tones. Elapsed time is shown by the tone alert system.
- **Supplied accessories**
  Mounting bracket, DC cable, fuses, mic, mic hook.
- **Choice of accessories**
  A full line of mics, speakers, and other accessories is available. See your authorized Kenwood Amateur Radio dealer for details!

Specifications guaranteed for Amateur band use only.



TM-742A/942A

Mobile Transceivers

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745

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Save Instantly When You Purchase Any One Of These Popular ICOM Radios Through December 31, 1993!

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IC-2iA..... $20 Off!	IC-3230H.....$60 Off!
IC-2SAT..... $20 Off!	IC-2410H.....$70 Off!
IC-W2A..... $40 Off!	IC-707.....$40 Off!
IC-W21AT.....$65 Off!	IC-737.....$100 Off!

ASK YOUR DEALER FOR DETAILS!

CHRISTMAS BONUS!

When you buy any ICOM radio between now and December 31, 1993, you are also entitled to a special Christmas gift exclusively from ICOM and friends!

Our Christmas Coupon Book is stuffed full of valuable coupons from your favorite suppliers. Save on antennas, classes, books, magazines, accessories, software, seminars, memberships and more! See your dealer for details.

The Instant Cash Back from ICOM promotion we ran last spring was so popular that we decided to bring it back just in time for Christmas!

What better time to experience extra savings on your favorite ICOM products. Combined with our Christmas Coupon promotion, you can drive home with a sleigh full of values on your favorite ICOM products!

So stop by your local dealer today and cash in on *instant savings* exclusively from ICOM!

How To Enjoy Instant Savings, Exclusively From ICOM:

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2. Tell your dealer that you want to save instantly with ICOM.
3. Your dealer has the coupons and will deduct the specified amount from your purchase price. Right at the store! You save instantly!

That's it! No need to mail a coupon or wait for a check. Simply enjoy instant savings on your favorite ICOM radios!

For free product information, call our brochure hotline: (206) 450-6088

Pioneer Hi-Fidelity

ICOM

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Membership in the ARRL, including a subscription to *QST*, is available to individuals at the following rates: $30 per year in the US and possessions, $42 elsewhere, payable in US funds. Age 65 and over, with proof of age, $24 US, $36 elsewhere. Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Membership and *QST* cannot be separated. Fifty percent of dues is allocated to *QST*, the balance for membership. Subscription rate for libraries and institutions: $30 per year postpaid in the US and possessions, $42 elsewhere. Single copies $3 in the US.

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Second-class postage paid at Hartford, CT, and at additional mailing offices. Postmaster: Form 3579 requested. Send change of address to: American Radio Relay League, 225 Main St, Newington, CT 06111-1494.

QST is available to blind and physically handicapped individuals on flexible disks from the Library of Congress, National Library Service for the Blind and Physically Handicapped, Washington, DC 20542.

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OUR COVER

The article by Bill Welsh, W6DDB, on page 22 tells you how to start your own collection of Amateur Radio postage stamps. The cover photo and those accompanying Bill's article show a complete collection of Amateur Radio stamps and other postal items from around the world. The collection shown has been donated to the ARRL by Southwestern Division Director Fried Heyn, WA6WZO, and his wife Sandi, WA6WZN, for display at HQ. *(photo by Kirk Kleinschmidt, NTØZ)*

CONTENTS

January 1994
Volume LXXVIII Number 1

TECHNICAL

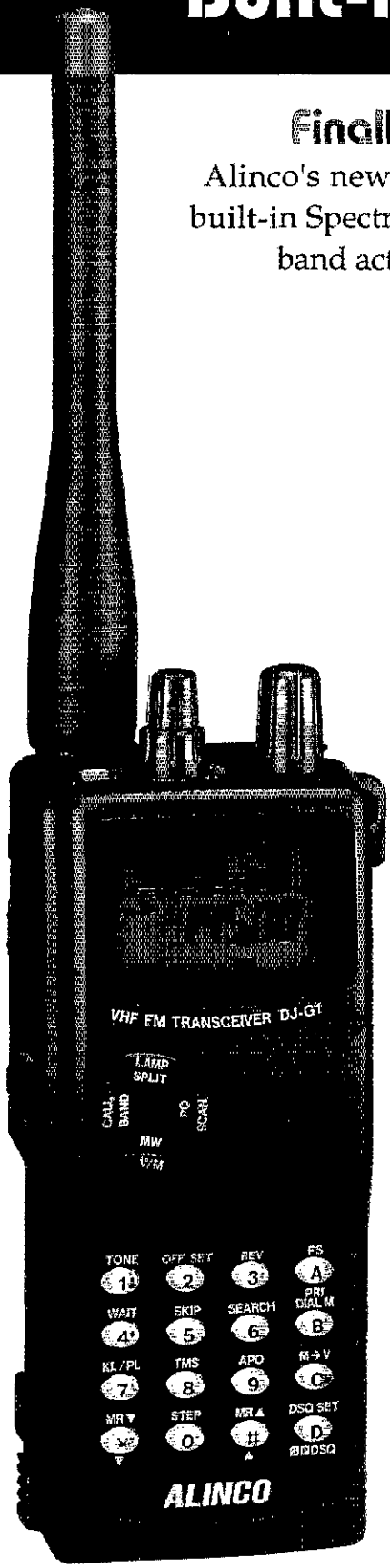
NEWS AND FEATURES

NEW HAM COMPANION

OPERATING

DEPARTMENTS

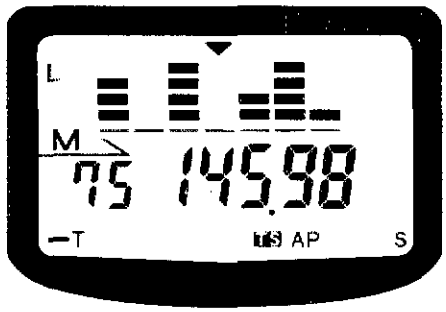
ALINCO Scores Another First
Built-In Spectrum Analyzer



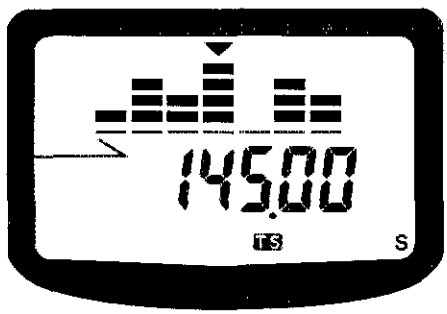
(FCC Approval Pending)

Finally. A New Feature That's Really Useful.

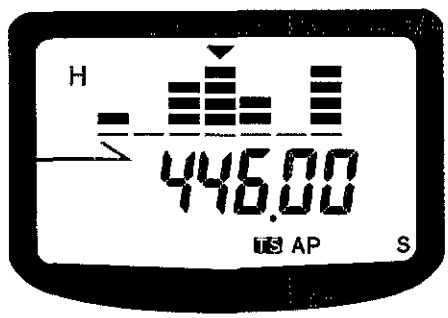
Alinco's newest 2-Meter HT, the DJ-G1T, offers the new "Channel Scope" built-in Spectrum Analyzer. This remarkable feature lets you visually monitor band activity, much like a commercial Digital Spectrum Analyzer.



Channel Scope (in memory mode)



Channel Scope (in VFO mode)



2m/70cm Dual Band Receive

The over-sized display shows seven bar graphs, each of which can be assigned to an independent memory channel. This lets you monitor activity on seven different memory channels simultaneously, and instantly, with just a glance at the display. If one or more memory channels becomes active, the corresponding bar graph lets you know, and also gives you information on apparent signal strength.

Alternately, the Display can be used to show band activity in the frequency domain, in either 5, 10, 12.5, 15, 20, 25, 30, or 50 KHz steps. **Hunting for band activity just got easier.**

Some of the DJ-G1T's outstanding features include:

- 440 Receive (440 - 449.995 MHZ)
- 80 Memory Channels
- Channel Scope
- AM Aircraft receive
- 5 Autodialer Memories
- Programmable Delay for Autodialer
- DSQ for Private Paging
- Exceptional Audio quality (True FM)
- Cross-Band Semi Duplex
- CTCSS Encode built in
- 6 Scan Modes
- Odd-Splits on all Memory Channels

Better Products, Better Service
See for yourself why people are coming to Alinco

ALINCO ELECTRONICS INC.

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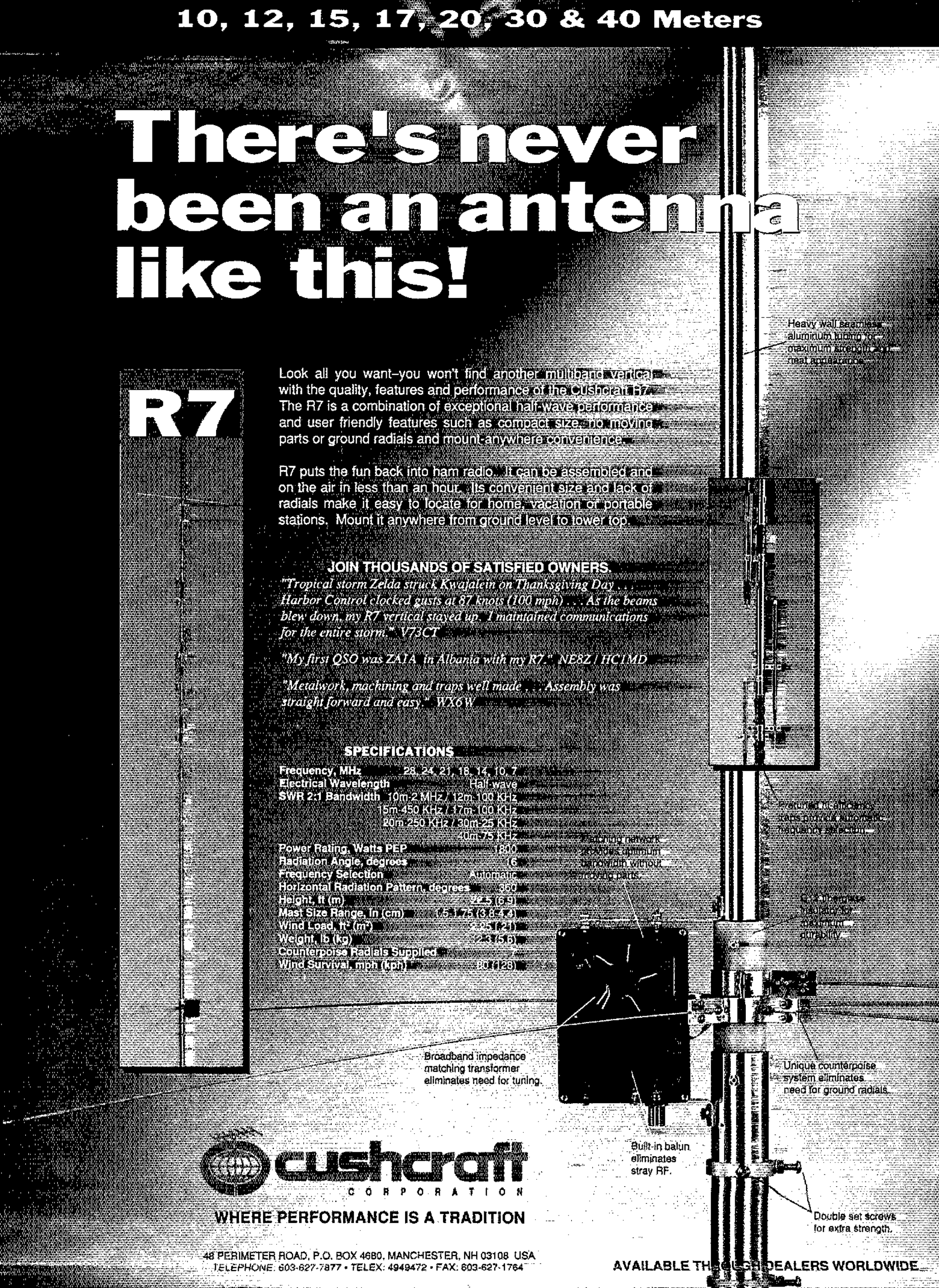

10, 12, 15, 17, 20, 30 & 40 Meters
There's never been an antenna like this!
R7
Look all you want–you won't find another multiband vertical with the quality, features and performance of the Cushcraft R7. The R7 is a combination of exceptional half-wave performance and user friendly features such as compact size, no moving parts or ground radials and mount-anywhere convenience.
R7 puts the fun back into ham radio. It can be assembled and on the air in less than an hour. Its convenient size and lack of radials make it easy to locate for home, vacation or portable stations. Mount it anywhere from ground level to tower top.
JOIN THOUSANDS OF SATISFIED OWNERS.
"Tropical storm Zelda struck Kwajalein on Thanksgiving Day . . . Harbor Control clocked gusts at 87 knots (100 mph) . . . As the beams blew down, my R7 vertical stayed up. I maintained communications for the entire storm." V73CT
"My first QSO was ZA1A in Albania with my R7." NE8Z / HC1MD
"Metalwork, machining and traps well made . . . Assembly was straight forward and easy." WX6W
SPECIFICATIONS
Frequency, MHz 28, 24, 21, 18, 14, 10, 7
Electrical Wavelength Half-wave
SWR 2:1 Bandwidth 10m-2 MHz / 12m-100 KHz
15m-450 KHz / 17m-100 KHz
20m-250 KHz / 30m-25 KHz
40m-75 KHz
Power Rating, Watts PEP 1800
Radiation Angle, degrees 16
Frequency Selection Automatic
Horizontal Radiation Pattern, degrees 360
Height, ft (m) 22.5 (6.9)
Mast Size Range, in (cm) 1.5-1.75 (3.8-4.4)
Wind Load, ft² (m²) 2.25 (.21)
Weight, lb (kg) 12.3 (5.6)
Counterpoise Radials Supplied 7
Wind Survival, mph (kph) 80 (128)
Heavy wall seamless aluminum tubing for maximum strength and neat appearance.
Matching network provides optimum bandwidth without moving parts.
G-10 fiberglass insulator for maximum durability.
Broadband impedance matching transformer eliminates need for tuning.
Unique counterpoise system eliminates need for ground radials.
Built-in balun eliminates stray RF.
Double set screws for extra strength.
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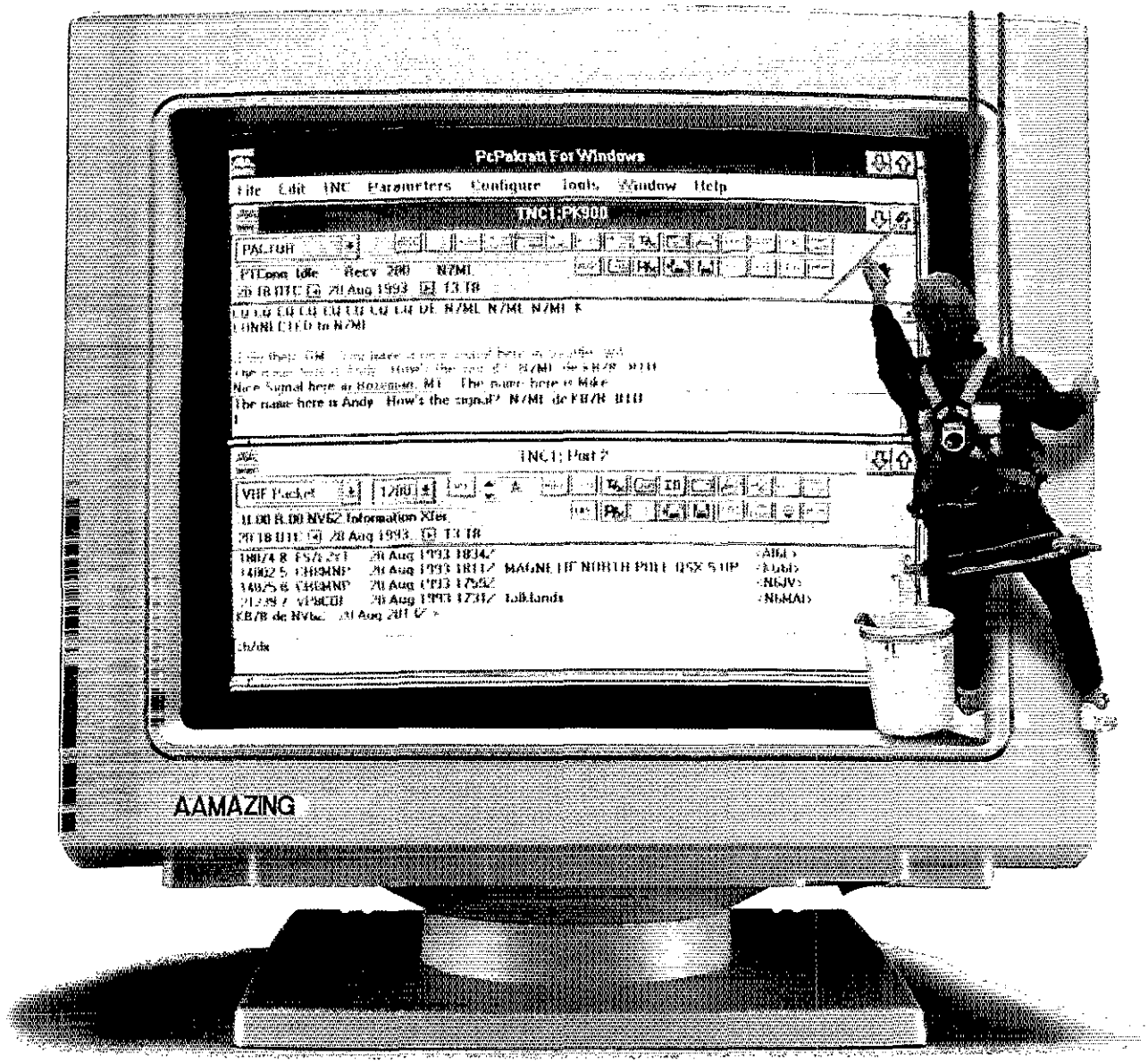


We Do Windows™

Tired of being controlled by your data controller software? Take control with PC-Pakratt for Windows. PC-Pakratt for Windows lets you do all the things you wanted to do in DOS but were afraid to try—or couldn't remember the command for.

With full Windows™ functionality (like background operation, cut & paste, etc.) and extensive on-line context-sensitive help, PC-Pakratt for Windows is the easiest way to use a data controller. You don't have to remember cryptic commands, either—just click a button and you're on your way.

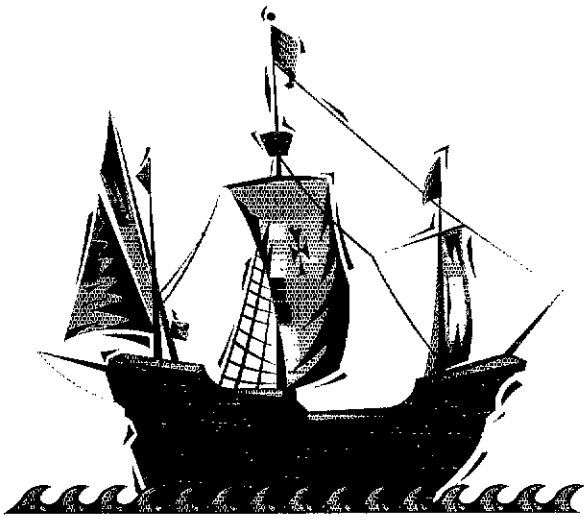
Not only is PC-Pakratt for Windows the easiest way to communicate, it's the friendliest. Change the colors, display font, or operating window layout—*you* are in control here!

PC-Pakratt for Windows cleans up with top-notch features, too. Control two data controllers *simultaneously* for dual-, tri-, or even quad-port operation. Pick your favorite mode—PACTOR, Packet, AMTOR/SITOR, Morse, RTTY (Baudot/ASCII), NAVTEX, or TDM. PC-Pakratt for Windows supports all current AEA Data Controllers.

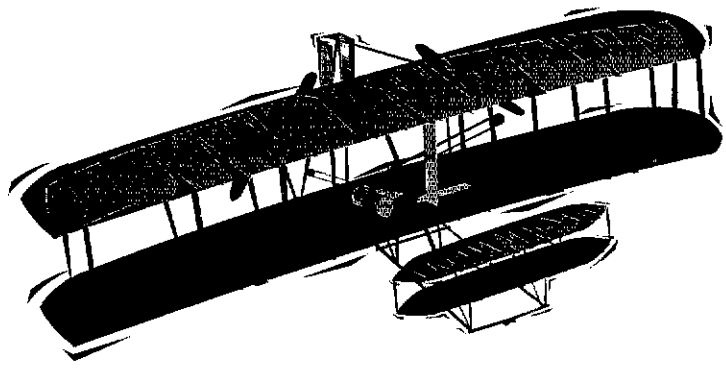
Call AEA's literature request line at (800) 432-8873 for more information, or call us direct at (206) 774-5554. Contact your favorite ham radio equipment dealer for a demonstration and best pricing.

AEA

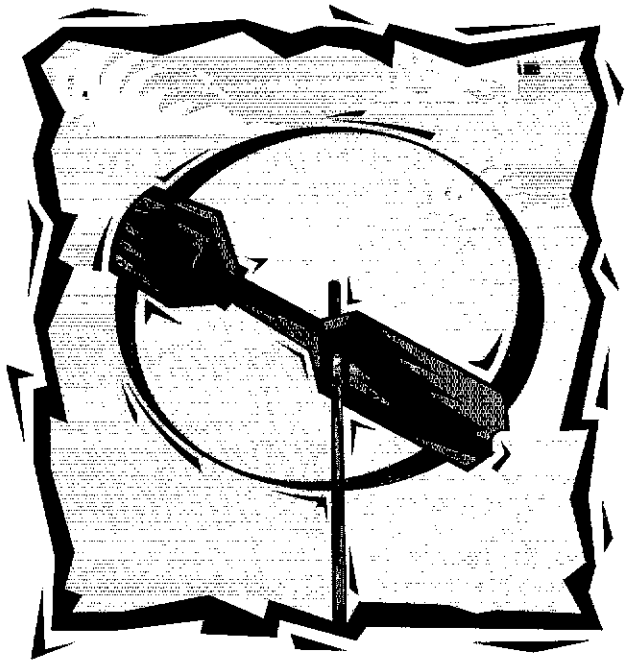
Contact with us



"THE WORLD IS FLAT"



"THAT THING WILL NEVER FLY"



"THAT ANTENNA IS TOO SMALL TO WORK"

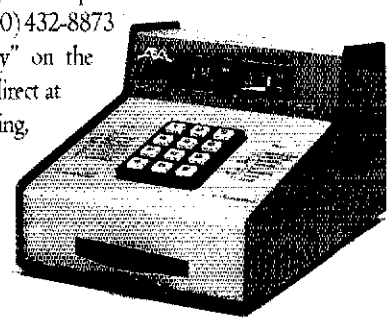
There's one in every crowd—one that pushes the limits and proves the skeptics wrong. The world sailed into a new era of discovery with Columbus. The Wright brothers propelled us into the age of air travel. AEA advances into the ranks of these distinguished pioneers with the IsoLoop 10-30 HF antenna—a 35" loop antenna with low-angle performance that is better than many full-size HF antennas.

One IsoLoop 10-30 HF pioneer offers this: "Big-gun DXers will tell you nothing *that* small can work. They will continue to tell you this after you work a couple hundred countries with it. Ignore them. In 24 months, I have worked 213 countries and confirmed 198."

The reason you get such a big performance in a small package is the efficiency of the IsoLoop 10-30 HF; it's 72% on 20m, rising to 96% on 10m. The main loop serves as an inductor, tuned with a 10,000 volt variable capacitor. Frequency range is 10 MHz to 30 MHz with continuous coverage. The unique compact design is also ideal if you're facing space limitations—mount it in your attic, on a balcony, or go mobile.

With the optional IT-1 Automatic Antenna Tuner (below), tuning your IsoLoop 10-30 HF becomes an adventure in speed— 2 or 3 seconds is typically all the time it takes before you're tuned and ready to go. (Antenna comes standard with a manual tuner.)

Discover the world of big antenna performance in a small antenna. Call our literature request line at (800) 432-8873 and request the "Inside Story" on the IsoLoop 10-30 HF or call us direct at (206) 774-5554. For best pricing, see your favorite amateur radio equipment dealer.



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*Executive Committee Member

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Western Massachusetts	Daniel Senie, N1JEB, 40 Elm St, Clinton, MA 01510 (508-365-5352)

Northwestern Division

Alaska	Merle Beller, AL7LD, 4341 Tikishla St, Anchorage 99504 (907-338-0838)
Eastern Washington	Kyle Pugh, KA7CSP, W 5006 Houston Ave, Spokane 99208 (509-327-5039)
Idaho	Don Clower, KA7T, 5103 W Cherry Ln, Meridian 83642 (208-888-7020)
Montana	Darrell Thomas, N7KOR, 743 33rd Ave NE, Great Falls 59404 (406-453-8574)
Oregon	Randy Stimson, KZ7T, 9890 SW Inglewood St, Portland 97225 (503-297-1175)
Western Washington	Harry Lewis, W7JWJ, 10352 Sand Point Way NE, Seattle 98125 (206-523-9117)

Pacific Division

East Bay	Bob Vallio, W6RGG, 18655 Sheffield Rd, Castro Valley, CA 94546 (510-537-6704)
Nevada	Joe Lambert, W8IXD, PO Box 61201, Boulder City 89006-1201(702-294-0505)
Pacific	Robert Schneider, AH6J, Box 131, Keaau, HI 96749 (808-966-8146)
Sacramento Valley	Jettie Hill, W6RFF, 306 St Charles Ct, Roseville, CA 95661 (916-783-0383)
San Francisco	John Wallack, W6TLK, PO Box 1115, Kenwood, CA 95452 (707-833-1873)
San Joaquin Valley	Mike Siegel, KI6PR, 1145 Julie Dr, Merced, CA 95348 (209-383-2166)
Santa Clara Valley	Steve Wilson, KA6S, 813 Berryessa St, Milpitas, CA 95035 (408-946-7410)

Roanoke Division

North Carolina	W. Reed Whitten, AB4W, 1208 Oxford Pl, Cary 27511(919-467-7464)
South Carolina	Charles E. Moeller, N4FVU, 116 Willow Winds Dr, Columbia 29210-4454 (803-772-1186)
Virginia	Edward Dingler, N4KSO, 211 Four Apple Ave, Chilhowie 24319 (703-646-5798)
West Virginia	Karl S. Thompson, K8KT, Rte 7, Box 422K, S Charleston 25309 (304-744-7829)

Rocky Mountain Division

Colorado	Tim Armagost, WBØTUB, 6337 S Lafayette Pl, Littleton 80121 (303-795-9683)
New Mexico	Joe Knight, W5PDY, 10408 Snow Heights Blvd NE, Albuquerque 87112 (505-299-4581)
Utah	Richard Fisher, NS7K, 1510 Celia Way, Layton 84041(801-544-1928)
Wyoming	Warren "Rev" Morton, WS7W, 1341 Trojan Dr, Casper 82609 (307-235-2799)

Southeastern Division

Alabama	Ken McGlaughn, KM4JD, 29 Polaris Dr, Montgomery 36108 (205-262-9668)
Georgia	Jim Altman, N4UCK, 636 Grant St SE, Atlanta 30312 (404-589-8145)
Northern Florida	Rudy Hubbard, WA4PUP, PO Box 843, Milton 32572-0843 (904-626-0620)
Southern Florida	Richard D. Hill, WA4PFK, 12380 NW 30 St, Sunrise 33323 (305-572-3172)
Puerto Rico	Tele Figueroa, KP4P, PO Box 1651, Yabucoa 00767 (809-744-7539)
Virgin Islands	Ronald Hall Sr, KP2N, PO Box 3987, St Thomas 00803 (809-774-4740)

Southwestern Division

Arizona	Clifford Hauser, KD6XH, 8741 N Hollybrook Ave, Tucson 85741 (602-744-9095)
Los Angeles	Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186)
Orange	Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (909-687-8394)
San Diego	Harry A. Hodges, WA6YOO, 2435 Our Country Rd, Escondido, CA 92029 (619-743-4212)
Santa Barbara	Marc Holzer, N6UNX, 712 Primrose St, Thousand Oaks, CA 91360 (805-492-0744)

West Gulf Division

North Texas	Robert Adler, NZ2T, 507 San Juan Dr, Southlake 76092 (817-329-0820)
Oklahoma	Joseph Lynch, N6CL, PO Box 73, Oklahoma City 73101 (405-528-6625)
South Texas	Alan Cross, WA5UZB, 4714 Coltwood Dr, Spring 77388 (713-350-0322)
West Texas	Amelia "Milly" Wise, W5OVH, 8516 Mt Scott, El Paso 79904 (915-751-4160)

"It Seems to Us..."

Instant Licensing

Every radio amateur has had to endure a period of anxious, watchful waiting after taking an examination. Just as the watched pot never boils, the watched mailbox never disgorges the desired news from Gettysburg. When *will* that license finally arrive? For a new enthusiast it can never be soon enough.

Last summer, licensing delays got pretty bad. For a while it was taking three months or more from the time an exam was passed until the license hit the mailbox (although at this writing, the turnaround time is down to about six weeks). No one thinks such long delays are acceptable.

Here's how the process works. Typically, local teams of Volunteer Examiners return the exam results to the Volunteer Examiner Coordinator (VEC) in just a couple of days. The VECs are obligated to turn the sessions around in 10 days, and usually take a lot less time than that. The ARRL/VEC then uses overnight delivery to get the session results to the FCC's processors in Gettysburg. There, work tends to back up because of limited staff and an obsolete computer system.

Delay begets delay. When the licenses don't come after a reasonable time, applicants want to make sure their paperwork hasn't been lost, or held up because they filled something out wrong. So, they get on the phone to the VEC and the FCC. You can't blame them for wanting to know, but this pulls people away from processing and adds even further to the backlog.

There has to be a better way.

In November, the FCC proposed what it apparently thought was a better way. The scheme, as outlined in a Notice of Proposed Rule Making in PR Docket 93-267, is to grant temporary operating authority for up to 120 days to anyone who has earned a Certificate of Successful Completion of Examination (CSCE) by passing the examination elements required for a license. Those with a history of non compliance with FCC Amateur Radio Service rules would be ineligible, and the temporary authority could be modified or cancelled at any time.

The timing of the Commission's proposal was a bit curious, because the problem already was being addressed in another way. In October 1992, in Public Law 102-538, Congress authorized the FCC to implement electronic filing of applications by allowing them to be signed "in any manner or form, including by electronic means, as the Commission may prescribe by regulation." In April 1993, the FCC adopted the necessary amendments to its Private Radio Service rules; at the time it noted that the amateur rules, Part 97, required no amendment because there are no specific provisions regarding signatures in Part 97. Now, more than a year after Congress acted, new electronic filing procedures still remain to be implemented. At the time the Commission said, "Electronic filing will expedite the licensing process by eliminating the need for manual entry of application data into the Commission's data base."

The ARRL and other VECs have emphasized a willingness to submit applications electronically, thus eliminating the delays at Gettysburg that result from everything having to wait to be entered manually. Our budget planning includes adequate provision for implementing electronic filing as soon as the FCC gives us the go-ahead. Coupled with a new computer system the Commission is already working on, this should result in typical turn-around times dropping to just a couple of weeks—a dramatic improvement over past and present performance.

Judging from the comments we're hearing, the amateur community thinks this would be sufficient and is unpersuaded that the additional advantages to be gained from "instant licensing" outweigh the risks.

Mostly, the concerns are with the proposed system for on-the-air identification. The call signs being proposed would not in all cases conform to the ITU regulations; an even bigger problem, however, is that they would be self-assigned, with no means for local amateurs to check on the validity of a suspicious operator. In its Notice, the Commission doesn't even discuss the need for safeguards against such abuse. Also puzzling is that the Commission determined just a few years ago that it lacked the authority to implement a similar temporary-licensing proposal; the basis for its now having come to the opposite conclusion is unknown, even though the League raised this point at an earlier stage in the proceeding.

If you're among the many who have misgivings about the proposal, rest assured that the ARRL Board shares your concerns. The League is on record as favoring an early implementation of electronic filing as a better way of getting new amateurs on the air faster. Whether you agree or not, feel free to share your thoughts by writing your elected ARRL Director; they hold the office because they're interested in your opinion. You may also want to let the FCC know what you think. Frankly, because the Commission went ahead and proposed something we'd already told them was flawed, we wouldn't mind a bit (and it might be very useful) if you would just tell them you support the ARRL position on PR Docket 93-267, and that they should get moving on electronic filing instead.

Send an original and four copies of your comments to the Secretary, FCC, Washington, DC, 20554. At the top put, "In the matter of PR Docket 93-267." Make sure your comments arrive by January 10, 1994. We, and your Director, would be pleased if you'd favor us with a copy.—*David Sumner, K1ZZ*

NEW!

FT-11R/41R
2m/70cm Handhelds

- **Frequency Coverage:**
  Wide Receiver Coverage:
  FT-11: 110-180 MHz RX,
  144-148 MHz TX
  FT-41: 430-450 MHz RX/TX
- Selectable Alpha Numeric Display
- New Compact Battery Design
  4.8V produces 1.5 Watts
  9.6V produces Full 5 Watts
- 150 Memory Channels
  (75 when Alpha Numeric)
- AM "Aircraft" Receive
  (110-136 MHz)
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- Large Back-Lit Keypad and Display
- Up/Down Volume/Squelch Controls
- Built-in DTMF Paging/Coded Squelch
- Automatic Power Off (APO)
- **Accessories:**
  FNB-31 4.8V, 600 mAh Battery
  FNB-33 4.8V, 1200 mAh Battery
  FNB-38 9.6V, 600 mAh Battery
  FBA-14 6 AA Size Battery Case
  FTS-26 CTCSS Decode Unit
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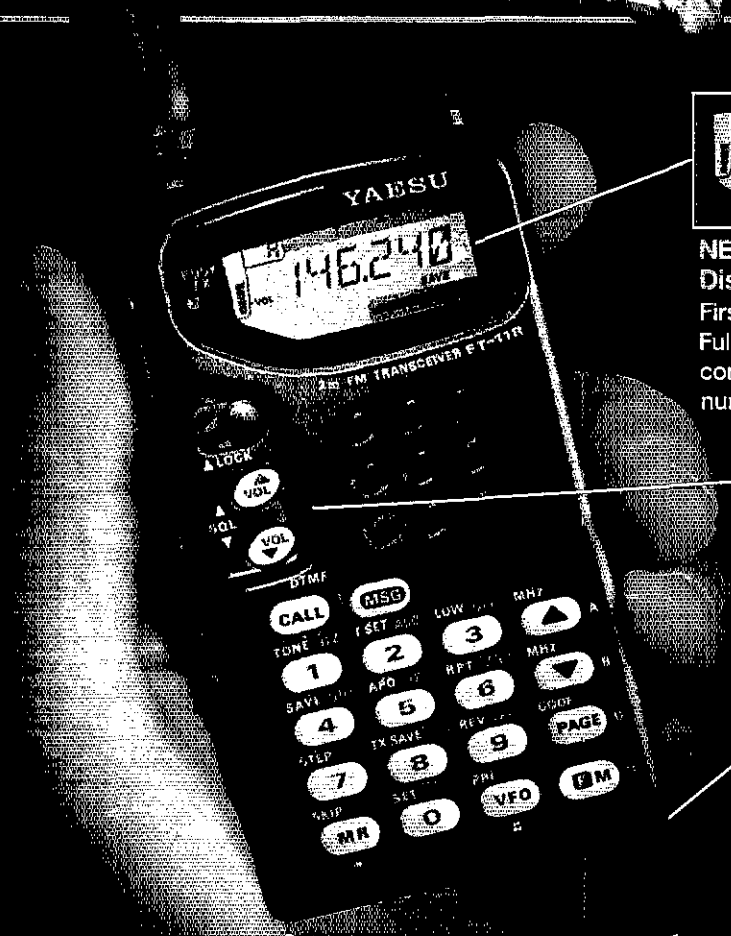
  CA-10 Charge Adapter (required w/ NC-50)

Contact your Dealer for full details.

"Look, alphanumeric display and a 4.8V battery. Terrific!"

"Small and thin – with a full sized keypad! How'd they do that?"

"Yaesu did it again!"



NEW Alphanumeric Display
First time for Yaesu HT
Full function LCD combines letters and numbers.

NEW Up/Down Thumb Control
with Volume and Squelch Bar Graph. No other radio has this. Back lit, too!

NEW Compact Battery Design
4.8V gets you 1.5 Watts. A first for amateur radio.

Get a grip on this!

World's smallest size HT with a full sized keypad
Measures only: 4"H x 2¼"W x 1"D

"Small" is relative, isn't it? It could mean size – which in this case it does. And, it could mean "reduced", which it doesn't! Nothing missing from the hot new FT-11R HT from Yaesu except bulk! You're going to wonder just how all the features of this full-function radio fit in. Until you remember Yaesu pioneered 2-way radio micro technology.

To see what this really means to you, check out all the new features. Like the alphanumeric display. This Yaesu HT first, lets you tag your favorite frequency by name, call sign or number. Or, the new "voltage stingy" battery. It's an industry first for amateur radio. Smaller and compact, the 4.8V battery gives you 1.5 watts on TX. And, if that's not enough, there's an optional drop in, dash mount battery charger.

You see it's not a small time performer. Just small sized. The FT-11R. Another small example of Yaesu superiority. See your dealer today!

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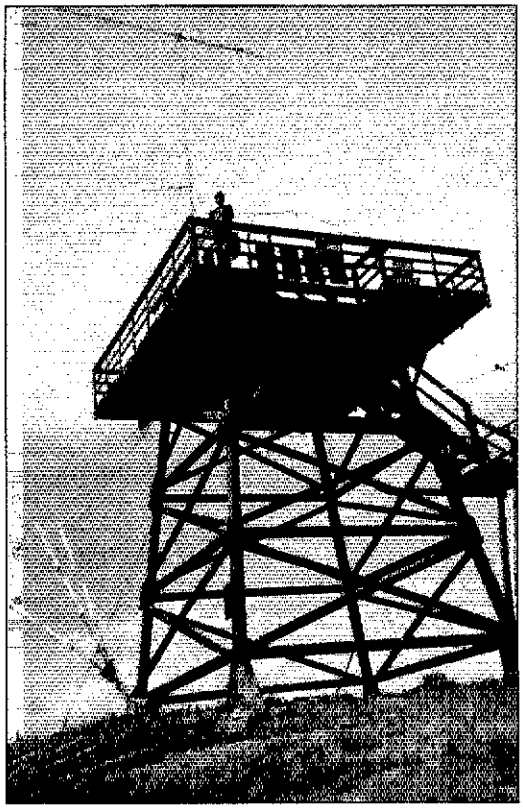
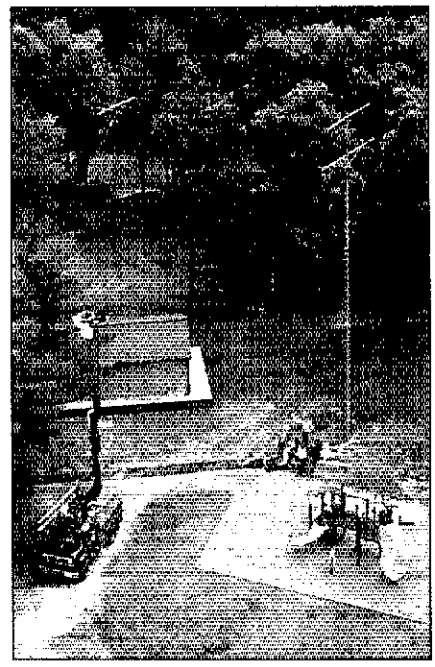
UP FRONT in QST



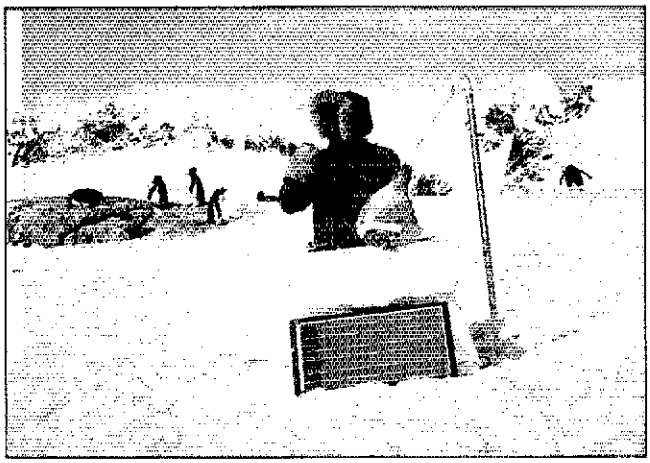
VE VHF: The 100 members of the North Okanagan Radio Amateur Club (NORAC) of Vernon, British Columbia, Canada, are an active group, avidly participating in such events as Field Day, Canada Day, VHF/UHF contests, the International Falkland Sled Dog Races, parades and ARES. Wilf Mulder, VE7OHM, of Calgary, Alberta, peers out from the site of the club's contest station on Tut Mountain, just outside Falkland (between Vernon and Kamloops), during their 1993 ARRL June VHF QSO Party effort as VE7OHM. *(photo courtesy of VE7OHM)*



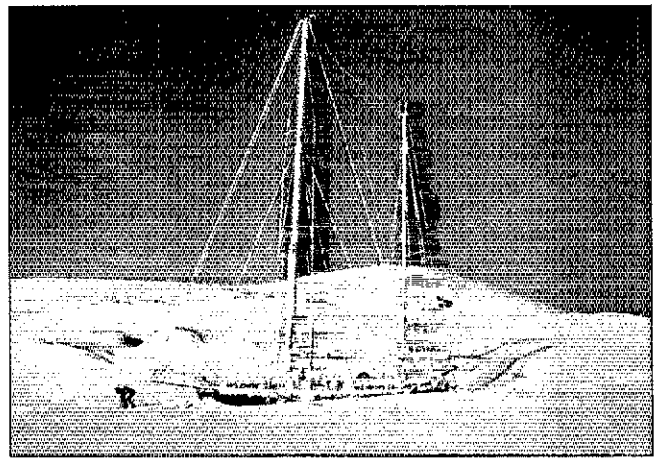
On the ultrahighs: The Overlook Mountain ARC operated KC2GE at the town recreation center in West Hurley, New York, during the 1993 ARRL September VHF QSO Party. *(helicopter photo by Steve Heyer Sr, KC2L)*

The 47th ARRL January VHF Sweepstakes is the 22-24th!
(See the announcement on page 128 of December 1993 *QST*)

SOUTHERN EXPOSURE



When Deborah Shapiro, N1CCA, wants to get away from it all and enjoy Amateur Radio, she goes for the gusto! This photo was taken during a ski expedition to a Gentoo penguin colony on the Antarctic peninsula's Pleneau Island in January 1992. Deborah says she was using a "solar-powered Prosciutto 101." Unfortunately, nobody responded to her CQs. Perhaps the antenna wasn't well matched.... *(N1CCA photos)*



Where's a nuclear-powered icebreaker when you need one? One inconvenience of Antarctic sailing is getting stuck in the ice—for the entire winter! Deborah's boat, the *Northern Light*, ran into just such a "problem" near Hovgaard Island, 65° 06' S, 64° 05' W.

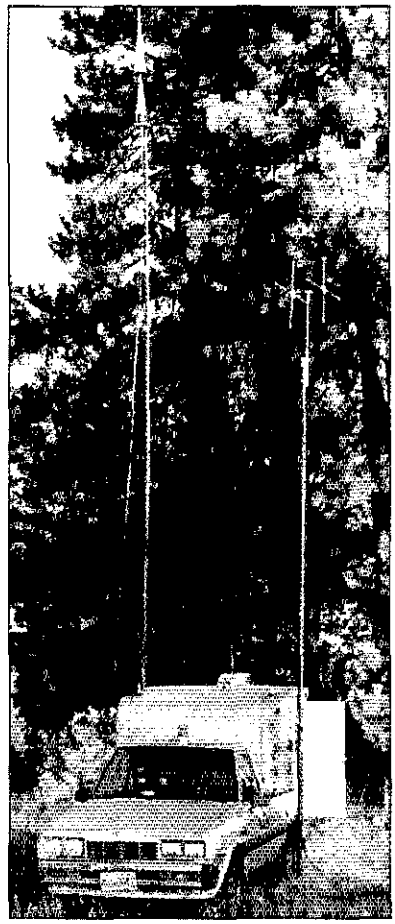
The rime frost on the rigging shows off the top-hat-loaded vertical antenna. RF is produced by an HF transceiver nestled below decks, fed by a packet TNC and a laptop computer.

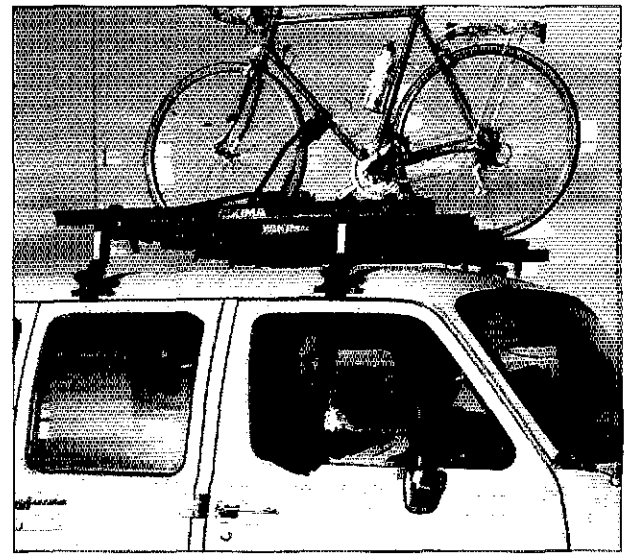
Amateur Radio was a real sanity saver for Deborah and her husband, Rolf Bjelke. The two adventurers met no other people for 9 of the 15 months they spent in Antarctica.

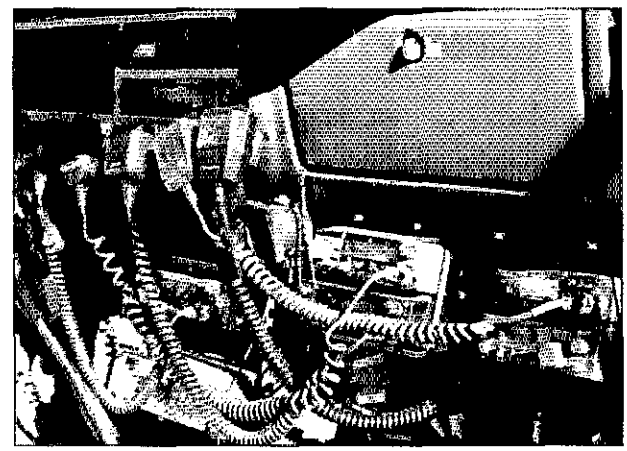
Ham heaven: The manufacturers' and dealers' displays at the 1993 ARRL National Convention in Huntsville, Alabama, on August 14-15 drew a packed crowd to the Von Braun Civic Center. The Huntsville Hamfest did a great job organizing and promoting the event in the Rocket City. We hope you can make it to the 1994 event, June 10-12 at the expanded Convention Center in Arlington, Texas, sponsored by HamCom. *(photo by David Rogers, WB4JRQ)*

Picking up the pieces: The cyclists were accompanied by support personnel, ambulances, bicycle repair units, "sag wagons," water tankers and trucks hauling showers, sinks, portable toilets, luggage and tents. Amateur Radio operators were stationed with the event's directors, paramedic supervisor, food director, sag wagon vans and mission-control motorhome. Ron Heinz, KA7SIK, mans a sag wagon that attended to distressed bicyclists along the route.

Watch out for lightning! ARRL Oregon Section Manager Randy Stimson, KZ7T, used his truck as mobile net control station (NCS) for part of Cycle Oregon IV, as 2000 bicyclists rolled out of Baker City, Oregon, to celebrate the sesquicentennial of the Oregon pioneer journey by following the historic Oregon Trail. The 1993 riders covered 448 miles across desert, mountains and valleys, from Baker City to Oregon City, with participants from 41 states and Canada. The event organizers said, "We couldn't do it without you hams!" See the story by Judy Glenn, WZ7S, in this month's Public Service column. *(photos by Randy Stimson, KZ7T)*







"Stand by while I locate the mike!" Here's the inside of Randy's NCS truck. He and Jim Schaefer, KB7ADH, rotated the daily job of keeping track of all the hams.

HOW TO CONTACT THE ARRL

ARRL HQ is open from 8 AM to 5 PM, Monday through Friday, except holidays.

To reach ARRL HQ by mail or courier, send to: ARRL, 225 Main St, Newington, CT 06111-1494. Our voice telephone number is 203-666-1541, and our fax number is 203-665-7531. You can reach us electronically via MCI Mail (2155052), The ARRL BBS (203-666-0578), Compuserve (70007,3373), America On Line (ARRLHQ), GEnie (ARRL.HQ), BIX (ARRL), and Prodigy (MGTS39A).

MEMBERSHIP INFORMATION

ARRL membership, including a subscription to *QST*, is available to individuals at the following rates: $30 per year in the US and possessions, $42 elsewhere, payable in US funds. Age 65 and over, with proof of age, $24 US, $36 elsewhere. First Class and airmail rates are available upon request. Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Address membership inquiries to the Circulation Department.

Publications Delivery—Direct changes of address and questions about *QST*, *QEX*, *NCJ* and *The ARRL Letter* delivery to the Circulation Department.

Back Issues—Back issues of *QST* are available for $3 each, postpaid, from the Circulation Department.

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Writing for *QST*—If you're interested in writing for *QST*, send a stamped, self-addressed envelope (SASE) along with a written request for our free author's guide. *QST* accepts unsolicited manuscripts; please include your name, call sign, address and daytime telephone number. Address inquiries and submissions to the *QST* Editor.

Press Releases and New Products/Books—Direct all general press releases to the *QST* Editor. Address New Product and New Book releases to the *QST* Features Editor.

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REGULATORY INFORMATION

Direct questions about FCC rules and regulations, antenna ordinances, third-party agreements, and reciprocal operating permission to the Regulatory Information Branch. An SASE will speed your reply.

VOLUNTEER EXAMINATIONS

Contact the Volunteer Examiner Department for information on: the location of examination sessions in your area if you have an amateur license and want to upgrade; becoming a volunteer examiner; and examination accommodations and/or Morse code exemptions for the disabled.

EDUCATIONAL ACTIVITIES

Contact the Educational Activities Department (EAD) for general information on Amateur Radio. EAD can tell you how to become licensed and how to locate Amateur Radio clubs, instructors, licensing classes, and Novice examiners in your area; recommend study materials; supply Novice examiner testing materials; and help you promote Amateur Radio activities to the general public.

League Lines

The FCC extended to January 11 the comment period in ET Docket 93-62, which proposes to adopt new guidelines for evaluating the environmental effects of RF radiation, based on petitions for more time from CBS and ABC. For information see May 1993 *QST*, page 90.

The ARRL DX Advisory Committee (DXAC) has recommended the creation of an RTTY DXCC Honor Roll, to require the same number of RTTY countries as the Mixed Honor Roll. If approved by the ARRL Awards Committee, the new Honor Roll would include all non-CW digital modes, including Baudot, packet, ASCII and AMTOR. The DXAC also voted to maintain the "start date" for CW DXCC at January 1, 1975 (rather than moving it back to 1945 to match Mixed and Phone DXCC).

The first private station DXCC application has been received from the People's Republic of China, from BZ4RBX of Nanjing. Operator Wang Long submitted 102 QSL cards, which, interestingly, did *not* include a card from his own country. The lucky American in this historic first DXCC for the PRC is Marion Shellhorse, K4MIH, of Cartersville, Georgia.

The FCC has added Bosnia-Herzegovina (T9) to the list of countries with which the US has an Amateur Radio third-party traffic agreement.

***Manuscripts on antennas and propagation are being accepted through March 1, 1994, for Volume 4 of the* ARRL Antenna Compendium.** Prospective authors should contact Dean Straw, N6BV, at ARRL HQ.

Three more names have been added to the ARRL HQ monument honoring radio amateurs who died in public service: Robert Allard, KA1SJE (August 18, 1991, Ocean State Bike Trek); Herbert Engelman, KD4OZY (September 2, 1992, Hurricane Andrew relief); and Shirley Emmerich, N9JKB (February 2, 1992, search-and-rescue drill).

1994 ARRL National Exam Days have been set for May 14 and October 29. Details will be in February *QST*, but you can start planning now by checking February 1993 *QST*, page 96.

Congratulations to space shuttle Cmdr Charles Bolden Jr and Mission Specialist Ronald Sega on passing their Technician-class exams. They're awaiting licenses from the FCC. The two new hams are scheduled to fly on mission STS-60, leaving January 27, 1994.

The Motorola ad in October and December QST ("ATTENTION, Public Safety Announcement"), ***was aimed at uncovering lawbreakers*** known in the industry as "cellular phone hackers," who bill calls to other numbers by breaking cellular codes, according to Motorola. Books on how to do this are advertised in some magazines (*not QST*).

The ARRL has given a proposal to the FCC to alleviate a call sign shortage for Extra Class licensees in Puerto Rico, Alaska and Hawaii, and for an impending shortage of Advanced-class call signs in Hawaii. The plan would use numbers in addition to the current 4, 6 and 7 to open up more "preferred" call signs.

Amateur moonbounce pioneer Tom McMullen, WISL, died in mid-October after a brief illness. He was 67. McMullen, managing editor of *Ham Radio Horizons* magazine in the 1970s, was before that a member of the ARRL Technical Department staff and an early experimenter in 432-MHz moonbounce communications from his home in North Canton, Connecticut. While living in Florida in the early 1980s, he worked for Motorola and helped to develop the special equipment used by Owen Garriott, W5LFL, during the first Amateur Radio operation from space shuttle *Columbia*, in 1983. He is survived by his wife, Eleanor McMullen, W1RNT.

Japan has changed its licensing of amateur stations, now disregarding the nationality of applicants, including its own citizens. This means that anyone holding a valid amateur license from a country with which Japan has a reciprocal agreement may apply for a *station* license (ie, a call sign) in Japan—these countries are the US, Germany, Canada, Australia, France, the Republic of Korea, Finland and Ireland.

The Dayton ARA Inc is accepting applications for its 1994 scholarships and awards. The Amateur of the Year, Technical Excellence and Special Achievement awards will be presented at the HamVention, and the nomination deadline is March 1. All licensed amateurs completing their senior year in high school are eligible for the $2000 scholarship program. Contact Stan Kuck, KY8F, at DARA Scholarships, 45 Cinnamon Ct, Springboro, OH 45066-1000; the application deadline is May 15. Get in touch with Barbara Hillman, N8EYW, regarding awards, at DARA, PO Box 44, Dayton, OH 45401. Please accompany correspondence with self-addressed, stamped envelopes.

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NEW AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing . . . it also runs cooler because its Eimac 3-500Z tube completely turns off between words . . .

Ameritron's all NEW AL-80B kilowatt *output* desktop linear can *double* your average SSB power output with high-level RF processing using Ameritron's exclusive *Dynamic ALC™*.

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Dynamic ALC™ doubles average SSB power

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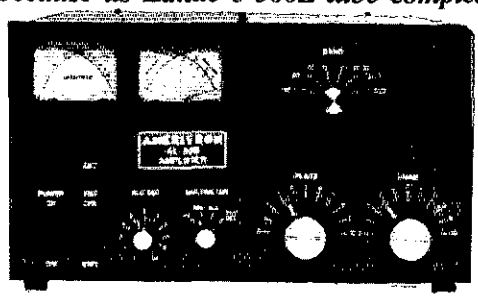

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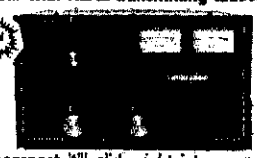
A tough low cost linear with REAL transmitting tubes!

Ameritron's new AL-811 linear amplifier gives you plenty of power to bust thru QRM. You get a quiet desk top linear that's so compact it'll slide right into your operating position – you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet.



You get three tough vertically mounted 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC, standby switch, transmit LED, UPS shippable and much more.

Select the 3 tube 600 watt out AL-811, $649 – or the new 4 tube 800 watt out AL-811H, $795.

70% efficiency

The AL-80B is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

Superb RF design and layout, Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. Your power goes into your antenna instead of heating up your amplifier.

A whisper quiet internal fan draws in cool air over power supply components and pressurizes the 3-500Z tube compartment to remove heat for longest life.

Tuned Input lets your rig deliver full output

A 50 ohm broadband Pi-Network *tuned input* is used.

Pi/Pi-L Output Network

A carefully designed Pi/Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide matching range, full band coverage and peak performance at all power levels.

Has ball bearing vernier reduction drives with logging scales on plate and load controls.

Step-Start Inrush Protection™

Step-Start Inrush Protection™ stops damaging inrush current with a start up sequence that's *easy* on your tube and power supply components.

Multi-Voltage Power Transformer

Ameritron's exclusive *Multi-Voltage Power Transformer* lets you optimize for different line voltage. You can select from 14 different *primary* voltages from 90 to 140 VAC and 205 to 250 VAC.

Dual Illuminated Cross-Needle Meters

Ameritron's dual illuminated cross-needle meters give you *four separate meters* to monitor your operating conditions -- you can tell right away if something is wrong.

QSK Compatible

The fast *custom* T/R (transmit/receive) relay in the AL-80B switches nearly as fast as some vacuum relay QSK T/R switches.

For *lightning fast* QSK operation use the optional external Ameritron *electronic PIN diode* QSK-5 T/R switch or the internal QSK-5PC. Please contact Ameritron for details.

Plus more . . .

An *Standby* switch lets you run barefoot, but you can instantly switch to full power if you need it.

Has transmit LED; 12 VDC, 200 mA jack; 12 VDC keying relay for solid state and tube rigs; tough, nearly indestructible Lexan-over-aluminum front panel. Two year limited warranty.

AMERITRON offers the best selection of legal limit linears!

These 3 rugged linears all use a super heavy duty hypersil power supply capable of 2500 watts!

Ameritron's most powerful amplifier

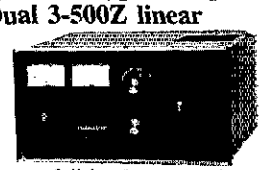
AL-1500 **$2625** Suggested Retail

Ameritron super power amplifier uses the herculean Eimac• 8877 ceramic tube.

It's so powerful that 65 watts drive gives you full legal output—and it's just loafing because the power supply is capable of 2500 watts PEP.

Ameritron's Dual 3-500Z linear

AL-82 **$1995** Suggested Retail



This linear gives you full legal output using a pair of Eimac• 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

Ameritron's 3CX1200A7 linear

AL-1200 **$2095** Suggested Retail

Get ham radio's toughest tube with the Ameritron AL-1200—the Eimac 3CX1200A7. It has a 50 watt control grid dissipation—12 times tougher than the 4 watt rating of the 3CX800A7—yet you get the same full legal output as you get from a *pair* of 3CX800A7s.

AMERITRON brings you the finest high power accessories!

Legal limit antenna tuner

ATR-15 **$399** Suggested Retail

Ameritron — *the high power specialist* — brings you the ATR-15 antenna tuner that's designed for legal limit amplifiers. Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

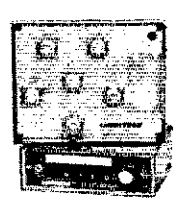
Legal Limit Dummy Load

ADL-1500X **$39.50** Suggested Retail

Oil cooled 50 ohm dummy load. Handle 1500 W for 5 min. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz. 7½" H x 6 5/8" D. **ADL-1500X** without oil, $39.95. **ADL-1500** with oil, $59.95

Remote Coax Switches

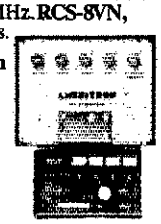
RCS-8V **$149** Suggested Retail



RCS-8V, DC-UHF 5 KW Coax Switch. Replace 5 coax feedlines with one with this Remote Coax switch. Weatherproof box mounts outdoors on your tower or mast. Attractive control unit sits on your operating desk. Low SWR to 450 MHz. Low loss. Rated at 5 KW to 30 MHz, 1 KW at 150 MHz. **RCS-8VN, $169.95** with "N" connectors.

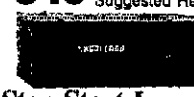
RCS-4, $134.50. 4 position HF switch. Similar to RCS-8V. No control cable needed. Handles 2500 watts PEP.

RCS-4 **$134.50** Suggested Retail



QSK-5 Pin Diode T/R Switch

$349 QSK-5 Suggested Retail



Self-contained, connects externally to most HF amplifiers. Handles 2.5 KW PEP, 2 KW CW. Six time faster then vacuum relay. 6x4x9½ inches.

Step-Start Inrush Current Protector

Stops power up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V or ICP-240 for 220-240 VAC.

ICP120/240 **$79** Suggested Retail

AMERITRON

. . . the high power specialist

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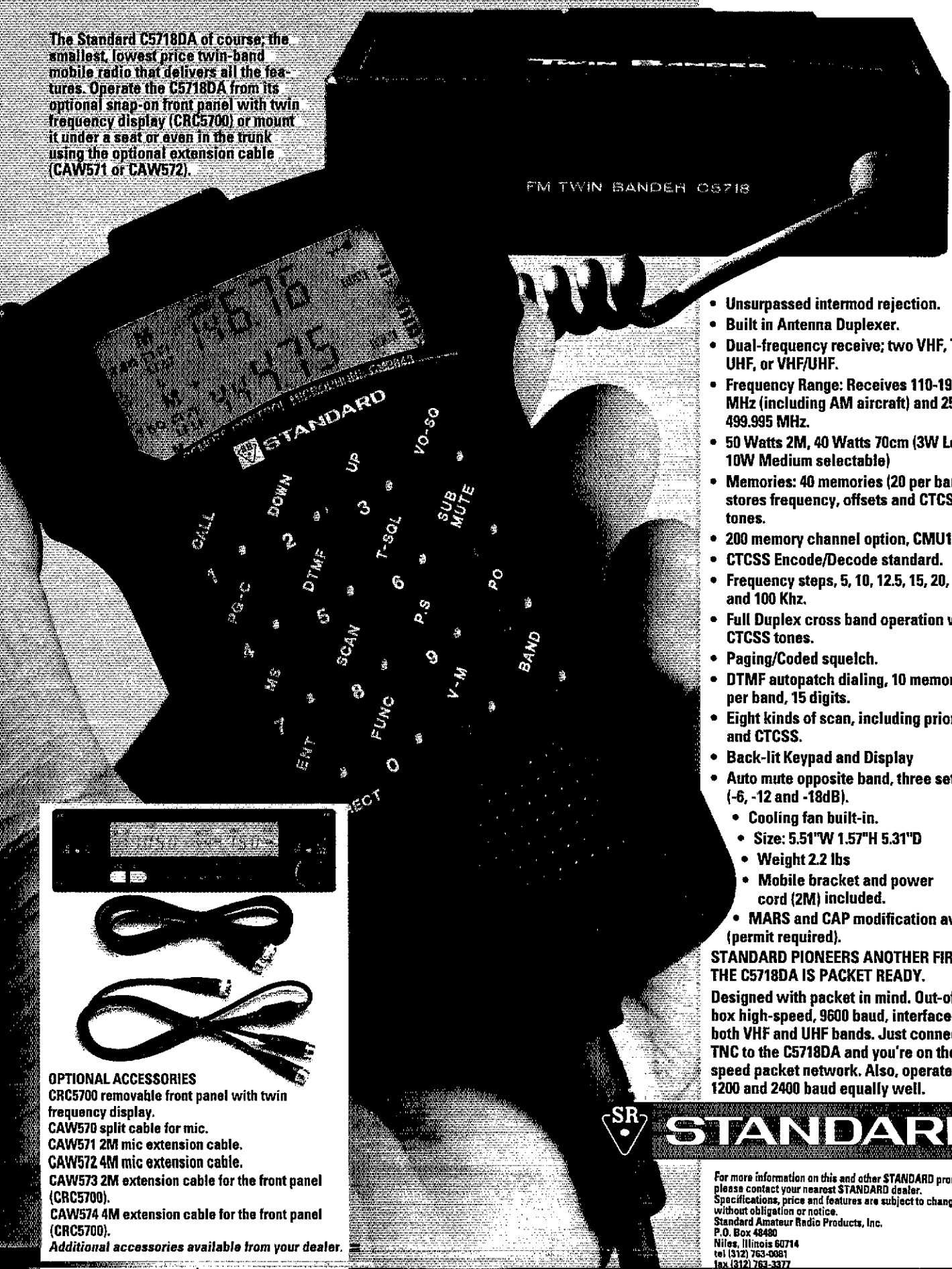
Prices and specifications subject to change.

WHAT TWIN-BAND RADIO'S SPEAKER-MIC DISPLAYS BOTH BANDS WHILE DELIVERING UP TO 50 WATTS?

The Standard C5718DA of course: the smallest, lowest price twin-band mobile radio that delivers all the features. Operate the C5718DA from its optional snap-on front panel with twin frequency display (CRC5700) or mount it under a seat or even in the trunk using the optional extension cable (CAW571 or CAW572).



- Unsurpassed intermod rejection.
- Built in Antenna Duplexer.
- Dual-frequency receive; two VHF, Two UHF, or VHF/UHF.
- Frequency Range: Receives 110-199.995 MHz (including AM aircraft) and 250-499.995 MHz.
- 50 Watts 2M, 40 Watts 70cm (3W Low, 10W Medium selectable)
- Memories: 40 memories (20 per band); stores frequency, offsets and CTCSS tones.
- 200 memory channel option, CMU182.
- CTCSS Encode/Decode standard.
- Frequency steps, 5, 10, 12.5, 15, 20, 25, 50 and 100 Khz.
- Full Duplex cross band operation with CTCSS tones.
- Paging/Coded squelch.
- DTMF autopatch dialing, 10 memories per band, 15 digits.
- Eight kinds of scan, including priority and CTCSS.
- Back-lit Keypad and Display
- Auto mute opposite band, three settings (-6, -12 and -18dB).
- Cooling fan built-in.
- Size: 5.51"W 1.57"H 5.31"D
- Weight 2.2 lbs
- Mobile bracket and power cord (2M) included.
- MARS and CAP modification available (permit required).

STANDARD PIONEERS ANOTHER FIRST!! THE C5718DA IS PACKET READY.

Designed with packet in mind. Out-of-the-box high-speed, 9600 baud, interface for both VHF and UHF bands. Just connect your TNC to the C5718DA and you're on the high speed packet network. Also, operates at 1200 and 2400 baud equally well.

OPTIONAL ACCESSORIES
CRC5700 removable front panel with twin frequency display.
CAW570 split cable for mic.
CAW571 2M mic extension cable.
CAW572 4M mic extension cable.
CAW573 2M extension cable for the front panel (CRC5700).
CAW574 4M extension cable for the front panel (CRC5700).
Additional accessories available from your dealer.

SR STANDARD®

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Niles, Illinois 60714
tel (312) 763-0081
fax (312) 763-3377

The IC-Δ100H Takes The Magic Beyond 3 Wishes!

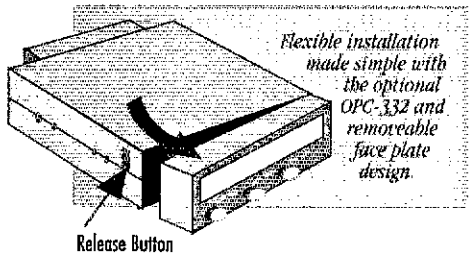
Exclusive Triple Band Capability

- Three independent band units for 2 M, 440 MHz and 1.2 GHz operation (simultaneous receive).
- Three independent displays can freely select the desired band unit.
- Each display indicates S/RF, volume and squelch levels.
- Each display is controlled by a separate volume and tuning knob.
- Select from 3 external speaker jacks.

8 POSSIBLE COMBINATIONS!		
#1	#2	#3
2M	440MHZ	1.2GHZ
2M	440MHZ	440MHZ
2M	2M	1.2GHZ
2M	2M	440MHZ
440MHZ	440MHZ	1.2GHZ
440MHZ	440MHZ	440MHZ
440MHZ	2M	1.2GHZ
440MHZ	2M	440MHZ

More than a tri-band radio, the IC-Δ100H gives you true freedom of choice!

- No removal or installation of additional band units required.
- Each operating band has a separate antenna connector to enable duplexer/triplexer use without any mismatching antenna loss (not one common antenna for multi-signal, one band operation like you see in competitive models).
- Cross band double duplex (transmit on one band while receiving on two others) and full crossband duplex (transmit on one band and receive on another) is possible. The one-touch PTT enables telephone-like conversations without having to continually press PTT.



Flexible installation made simple with the optional OPC-332 and removeable face plate design.

Release Button

Remote Installation Options

- **One Body** – install as a complete unit.
- **Separate** – detach the front panel and mount each separately (see illustration).
- **Remote** – Mount the main body in the trunk (OPC-333 and OPC-335 req.).

Incredible Performance

- AFC-RIT, AFC-VXO, manual RIT and manual VXO modes to compensate for "off frequency" of the Tx station (1.2 GHz).
- High Sensitivity – less than .16μV.
- Double-conversion superhetrodyne receiver system.
- More than 2.4 W audio output power.

Memory Bank System

- 642 memory channels organized in two separate banks* (very convenient for two ham families).

MEMORY BANK SYSTEM							
Options	Bank/User #1			Bank/User #2			TOTAL
Bank	#1	#2	#3	#1	#2	#3	
Normal*	100	100	100	100	100	100	600
Scan Edge	6	6	6	6	6	6	36
Call	1	1	1	1	1	1	6
Total IC-Δ100H Memory Channels:							642

The memory bank system can even be customized for "his" and "hers" operation!

- Priority Watch – Scans one (or more) memory channels per band while operating on a VFO frequency.
- Transfer call or memory channel contents to VFO. Particularly useful when searching for signals around a memory channel frequency and for recalling the offset frequency, tone frequency, etc.
- 14 DTMF autodial memories for autopatching, accessing repeaters and controlling other equipment, etc.

* Stores operating frequency, duplex direction, offset frequency, subaudible tone frequency, encode on/off, tone squelch on/off and skip information.

Microphone Remote Controls

Power On/Off	Code Squelch
Select Main Band	Tone, Tone Squelch
Change Operating Band	Pocket Beep On/Off
Volume Adjust	AFC On/Off
Squelch Adjust	Attenuator On/Off
Mode Select	Set Mode
Duplex Select	DTMF Auto or Manual
Frequency Select	Operating Freq. Annce. (with opt. UT-66 synth.)
Memory Channel Select	Write VFO Contents to Memory or Call Channel
Mute Bands	Lock All Mic Keys or Keyboard Only
Scan or Priority Watch	
Pager On/Off	

- A multi-function keyboard with complete control over the IC-Δ100H.
- The beep tones for each band are different and distinguishable so you can keep your eyes on the road.
- Over 22 functions are at your fingertips with the IC-Δ100's unique microphone keyboard (see chart above)!

IC-Δ100H Triple Band Mobile Transceiver (shown with the optional OPC-332)

Other Great Features

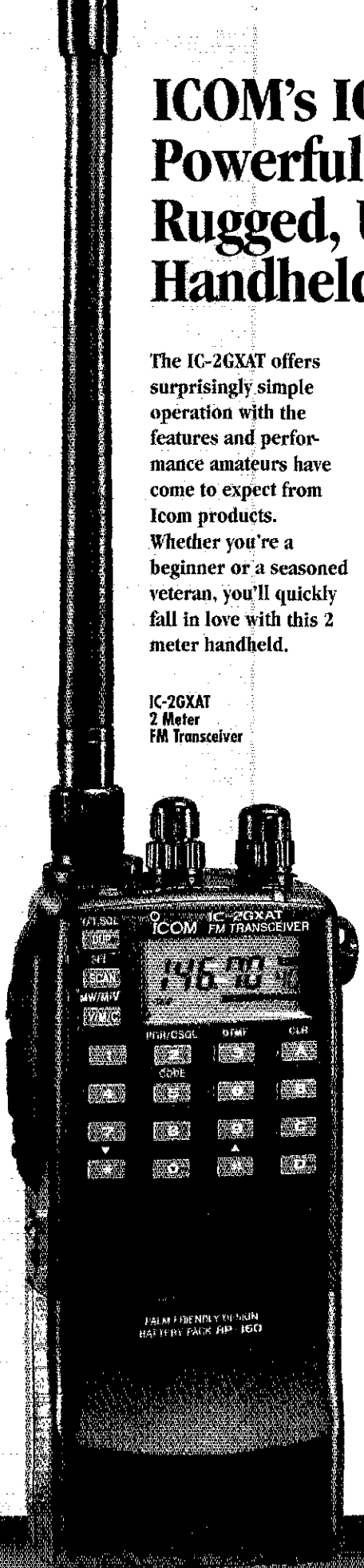
- External remote control via another transceiver (UT-55 required)
- Tri, dual or mono band operation
- Sub band access/mute/busy beep functions
- Optional pocket beep and tone squelch
- Opt. pager/code squelch
- Tone encoder built in
- Multiple scans

ICOM's IC-2GXAT . . . Powerful Versatility In A Rugged, User-Friendly Handheld.

NEW

The IC-2GXAT offers surprisingly simple operation with the features and performance amateurs have come to expect from Icom products. Whether you're a beginner or a seasoned veteran, you'll quickly fall in love with this 2 meter handheld.

IC-2GXAT
2 Meter
FM Transceiver



SIMPLE OPERATION

Channel Operation – display can be set to indicate memory channel numbers only. This keeps frequencies secret, restricts operating frequencies or simplifies operation for an unfamiliar user.

Auto Repeater Operation – automatically activates the correct duplex direction when the receiver frequency tuned is within the repeater output frequency range.

Tone Scan – scans for, detects and sets the subaudible tone frequency to enable communication with another station that is using subaudible tones.

DTMF Redial– for quick and easy access to autopatches.

User Friendly Keyboard – uncluttered, user-friendly design for ease of operation.

ADVANCED FEATURES

Power Saver – reduces the current drain to 35 mA (avg. Rx) for battery conservation and extended operating time.

Low Power Option – switch to 1 W output power to extend your operating time when high power isn't required.

40 Memory Channels – store all repeater information independently.

Memory Transfer – the contents of a memory channel are transferred into VFO, **and the VFO mode is automatically selected,** to assure quick and easy QSY'ing.

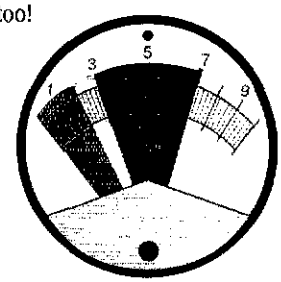
5 DTMF Auto Dial Memories – for quick and easy autopatching to frequently used telephone numbers.

Selectable DTMF Autodial Digit Duration – adjust your DTMF speed to the decode capabilities of the repeater.

Need more information?
Call our brochure hotline:
(206) 450-6088

MAXIMUM POWER

7 W Output Power – one of the highest powers available in a handheld (nominal with 13.5 V DC or the optional BP-132A battery pack). The BP-132A battery pack provides more than enough power to reach those fringe areas, and a long lasting 600 mAh too!



DURABLE CONSTRUCTION

Die-cast Aluminum Rear Case – will withstand the demands of rugged outdoor use.

Splash Resistant Body – maintains performance in harsh outdoor environments.

Rated JIS II for splash resistance, the IC-2GXAT is built to withstand rugged outdoor use.

OTHER GREAT FEATURES

- High Sensitivity: 0.18 µV for 12 dB SINAD
- Multiple Scan Modes
- Monitor Function
- SET mode to customize transceiver operation
- Display lighting with 5 second timer
- Subaudible tone encoder, tone squelch and pocket beep
- Optional pager and code squelch
- BP-160 (3 W, 700 mAh) battery pack, wall charger, belt clip and hand strap come standard
- 8 tuning steps (5, 10, 12.5, 15, 20, 25, 30 or 50 kHz)
- Call Channel
- Icom compatible accessories

the **NEW** Kantronics **KAM Plus**™

the **Multi-Mode** with PACTOR

Kantronics, the digital leader, again defines state-of-the-art by creating a new industry standard in digital communications. The Kantronics All Mode Plus (**KAM Plus**) includes the KAM's breakthrough design of simultaneous HF/VHF operation and Host Master split screen software compatibility. In addition to PACTOR, the **KAM Plus** operates CW, RTTY, ASCII, AMTOR, and PACKET, supported in terminal and HOST modes.

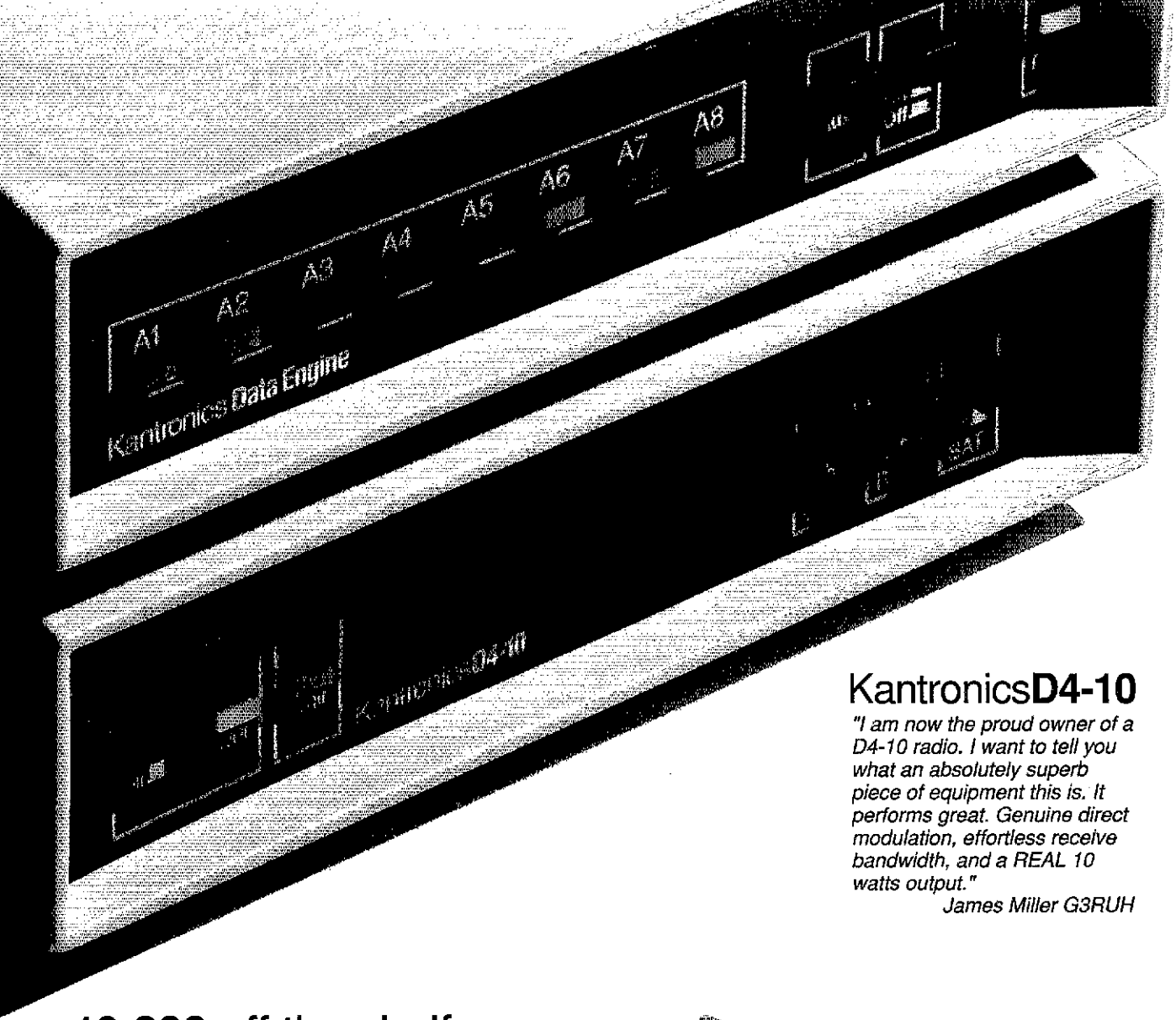
Standard features of the new **KAM Plus** include

- PACTOR
- 128K bytes of RAM, expandable to 512K
- EPROM space expanded to 1Meg bits
- socketed lithium battery & on-board clock
- new user/expert command sets
- quick start and reference manuals
- enhanced mail box command set
- extended RTTY & AMTOR character sets
- on-line help messages for each command
- enhanced CW: Farnsworth, weighting, tone
- programmable mark & space filters
- low power consumption

We have great news for existing **KAM users** too. Kantronics has developed a plug-in board that adds full **KAM Plus** functionality to your KAM. The KAM add-on board converts an existing KAM to one with Pactor, clock,128K bytes of RAM (max), lithium battery, and the same firmware additions listed above.

Get what you need, the KAM add-on board or the Kantronics **KAM Plus**, expanded for the future.

Kantronics 1202 E. 23rd St, Lawrence, KS 66046-5006, 913.842.7745 FAX 913.842.2021



KantronicsD4-10

"I am now the proud owner of a D4-10 radio. I want to tell you what an absolutely superb piece of equipment this is. It performs great. Genuine direct modulation, effortless receive bandwidth, and a REAL 10 watts output."

James Miller G3RUH

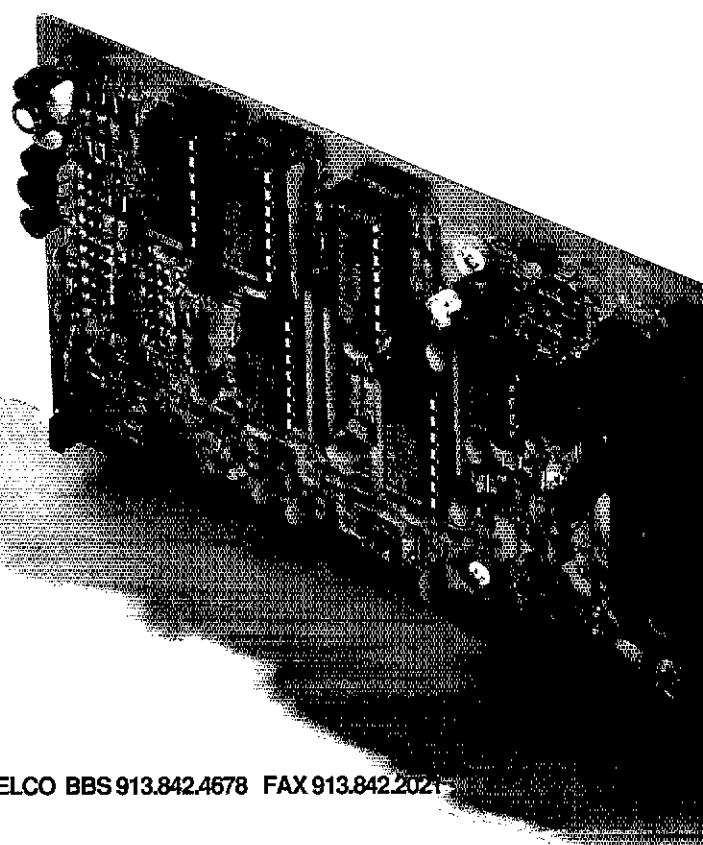
19,200 off the shelf

No tweaking, no kludges, no kidding . . . The Kantronics D4-10 transceiver provides robust 19,200 baud operation off the shelf, today. Manufactured to respond to your requests for a faster, more powerful transceiver, the D4-10 represents state of the art design equalling that found in our DataEngine and beyond that found anywhere else in the industry.

The Kantronics D4-10 features user-selectable narrow and wide bandwidth operation (60 KHz). This provides conventional and high speed data modes at 1200, 9600, and 19,200 baud with our DataEngine and plug-in modules.

For very fast TR switching, the D4-10 features two-channel, crystal-controlled operation (shipped with one channel installed at 430.55 MHz simplex). Combined with an analog port (G3RUH compatible), and a TTL port which supports internal DFSK modulation and threshold demodulation at 9600 and 19,200 BPS, you have a 70 cm transceiver that is as fun to use as it is technologically advanced.

The Kantronics D4-10 transceiver, the state of the art available off the shelf from Kantronics.



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We're proud to be able to present the Technician Class Video Course with the famous King quality.

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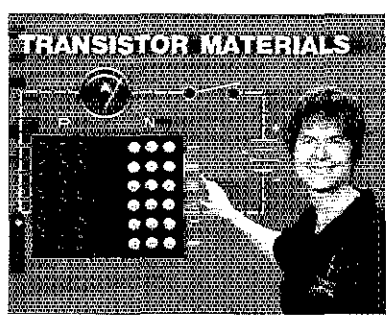

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Start with something simple, an FM mobile rig in your car, perhaps, or a compact hand-held radio, and follow your interests wherever they lead. You'll be underway...able to talk to friends (old and new) at home or in your car—always prepared for emergencies.

Plus...with packet radio (ham radio's "computer revolution"), you can access an exciting worldwide network of Amateur Radio computer bulletin boards and personal electronic mailboxes.

So what are you waiting for?

With your new license, the world of Amateur Radio awaits you. Pass your written exam now with the ARRL Technician Class Video Course...and **get in on the fun!**

Order Your Course Today—Risk Free!

Order Risk Free

We're so sure you'll do well on your exam with the Technician Class Video Course that we make this guarantee:

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2. You will pass your FCC written exam with the ARRL Technician Class Video Course within one year, or return it and we'll refund your money. Every penny. **You pass, or you don't pay!** (Include a dated proof of purchase and the date and location of your VEC-administered exam session when you return your course.) **And...**

3. In addition, the veteran hams at ARRL Headquarters in Newington, Connecticut, stand ready to answer your questions and provide expert advice and information. **We won't let you fail.**

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The ARRL Technician Class Computerized Exam Review is a fun, user-friendly program that lets you choose questions by subject, or take them all.

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Plus... the program selects unanswered or previously missed questions, tracks your progress, and gives you a personal Report Card so you can watch your score improve!

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Technician Class Computerized Exam Review

❑ Macintosh ❑ IBM Compatible (512k, hard drive)

Specify ❑ 3½" ❑ 5¼" Disks

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TOTAL AMOUNT $ _____

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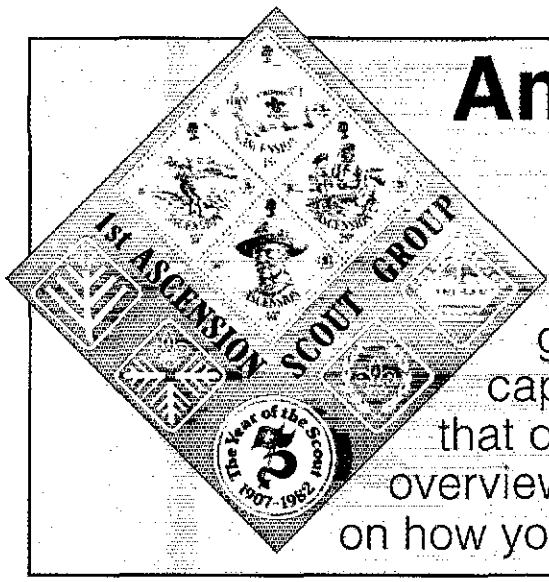
225 Main Street, Newington, CT 06111
203-666-1541 • Fax 203-665-7531



Amateur Radio Postage Stamps

Many postage stamps are objects of great beauty. And what stamps could capture a ham's interest better than those that depict Amateur Radio! Here is an overview of ham radio stamps and information on how you can start your own mini-collection.

By Bill Welsh,W6DDB
45527 3rd Street East
Lancaster, CA 93535-1802

I am not a philatelist (stamp collector), but my wife's collection of Amateur Radio stamps caught my attention. It seems reasonable to assume that many amateurs might like to know about postage stamps associated with Amateur Radio. This article is primarily for amateurs who are not necessarily experienced philatelists, but who might become interested in acquiring an interesting set of Amateur Radio stamps.

Amateur Radio Stamps

Different people have different opinions regarding which postage stamps are (and are not) "Amateur Radio stamps." I have made my own arbitrary choices and have found two groups of stamps that might be of interest to hams. The sidebar to this article entitled, "Amateur Radio Postage Stamps," is restricted to postage stamps honoring anniversaries of amateur organizations, DXpeditions, ham events, and individual amateurs, and also includes stamps that show amateur accessories or equipment.

A further listing, "Electronics and Communications Postage Stamps," which lists stamps that show radio and electronics inventors and pioneers, ITU anniversaries, and telephone and television subjects, has also been compiled by the author. It is available free from the ARRL. Address your request for the STAMP LIST to: Technical Department Secretary, ARRL, 225 Main Street, Newington, CT 06111. Please enclose a business-size SASE. This second list is just representative, since there is almost no limit to the subjects one might categorize as being indirectly related to ham radio.Where date of issue, face value of stamp, and catalog numbers are missing

Stamp Catalog Companies

The stamp list in this article includes well known catalog numbers that make it easier for readers to identify the stamps to dealers. U.S. stamp dealers almost always use Scott Publishing Company numbers. The stamp catalog companies referenced herein are as follows:

Scott (SC- numbers)
Scott Publishing Company
911 Vandemark Road
Sidney, Ohio 45365
(Scott catalog numbers are used with the permission of the Scott Publishing Company)

Michel (MI- numbers)
Schwaneberger Verlag GmbH
Muthmannstrasse 4
80939 München, Germany
(The use of the Michel catalogue numbers is made with the kind permission of Schwaneberger Verlag of Munich)

Minkus (MN- numbers)
Novus Debut, Inc
PO Box 806
Fort Mill, SC 29715
(Minkus catalogue numbers used with permission of Novus Debut, Inc., Fort Mill, S.C., USA, publishers Minkus stamp albums)

Stanley Gibbons (SG- numbers)
Stanley Gibbons Publications Limited
Parkside, Christchurch Road
B H24 3SH Ringwood Hants, United Kingdom
(Stanley Gibbons catalogue numbers used with permission of Stanley Gibbons Publications Limited)

Yvert & Tellier (YT- numbers)
Editions Yvert & Tellier
37, rue des Jacobins
F 80036 Amiens Cedex, France
(Yvert & Tellier catalogue numbers used with permission of Editions Yvert &Tellier)

Vic Clark, W4KFC

One ham who deserves special mention when discussing Amateur Radio stamps is Vic Clark. Vic was a superb operator of many decades' standing and a consummate gentleman, both in his personal dealings and on the air as a perennially active ham. No one who met Vic could ever forget him.

Vic was licensed as a teen-ager as W6KFC, during the days that his home in Arizona was in the sixth call area. He eventually settled in Virginia, and was issued the call that became so familiar to his fellow traffic handlers, contesters, and DXers—W4KFC. Vic was an active member of the ARRL for many years, and was Director of the Roanoke Division from 1967 until 1974. He was elected President of the League in 1982, and served in that office until he became a Silent Key in 1983.

One of the many things Vic did for our hobby was to kindle a lasting interest in postage stamps related to Amateur Radio. In addition to getting amateurs interested in such stamps, Vic was instrumental in prompting a number of countries around the world to issue Amateur Radio stamps. His efforts resulted in several stamps being issued even after Vic became a Silent Key.

from these lists, it is because they were not known when this article was being prepared.

Purchasing Stamps from Dealers

When attempting to purchase a desired stamp, it is essential to provide the stamp dealer with as much information as you can gather—the country of origin, catalog number, date of issue, postage amount, and subject matter. Stamp dealers are unlikely to work on stamp requests from people who fail to supply essential information.

The two sidebars listing stamps give catalog numbers from several well-known stamp catalogs. The sidebar, "Stamp Catalog Companies," gives the names and mailing addresses of those companies. The author appreciates the permission of those companies to use their catalog numbers in this article.

Some of the stamps you may want to collect are only sold as parts of stamp sets, as shown in the title photo. Most stamp sets consist of several stamps. In some cases, just one stamp in a stamp set is related to Amateur Radio, but you must usually purchase the entire stamp set to get that one desired stamp. Stamp sets are listed as "s/s" in the lists in this article. If the catalog number of an Amateur Radio stamp in a stamp set is known, that number is also given, since you might be able to purchase such a stamp separately.

In catalogs or stamp descriptions, you will see five symbols that are commonly used in stamp collecting (Fig 1). These listings are commonly used, so you can easily learn to understand the condition of a stamp being offered by mail.

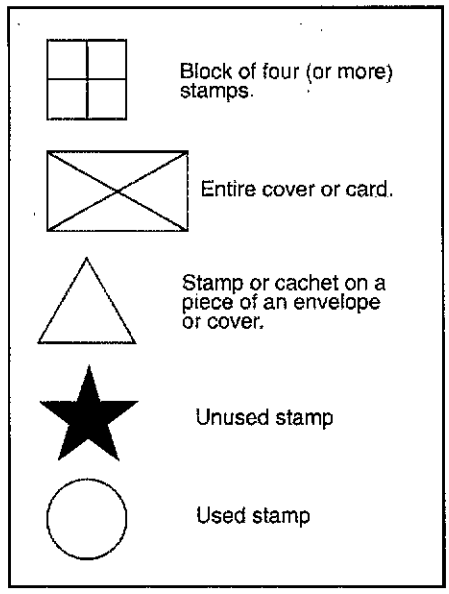


Fig 1—Common stamp symbols used in catalogs and stamp lists.

Alas, stamp dealers are not consistent with regard to stamp prices. Prices often vary by a ratio as large as five to one between dealers selling the same stamp. The good news is that Amateur Radio stamps are not expensive. In fact, virtually every Amateur Radio stamp or set retails for less than $5.00, with most retailing in the $1.00 to $3.00 range. The bad news is that, although the stamps are inexpensive, few dealers will have any of them in stock; other than the two dealers listed as Amateur Radio stamp dealers in the sidebar, "Sources of Help."

Variations on the Theme

In addition to the individual stamps, there are a number of items that you might be interested in, such as souvenir sheets, first-day covers (FDCs) and their associated cachets, imperforates and maximum cards.

Souvenir sheets (Fig 2) are small sheets with stamps printed on them, but with extra wording printed on the margins of the sheet. The extra wording usually provides descriptive information of the stamp of the event depicted.

A first-day cover (Fig 3) consists of an envelope that is franked with a stamp of interest and which is postmarked from the point of interest on the first day the stamp is available. Most first-day covers include a front, left-side cachet that contains a picture or line drawing of the associated event or person. Amateur Radio first-day covers are often related to DX-peditions and organization anniversaries.

Imperforates are stamps that do not have the perforations between stamps to allow the stamps to be pulled apart. Such stamps are usually cut using scissors. Limited numbers of the Djibouti, French Southern Antarctic Territories and Nicaragua Amateur Radio stamps are known to be issued as imperforates.

Maximum cards (Fig 4) are usually larger than a standard-size postcard. They show a picture of the stamp of interest (or material associated with that stamp) and are franked with that stamp. The stamp is cancelled either on the first day it became available, or on a date related to the person or event depicted on the stamp. Pictures on these cards are almost always in color.

Removing Stamps from Envelopes

When stamps have been attached to envelopes with their own glue, they can be soaked off envelopes easily. Separate envelopes according to colors. Cut the stamps off the envelopes, leaving a paper border of about one-eighth inch around each stamp or group of stamps.

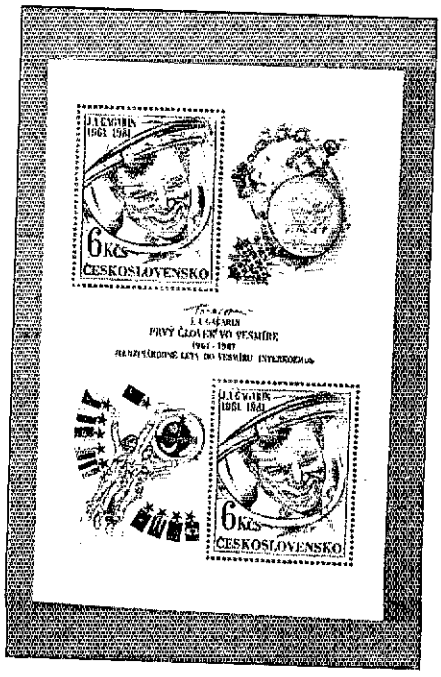


Fig 2—A souvenir sheet.

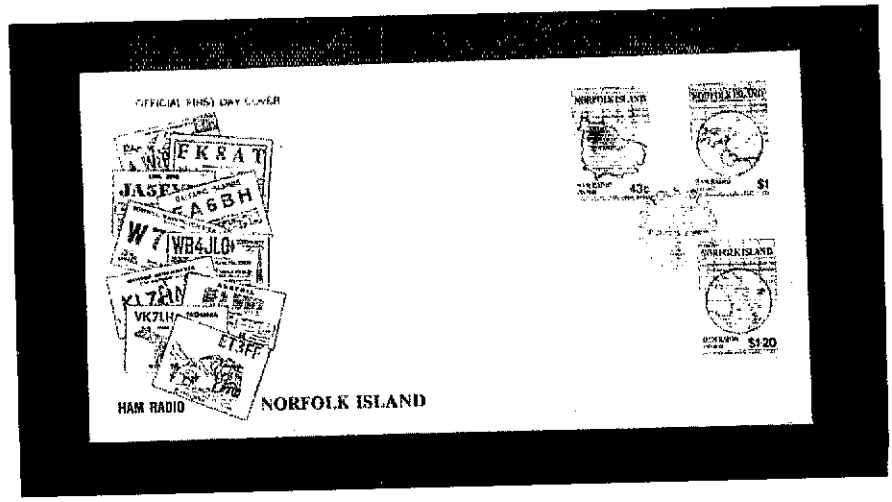


Fig 3—A first-day cover

Amateur Radio Postage Stamps

Argentina
1 Nov 1980
The Radio Club of Argentina
7 pesos MC-1496 SC-1287 SG-1689 YT-1233
28 Dec 1991
LUSAT 1 Amateur Radio satellite
4000 and 4000A

Ascension Island
22 Feb 1982
Boy Scout Jamboree (the 25-pence stamp shows ZD8JAM)
10 pence SC-301
15 pence SC-302
25 pence MC-308 SC-303 SG-311 YT-305
40 pence MC-309 SC-304 SG-312 YT-306
(s/s SC-304A, for SC-301 through SC-304)

Australia
22 May 1985
Stamped envelope; 75th anniversary of the Wireless Institute of Australia
33 cents

Bolivia
26 Mar 1979
38th anniversary of the Radio Club of Bolivia
3 pesos MC-952 SC-638 SG-1032 YT-584
1 Mar 1991
50th anniversary of the Radio Club of Bolivia
2.40 Bs MC-1136 SC-819

Brazil
5 Nov 1977
Brazilian Amateur Radio Day
1.30 cruzei MC-1625 MN-1742 SC-1533 SG-1686 YT-1285

Bulgaria
10 Dec 1986
60th anniversary of the Bulgarian Amateur Radio Club
13 stontinki MC-3517 SC-3207 SG-3383

Chile
29 Dec 1982
60th anniversary of the Radio Club of Chile
7 peseos MC-1004 SC-631D SG-934

Colombia
26 Jun 1959
Luz Marina Zuruaga (HK6LT), Miss Universe
10 centavos SC-697
10 May 1973
40th anniversary of the Radio Amateurs League
60 centavos MC-1245 MN-1269 SC-813 SG-1333 YT-668
11 Jun 1983
50th anniversary of the Columbia Radio Amateurs League
12 pesos MC-1613 SC-C735 SG-1684 YT-722

Costa Rica
16 Apr 1975
16th Convention of Federation Radio Amateur Clubs
1.00 colones MC-912 MN-1185 SC-C633 SG-998 YT-A620
1.10 colones MC-913 MN-1186 SC-C634 SG-999 YT-A621
2.00 colones MC-914 MN-1187 SC-C635 SG-1000 YT-A622

Czechoslovakia
28 Mar 1959
10th anniversary of Radiosport
60 heleru MN-1258 SC-910
(of s/s SC-908/910)

Djibouti
25 Jun 1981
Djibouti Radio Club
250 francs MC-303 SC-528 SG-815 YT-534

Dominican Republic
8 Oct 1976
50th anniversary of the Dominican Republic Radio Club
6 centavos MC-1140 MN-1283 SC-773 SG-1271 YT-797
10 centavos MC-1141 MN-1284 SC-C246 SG-1272 YT-A291
25 Jan 1979
Beate Island DXpedition
10 centavos MC-1215 MN-1358 SC-C286 SG-1348 YT-A330
3 Oct 1980
Catalina Island DXpedition
7 centavos MC-1281 SC-C320 SG-1418 YT-A366

French South Antarctic Territory
1993
Amateur Radio
SC-C124

East Germany
8 Aug 1972
Society for Sports and Technology
25 pfennigs MC-1776 MN-1682 SC-1391 SG-E1494 YT-1463 (SC-1391 of s/s SC-1388/1391)

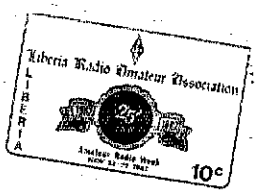
West Germany
12 Jul 1979
WARC (shows a KWM-2 tuned to 21.275 MHz)
60 pfennigs SC-1295
25 May 1973
O. Maksymillian Kolbe, SP3RN
40 pfennigs SC-1116

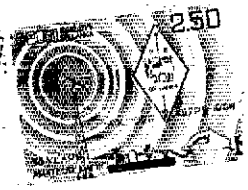
Indonesia
Oct 1991
8th IARU Region III Conference
30 Rp SC-1477

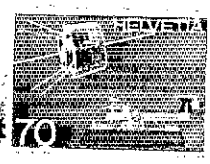
Israel
14 Jun 1987
40th anniversary of the Israel Radio Amateurs; club station 4X4Z
2.50 nis MC-1063 SC-964 SG-1027

Japan
24 Sep 1977
50th anniversary of the Japanese Amateur Radio League
50 yen MC-1336 MN-1394 SC-1312 SG-1476 YT-1238

Jordan
11 Aug 1983
Royal Jordanian Amateur Radio Society and King Hussein, JY1
10 fils MC-1228 MN-1318 SC-1156 SG-1375 YT-1102
25 fils MC-1229 MN-1319 SC-1157 SG-1376 YT-1103
40 fils MC-1230 MN-1320 SC-1158 SG-1377 YT-1104
50 fils MC-1231 MN-1321 SC-1159 SG-1378 YT-1105
100 fils MC-1232 MN-1322 SC-1160 SG-1379 YT-1106







Liberia
23 Nov 1987
25th anniversary of the Liberian Radio Amateur Society
10 c Jubilee Emblem
MC-1374 SC-1061
SG-1650
10 c Village
MC-1375 SC-1062
SG-1651
35 c Jubilee Award
MC-1376 SC-1063
SG-1652
35 c Flag and Award
MC-1377 SC-1064
SG-1653

Luxembourg
9 Mar 1987
50th anniversary of Amateur Radio in Luxembourg
12 francs MC-1173
SC-767 SG-1201

Morocco
9 Jul 1957
King Hassan, CN8AA
15 francs SC-16

New Caledonia
7 Jan 1987
25th anniversary of the New Caledonia Radio Amateur Association
64 francs MC-797
SC-C211 SG-801

Nicaragua
7 Oct 1983
Radio Amateur Federations of Central America and Panama
1 cordoba MC-2447
SC-1296 SG-2534
YT-1298
4 cordoba MC-2448
SC-1297 SG-2535
YT-1299

Norfolk Island
9 Apr 1991
Amateur Radio; call signs of five operators
43 cents MC-499 SC-501
1 dollar MC-500 SC-502
1.20 dollar MC-501
SC-503

Oman
1985
Sultan Qaboos Bin Said, A4XAA
2.50 baisa

23 Dec 1987
15th anniversary of the Royal Omani Amateur Radio Society
1.30 baisa MC-316
SC-306 SG-347

Peru
55th anniversary of the Amateur Radio Service
1300 sol MC-1303
SC-860 SG-1615

Poland
26 Jun 1961
Conference of Communications Ministers in Communist Countries
40 gr MN-1320 SC-991
60 gr MN-1321 SC-992
2.30 zlotys SC-993
(PZ club logo)
(s/s MN-1321A and SC-993A)

15 Apr 1975
IARU Region I Conference
1.50 zlotys MC-2368
MN-2453 SC-2088
SG-2356 YT-2207

1980
Postal card; 50th anniversary of Polish amateur radio society
2.00 zlotys

10 Oct 1982
O. Maksymillian Kolbe, SP3RN
27 zlotys

Russia
20 May 1973
Ernst Krenkel, RAEM
4 kopecks MN-4234
SC-4084

23 Feb 1979
RS-1 and RS-2 Amateur Radio satellites
4 kopecks MC-4820
MN-4932 SC-4733
SG-4860 YT-4576

25 Dec 1979
Ernst Krenkel, RAEM
4 kopecks SC-4801 (of s/s SC-4799/4801)

12 Mar 1981
30th All Unions Amateur Radio Exhibition (design contest)
4 kopecks MC-5048
MN-5159 SC-4917
SG-5089 YT-4785

1 Sep 1983
Radiotelegraphy Championship
6 kopecks MC-5306
SC-5174 SG-5357

San Marino
28 Apr 1983
World Communications Year honors Amateur Radio Society of San Marino
400 lira MC-1280
MN-1398 SC-1051
SG-1206

Solomon Islands
19 Dec 1983
Radio Society, H44SI
18 cents MC-519
SC-512 SG-509 YT-500

Spain
King Juan Carlos, EA0JC, and family
2 peseta MN-2381
SC-1927 (Queen)
3 peseta MN-2382
SC-1928
12 peseta MN-2383
SC-1929
MN-2384 SC-1930

King Juan Carlos, EA0JC
SC-2367

Sri Lanka
17 Jan 1983
55th Anniversary of Amateur Radio
2.50 rupee MC-603
SG-785 YT-620
SC-655 (of s/s SC-653/657)

Switzerland
6 Sep 1979
50th Anniversary of the Swiss Amateur Radio Union
70 centimes
MC-1163 SG-983
YT-1094
SC-679 (of s/s SC-677/680)

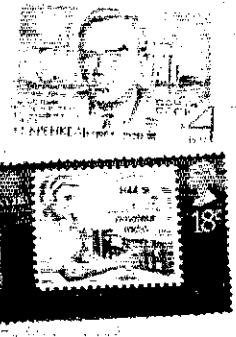
Thailand
5 Dec 1980
King Bhumibol Adulyadeji, HS1A
25 satangs SC-933

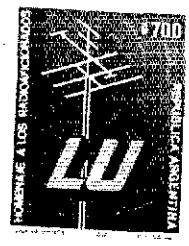
United States
15 Dec 1964
Amateur Radio; issued on the 50th Anniversary of ARRL
5 cents MC-875
SC-1260 SG-1242
YT-776

Uruguay
16 Apr 1984
50th Anniversary of the Radio Club of Uruguay
7 pesos MC-1691
MN-1319 SC-1157
SG-1835 YT-1142

Venezuela
18 Nov 1983
50th Anniversary of the Radio Club of Venezuela
2.70 bolivars
MC-2281 SC-1323
SG-2524 YT-1156

Yugoslavia
23 May 1966
20th Anniversary of Amateur Radio in Yugoslavia
85 paras MC-1157
MN-1443 SC-809
SG-1205 YT-1050





Soak stamps that are on envelopes of one color paper together, and separate from stamps on any other color of envelope paper. Soak each group of stamps in a basin (or sink) filled with warm water until they easily peel off the paper. Position each stamp face-down on a newspaper and leave it there until it dries.

If you serious about collecting stamps, check your local library for a basic stamp-collecting book. It's quite easy to damage stamps and thereby reduce their value if you don't know what you're doing!

Summary

I hope that this introduction to Amateur Radio stamps has made you interested in learning more about philately, and perhaps created enough interest to cause you to want to buy a few of these small, but beautiful pieces of amateur history. There are not many stamps that are directly related to our hobby, and it requires some effort to collect the ones that do exist.

If you become aware of additions or corrections that would improve the lists in this article, please send them to the author.

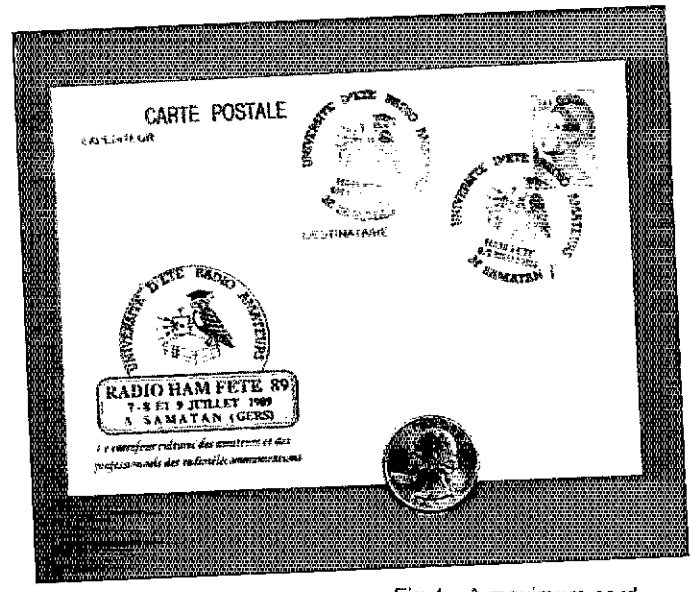


Fig 4—A maximum card.

Sources of Help

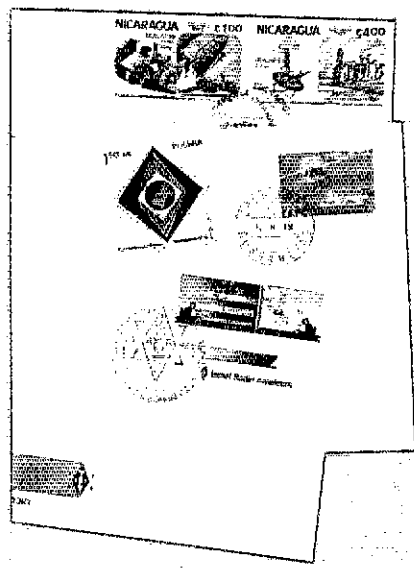
Readers who want more information and help in finding these Amateur Radio stamps (or any others) may contact the following sources for the help as indicated below each entry:

Phil Sager, WB4FDT
PO Box 327
Ruston, LA 71273
Amateur radio stamp dealer

William Littlewood, W9HE
Littlewood's Stamps
PO Box 681
Brookfield, WI 53008
Amateur radio stamp dealer

Taizo Arakawa, JA3AER/N2ATT/GW0RTA
5 St. John's Close, Hawarden, Deeside
B CH5 3QJ Clwyd, United Kingdom
List of stamps

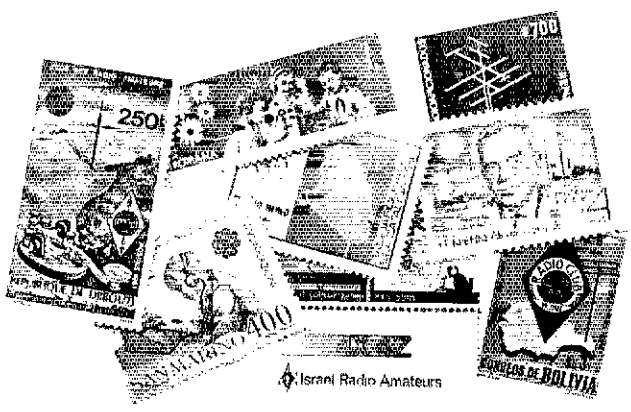
Manfred Bussemer, DL4UE
Ham Stamps Club
Eckstrasse 1
D-6792 Ramstein, Germany
Excellent ham stamps catalog

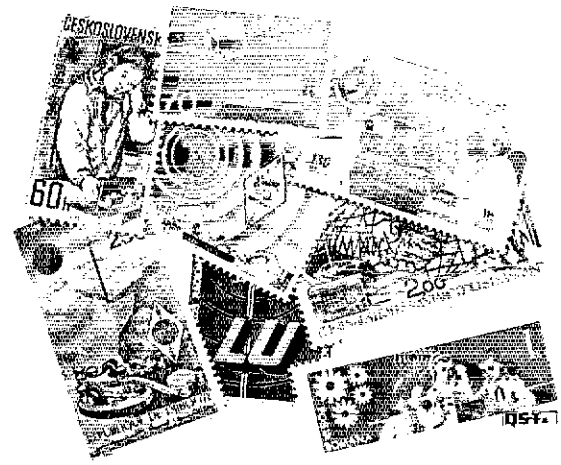


Neil Carleton
PO Box 1644
Almonte, Ontario, Canada K0A IA0
Annual radio stamps bibliography. Radio Stamps column in the *Journal of the North American Shortwave Association*. A radio stamps program is broadcast by shortwave broadcasting station HCJB on the first Saturday of each month. The address for HCJB is Casilla 691, Quito, Ecuador. Neil can provide time and frequency information for these broadcasts.

Fried Heyn, WA6WZO
962 Cheyenne
Costa Mesa, CA 92626
Stamp list
Excellent stamp collection

Gary G. Loser, N9DWT
PO Box 406
704 Northbrook Drive
Minier, IL 61759-0406
Amateur stamp list





An Inexpensive SSTV System

Simple hardware and flexible software can provide you with an SSTV system capable of excellent results!

By Ben Vester, K3BC
4921 Bonnie Branch Rd
Ellicott City, MD 21043

John Langner's great article on Slow-Scan TV[1] really got my interest. John's statement"...be sure to use an external crystal-controlled timing source...any attempt to use software timing loops is doomed to failure" was just too much of a challenge to ignore! I'd made some respec-table 64-color (gray shade) weather-fax receiving systems[2,3] for the Commodore and IBM computers using a simple interface between the receiver and computer. It didn't appear that demodulating an SSTV signal would be that much more difficult. What I wound up with is a color SSTV/FAX480/weatherfax system for IBM PCs and compatibles that is essentially 99% software! And this system *transmits,* too![4] I heartily recommend that you read John's article to fill in the gaps and learn something about the techniques and history of SSTV.

My work is aimed at the experimentally inclined, so if you're not familiar with BASIC programming, be prepared to learn a little about it if you want to maximize the utility of this system.

Hardware

Fig 1 (next page) shows a simple circuit used for receiving and transmitting. Connect the output of T2 to the phone patch input (often labeled **LINE INPUT**) of your transceiver. If you already have a phone patch, you can eliminate T2, and connect the line directly to the patch's phone-line terminals. All patches I know of employ transformer isolation, but a simple ohmmeter check will verify that is true of *your* patch. (I avoid using the transceiver's mike input because of the possibility of RF feedback problems.) RX is chosen to set the proper level for the audio going to the transmitter. We're using a 100% duty cycle signal, so you must set the audio signal to the transceiver at a level it can handle without overheating. With my transceiver, I went directly to the phone patch with an RX value of 43 kΩ.

I've not included any low-pass filtering in the audio line between the computer output and transmitter audio input. My on-the-air checks with many stations reveal no additional external filtering is required when using SSB transmitters equipped with mechanical or crystal filters. If you intend to use this circuit with an AM or phasing-type SSB rig (or with VHF/UHF FM transmitters), audio filtering is required to provide the required spectral purity. An elliptical low-pass filter such as described by Campbell[5] should be adequate for most of these cases, but I have not specifically addressed this.

Circuit component values aren't critical nor is the circuit's physical construction. *Do* use a socket for the IC. A PC board is available from FAR Circuits,[6] but perfboard construction employing short leads works fine.

The Computer

The most important piece of hardware is the computer, which should have an 80286 (or better) microprocessor; a '386 machine running at 16 or 33 MHz definitely gives better results. You need a VGA color monitor that can provide a 640 × 480, 256-color noninterlaced display and a VGA (usually identified as SVGA) video adapter card that offers a 640 × 480 × 256-color mode.[7] The software directly addresses six of the most common SVGA chip types and also includes a VESA standard choice. If your video adapter card doesn't match one of the six, you'll need a VESA driver for your specific card. If you have trouble finding a driver, try some

[1]Notes appear on page 29.

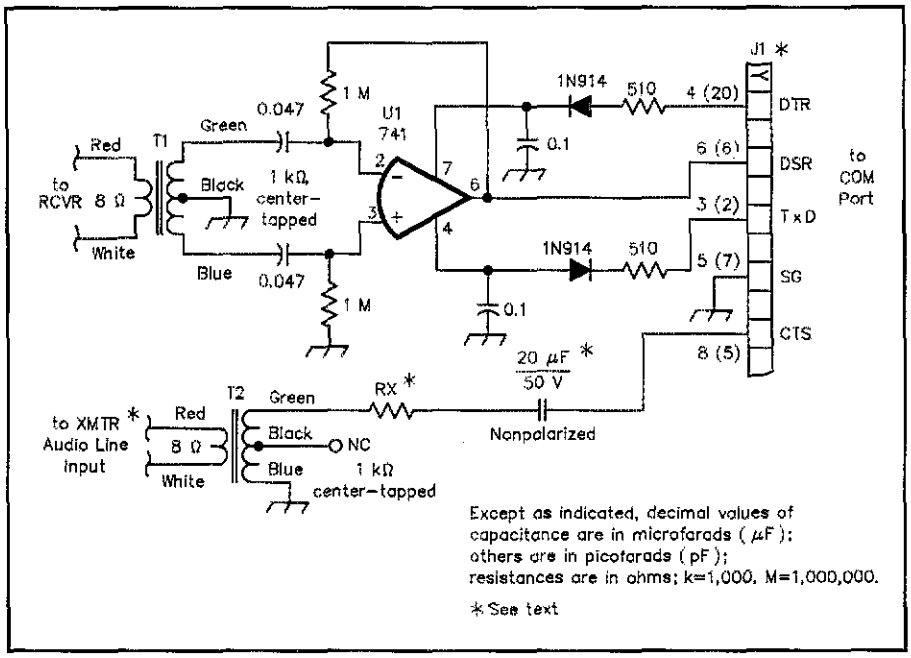


Fig 1—Schematic of the simple SSTV receive and transmit circuit. This circuit is based on one that appears in the September 1991 Technical Correspondence column (see Note 3). T1 and T2 are Radio Shack 273-1380 audio-output transformers; The 20-μF, 50-V capacitor is a parallel combination of two Radio Shack 272-999 10-μF, 50-V nonpolarized capacitors; equivalent parts can be substituted. See text for value of RX. Unless otherwise specified, resistors are ¼-W, 5%-tolerance carbon-composition or film units. An optional low-pass filter can be used between the output of the computer and the transmitter's audio-input line (see text). At J1, numbers in parentheses are for 25-pin connectors; other numbers are for 9-pin connectors.

computer BBSes; I'm told that the Steve Rimmer BBS (tel 416-729-4609) has many video drivers.

Software

As with my earlier weatherfax programs, I've used GWBASIC as the programming tool. Although the guts of the program are contained in assembly language code (.ASM files), this code is available to the program (and you) through BASIC. All of the modifications to the core programs (.ASM files) that adapt them to the multitude of SSTV/FAX modes are accomplished using BASIC POKEs. This allows experimenters with even a limited knowledge of BASIC programming to make modifications that add other modes, etc. In deference to a few of my friends who complained about learning any BASIC, I have included a system configuration list in the programs. The program uses this list to determine which POKEs to make. This system is strictly keyboard controlled. The software uses a unique technique to get wider color definition than is normally available with a 256-color video card. The pictures in this article illustrate its effectiveness!

FAX480 Influence

Ralph Taggart, WB8DQT, introduced his FAX480 mode while I was in the midst of developing this program. With the flexibility of my software structure, I was able to add FAX480 capability to the available modes within a couple of hours. Since my processing was set up for 64 shades of gray, I kept it for this mode.

Some Program Details

One of the common SSTV practices is to retransmit a picture you just received so other SSTVers not copying the originating station can see the image. This capability is included.

RT.BAS is the receive and retransmit program. On receive, you simply choose the mode from a menu, and wait for the picture transmission to complete. As of this writing, Robot 36 and 72 modes are available in either a synchronous or a line-synced mode. Other modes (all synchronous) are Scottie 1 and 2, Martin 1 and 2, AVT90, AVT94, Wraase 96, FAX480 and weatherfax.

When receiving, if you fail to get the mode selection made in time to catch the frame sync, you can go directly to copying by pressing the keyboard's spacebar. On all but the AVT modes, the next line sync is picked up and starts the picture. The AVT modes copy out of sync. Because the program allows you to scroll horizontally across the RGB color frames, you can resync after the picture has been received. A few images I've copied have nonstandard color registration, so I also included the ability to adjust color registration after the picture is received. You also can save the picture—usually after you have scrolled the picture so the CRT screen frames just the part you want to keep.

TX.BAS is used for transmitting any picture file. When queried, you provide the mode and the file name, and after a brief pause while the picture loads, press G(o) to transmit. To avoid additional switching complexity, VOX transmitter switching is used.

VU.BAS allows you to view a picture. It has the same adjustments available as *RT.BAS*. One feature (applicable only to the Robot modes) is the ability to "retune" the picture (in 10-Hz increments) as you view its color balance.

SLIDESHO.BAS gives you the vehicle to display a bunch of pictures as a slide show. Place *SLIDESHO.BAS* in a directory contained in your PATH statement so it can be called up from anywhere.

TIFCONV.BAS converts 640 × 480, 24-bit color, TIFF pictures into a format that can be transmitted by any of the supported SSTV modes except Robot. In my experience, TIFF is the most common format used to transfer higher-resolution pictures between programs. I've used this program with the Computer Eyes/RT[8] and Software Systems Consulting[9] frame grabbers. The picture output from this program can be viewed with *VU.BAS* and, of course, is bound by 320 × 240 with 18-bit color.

LABEL.BAS allows you to add call signs and other text to the SSTV pictures. It takes any black-and-white TIFF (ie, 1-bit) file and creates a mask cutout where the black is. You can superimpose the cutout over an SSTV picture either in any color you want, or transfer a cutout of any background file you find interesting. The letters will then look like they were cut out of the background picture. Obviously, you can use squares or circles in addition to fonts to transfer a piece of one file onto another one. I use a cheap hand scanner to capture interesting fonts I find. You can get a three-dimensional effect by painting a color through the mask, then moving the mask a few pixels and rerunning the data through *LABEL* with a background file or another color. Or, run several different masks through *LABEL* in sequence to obtain different colors or patterns on different letters.

Summary

Here, then, is a brief description of a fundamental color-SSTV/FAX480 weather-fax system constructed almost entirely of software (I'm still working on it). The software is *free*, is not copy protected and can be obtained from the ARRL BBS (203-666-0578). Have fun—you've got lots to experiment with!

Notes

[1]J. Langner, "Slow-Scan TV—It Isn't Expensive Anymore!", *QST*, Jan 1993, pp 20-30.

[2]B. Vester, "C64 WEFAX Improvements," Technical Correspondence, *QST*, Jan 1988, pp 47-49.

[3]B. Vester, "Improved HF Weather Facsimile Programs," Technical Correspondence, *QST*, Sep 1991, pp 40-41.

[4]The software is available free from the author and can be downloaded as VESTER.ZIP from the ARRL BBS (203-666-0578).

[5]R. Campbell, "High-Performance, Single-Signal Direct-Conversion Receivers," *QST*, Jan 1993, pp 32-40. See also Feedback, *QST*, Apr 1993, p 75.

[6]FAR Circuits, 18N640 Field Court, Dundee, IL 60118-9269. The PC-board is $4.50, plus $1.50 shipping.

[7]Picture quality is degraded with an interlaced display. Few, if any, newer displays are interlaced at 640 × 480.

[8]ComputerEyes R/T by Digital Vision, Inc, 270 Bridge St, Dedham, MA, tel 617-329-5400, BBS 617-329-8387.

[9]Software Systems Consulting, 615 S El Camino Real, San Clemente, CA 92672, tel 714-498-5784, fax 714-498-0568.

Ben Vester was first licensed in 1945 and formerly held the call W3TLN. He retired in 1984 after a 34-year career with Westinghouse in the aerospace industry. He holds a BSEE from Virginia Polytechnic Institute, an MSEE from Johns Hopkins and an SEP from Stanford.

Some may remember his article, "Surplus-Crystal High-Frequency Filters" (QST Jan 1959, pp 24-27), which was followed by the article "Mobile S.S.B. Transceiver" (QST, Jun 1959, pp 11-17 and 164) which used one of those filters and had about half the then-normal tube count. Two other articles written by Ben received QST Cover Plaque awards: "A Solid-State S.S.B. Transceiver" (QST, Jun 1963, pp 27-33) and "The Half-Square Antenna" (QST, Mar 1974, pp 11-14). Ben's other joy is sailing. QST

The Nearly Perfect Amplifier

Have you ever bought a car and thought that everything about it was perfect? Or do you always wish it had a few other nifty or safety features? It's the same with ham power amplifiers. Here are some modifications that will add some nifty and safety features—to the amplifiers, not the cars.

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

After the article "Circuit Improvements for the Heath SB-220 Amplifier" was published in the November and December 1990 issues of *QST*, I began to receive letters and phone calls from Amateur Radio operators who were contemplating buying an HF amplifier. They wanted to buy an amplifier that needs no circuit improvements—that is, a perfect amplifier. What follows is a discussion of some design features that—in my opinion—would be present in a perfect, or a nearly perfect, amplifier.

Cathode Considerations

In a directly heated cathode, a ditungsten carbide layer on the hot tungsten (alloyed with about 1.5% thorium) filament wire emits electrons. In an indirectly heated cathode, the filament (the heater) heats a nickel cylinder that is coated with strontium oxide and barium oxide. This coating is relatively frangible, but highly emissive.

Ditungsten carbide is commonly made by heating tungsten in an atmosphere of acetylene (C_2H_2) gas. Carbon atoms in the gas break their bonds with hydrogen atoms and bond with tungsten atoms to form ditungsten carbide on the surface of the filament wire. Since it is atomically linked to the underlying wire, the ditungsten carbide layer is very durable. During use, the process reverses. Ditungsten carbide gradually loses carbon and changes back to tungsten. Extra heat exponentially accelerates this process. The cathode is worn out when the carbon is mostly used up.

After their cathodes are worn out, large external-anode amplifier tubes are commonly "recarburized" with acetylene, vacuum pumped, and resealed. This restores full emission. Although it is possible to recarburize a 3-500Z, doing so is not economically feasible.

Each type of cathode has advantages and disadvantages. A nickel cylinder has much less inductance than a tungsten wire. Directly heated cathodes are relatively poor performers above the low VHF range, whereas some indirectly heated cathodes can perform satisfactorily at 2500 MHz. A directly heated cathode typically warms up in less than one second, while few indirectly heated cathodes can warm up safely in one minute (three to five minutes is not uncommon). However, the major disadvantage of indirectly heated cathode amplifier tubes is cost. In terms of dollars per watt, they are much more costly than 3-500Zs.

Cathodes deserve respect. Filament voltage and filament inrush current are areas of special concern.

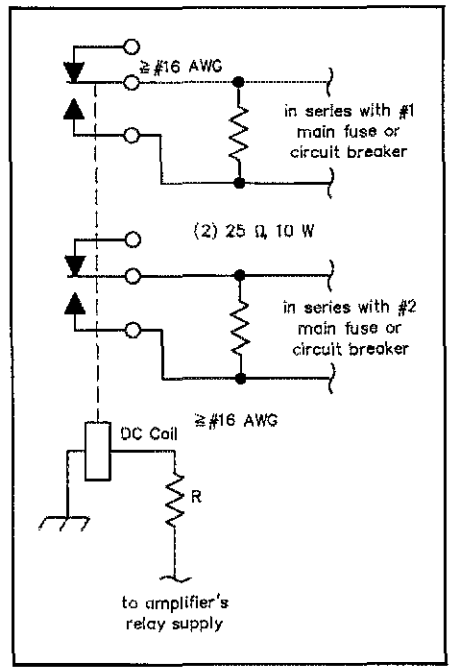


Fig 1—Step-start circuit for amplifiers that are designed for dual-voltage operation (120/240 V). In effect, the timing capacitor for the circuit is the high-voltage filter capacitor. The relay's coil voltage is approximately the same as the dc output voltage of the amplifier's relay supply. A contact rating of 10 A is adequate for 1500-W amplifiers. Adjust R for relay pull-in when the high voltage reaches about 65% of normal after turn-on. Typical pull-in time is 1 ± 0.5 second. R will be roughly half of the relay's dc coil resistance.

Filament Voltage

For optimum life from a directly heated cathode, the filament voltage should be just above the voltage where PEP output begins to decrease. As the cathode ages, filament voltage needs to be increased gradually to restore full output. Using this technique, commercial broadcasters typically achieve an operating life of *22,000 hours* from amplifier tubes with directly heated cathodes.

According to Eimac's *Care and Feeding of Power Grid Tubes*, every 3% rise in directly heated cathode filament voltage results in a 50% decrease in life due to carbon loss. Yes, each additional 3% rise in filament voltage decreases the life *by half*. Expressed mathematically, cathode life is proportional to $[E_1/E_2]^{23.4}$, where E_1 is the lowest filament voltage at which normal PEP output is realized and E_2 is the increased filament voltage.

It's easy to make the filament voltage adjustable when the filament is powered by its own transformer. All that's needed is a small rheostat in series with the primary. For dual-voltage, dual-primary transformers, a dual, ganged rheostat is required. When the filament is powered by a winding on the high voltage transformer, making the filament voltage adjustable is more difficult since the rheostats must be connected to the low voltage secondary winding—and dual, ganged 0.01-Ω, 30-A rheostats are not to be found in your local Radio Shack.

An indirectly heated cathode can be permanently damaged by being operated *below* its rated minimum filament voltage. When operated *above* its maximum filament voltage rating, an indirectly heated cathode quickly boils off emissive material. Errant emissive material is bad news when it lands on the grid. For maximum cathode life in HF service, an indirectly heated cathode should be operated at the rated minimum filament voltage. This can be accomplished best with a regulated dc sup-

ply. Set it once and forget about fluctuations in the electric mains voltage.

Filament Inrush Current

Directly heated cathode filaments are commonly two vertical meshing helices (coils) of tungsten wire that are suspended by their ends (see September 1990 *QST*, page 15). The conductance of tungsten at room temperature is about 8.33 times the conductance at its normal operating temperature. Thus, the start-up current for a 15-ampere filament can be 125 amperes.

In a high-amplification tube such as the 3-500Z, the filament helices clear the grid cage by a distance of only a few thousandths of an inch. If the position of the filament changes, a grid-to-filament short may result. Therefore, it is prudent to limit filament inrush current in order to minimize thermal and magnetic stresses. For many of its smaller directly heated cathode amplifier tubes—such as the 3-400Z and 3-500Z—Eimac recommends that filament inrush current be limited to no more than double the normal current.

Since the grid-to-cathode clearance in an indirectly heated cathode is not affected by movement of the heater inside the rigid nickel cylinder, indirectly heated cathodes are not affected by inrush current.

Measurements

I tested the filament inrush current in a popular factory-built MF/HF amplifier with a pair of 3-500Zs. Since each tube's operating filament current is 14.7 A, the inrush current should not exceed 29.4 A, but I measured 34 A of inrush current per filament. Eimac rates the filament voltage at 4.75 V minimum to 5.25 V maximum but the filament voltage measured 5.31 V. With 4.8 V instead of 5.31 V, the useful life of the 3-500Zs would be about *ten times* longer. I measured the filament voltage in a factory-built single 3-500Z amplifier. The filament voltage was over 5.7 V. At this voltage, the cathode would probably be worn out in 400 hours of operation—and this one was.

The 8877 has a filament voltage rating of 4.75 V minimum to 5.25 V maximum; for HF communications service, the optimum filament voltage is 4.75 V. One popular commercial amplifier operates its 8877 filament at about 5.95 V when the amplifier is operated at the US-standard 120/240 V. Operating an 8877 at a filament voltage of 5.95 V is recommended for those people who have more money than brains.

A Simple ac Voltmeter

For measuring ac filament voltage, linearity at the low end of the meter scale is not important. With this in mind, designing an ac voltmeter using a dc meter movement is much easier than would otherwise be the case. All that's needed is a half-wave rectifier using a Schottky diode, a capacitor and a few resistors. The meter can be the amplifier's multimeter. All that the operator needs is two marks on the meter scale—one for minimum voltage and the other for maximum voltage.

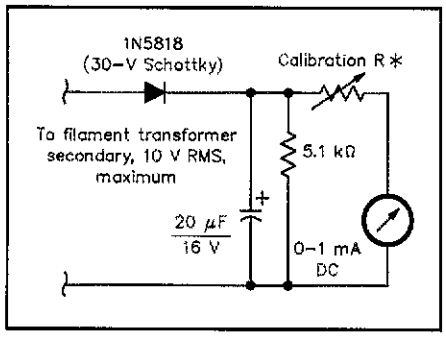


Fig 2—How to measure the ac filament voltage with a dc meter. Calibrate R with a standard voltmeter connected to the filament pins on the tube socket, so as to compensate for the voltage drop in the filament choke.

Grid Protection

I have performed autopsies on too many kaput amplifier tubes that died in HF amplifiers. Some of these tubes had damaged grids—but the damage was the unique type that is caused by VHF or UHF current. I have never found a grid that was damaged by excessive HF grid current. Perhaps this isn't so strange. I'm sure it's possible to roast a grid; tuning up key-down for a couple of minutes on 10 meters with the load capacitor set for 40 meters comes to mind. This would result in high grid current and almost no RF output. However, since most people—myself included—tune a grounded-grid amplifier for maximum RF—and maximum RF virtually coincides with normal grid current—very few people are likely to overheat a grid. Thus, complex electronic grid-protection circuits are unnecessary. A major disadvantage of electronic grid-protection circuits is they are not effective against the major source of grid damage—sudden, large bursts of VHF or UHF grid current. A more foolproof method of protecting the grid is a fuse or fuse resistor. Carbon-film resistors make good grid fuses.

Glitch Protection

During a major glitch, the anode (plate) current meter is subjected to a current surge as the HV filter capacitors discharge. Such a current is typically *several hundred* peak amperes—not exactly courteous treatment for a 1-A meter. However, the peak current will be much higher if a resistor is not used to limit the short circuit current that can be delivered by the HV filter capacitors. The current-limiting resistor is placed in series with the positive output of the filter capacitors. A 10-Ω, 10-W wire-wound resistor is adequate for up to 3 kV and 1 A. Since the current-limiting resistor will be dissipating many kilowatts during a major glitch, it should be a rugged glass-coated (ie, vitreous) type. If a glass-coated resistor opens during a major glitch, it won't be throwing large chunks of shrapnel around—like a rectangular ceramic-cased resistor often does.

If the positive high voltage briefly arcs to chassis ground—because of lint, a tiny insect, an intermittent VHF parasitic, or an errant hair—the negative high-voltage circuit will try to spike to several kilovolts negative. In the real world, this type of glitch is not an uncommon occurrence. Anything that gets in the way of the negative spike may be damaged. Since the grid-current meter is normally connected between chassis ground and the negative high-voltage circuit, the meter can be exposed to kilovolts at hundreds of amperes. I heard about one grid current meter in a homebrew amplifier that *exploded* during a glitch. The glass from the meter landed on the floor.

The easiest way to protect a current meter is to connect a silicon rectifier diode across it or across its shunt resistor. Usually, only one diode (connected with its cathode band to the meter's negative terminal) is needed in parallel with a meter.

It may take more than one diode to protect a meter shunt resistor. A silicon diode begins to conduct at a forward voltage of about 0.5 V. To avoid affecting meter accuracy, the operating voltage per protection diode should not exceed 0.5 V. For example, a 1-Ω shunt, for a reading of 1 A full-scale, has 1 V across it. Thus, two protection diodes would be needed to preserve meter accuracy. If the shunt resistor for a 1-A full-scale meter is 1.5 Ω, three diodes are needed.

Protection diodes should not be petite. Big, ugly diodes with a peak current rating of 200 A or more are best. I have seen smaller diodes—and the meter they were supposed to be protecting—literally blown away by a glitch. After some bitter experiences with lesser diodes, I began using the 1N5401. In small quantities, the 1N5401 costs about 20 cents each. It is rated at 200 A for 8.3 ms, 3 A rms, and 100 PIV. Other diodes from the 1N5400 family will work as well. During an extremely high current surge, a glitch-protection diode may short out—and, by so doing, still protect the precious parts. Replacing a shorted protection diode instead of a blown meter is almost fun.

A brief high-voltage flashover can damage an indirectly heated cathode tube. Here's how: In many amplifiers, one side of the filament/heater is grounded. The cathode is connected to the negative HV circuit. If the negative HV spikes to several kilovolts, the cathode will arc to the grounded filament. At a minimum, this breaks down the insulation between the heater and the cathode. Sometimes the heater wire burns out—and sometimes the cathode arcs to the grounded grid. Either way, the tube is kaput. There have been many 8877s and other indirectly heated cathode amplifier tubes that died this way—all for lack of 60 cents worth of glitch-protection diodes.

So why don't manufacturers of such amplifiers protect the negative HV circuit from spikes? The answer is an electronic

Catch-22. Even though it's likely that no amplifier manufacturer has ever seen a grid that was damaged by HF grid current, they seem to feel that electronic over-current protection for the grid is important. However, electronic over-current "protection" circuits for grids are not compatible with things that limit the voltage from the negative HV circuit to chassis ground. Thus, in an attempt to protect the amplifier tube from one *perceived* problem, designers leave the tube vulnerable to assassination from *common* occurrences.

To prevent the negative HV circuit from spiking to several kilovolts, connect a string of 200-A (or greater) glitch-protection diodes from the negative terminal on the high-voltage filter capacitor to chassis. Each diode will limit the voltage across itself to about 1.5 V. Typically, three diodes are needed—thus limiting the spike to about 4.5 V. The diode polarity is with the cathode band toward the negative high voltage. With one simple wiring change, the same string of diodes can also protect the grid-current meter and the anode-current meter.

Power Supplies

Transformers

Virtually all transformers use paper to separate and insulate each layer of windings, and paper is hygroscopic—it absorbs water vapor from the air. The presence of water reduces the insulating ability of the paper. In time, insulation breakdown is likely. The solution is to pot the windings; plastic resins are best for potting, and petroleum tar is next best. Since potting fills up the air spaces in the windings—and air is a poor heat conductor—potting improves heat transfer, thereby reducing internal temperature and decreasing the likelihood of failure. Potting adds very little to the initial cost of a transformer and subtracts substantially from the long-term cost by increasing the transformer's lifetime.

Filters

Capacitor-filtered power supplies are the norm in Amateur Radio amplifiers, because of their light weight, relative ease of obtaining high dc potentials, good transient-current voltage regulation (a must for SSB), and cost. Since choke and swinging-choke filters can not handle transient current loads, the only alternative for SSB use is a resonant-choke filter, which has advantages and trade-offs. A resonant-choke filter is tricky to tune, heavy, and expensive, and it requires a much-higher bleeder current than a capacitor filter requires. However, a resonant-choke filter demands only about one-sixth as much peak power from the electric mains as a capacitor filter demands. This means that for 120-V operation, where power is much more limited than with 240-V operation, a resonant-choke filter is clearly the better choice.

Rectifiers

The most frequent failure mode for high-voltage power-supply rectifiers is too much reverse current. This problem can be virtually eliminated in full-wave rectifier circuits by making sure that the total peak inverse voltage in each string of diodes exceeds the peak secondary voltage of the high-voltage transformer by a comfortable margin; 50% sounds comfortable to me.

Modern solid-state rectifiers are made differently than they were 30 years ago. In those ancient days, rectifiers did not have uniform capacitance. In an attempt to help equalize the peak reverse currents in series-connected rectifiers, a parallel resistor and capacitor was connected to each rectifier. It was felt that swamping 50 to 100 pF with 10,000 pF (0.01 μF) would help. In practice, it didn't work too well since the tolerance of the capacitors used was typically −20% to +80%. Another problem is that the resistors that were typically used (470 kΩ, 0.5 W) were rated at 250 V absolute maximum. It is hardly safe to use one of these resistors with a 1000-PIV rectifier. As a result, "equalizing" did more unequalizing than anything else. Even after rectifier technology improved, people hung on to the old habit of using parallel resistors and capacitors.

There is a flaw in the logic behind using rectifier equalization. In any series circuit, the currents in all of the elements are exactly equal. Thus, when rectifiers are in series, the reverse-current burden is exactly the same for each rectifier. How is it that something that is already exactly equal needs to be equalized? It should go without saying that series-connected rectifiers should always be of the same type. Mixing rectifiers with different junction capacitances can cause a problem.

There is one instance where equalizing resistors and capacitors are a good idea. Voltage spikes come in two flavors—positive and negative. In a full-wave capacitor-filter rectifier circuit, the energy from positive and negative voltage spikes is simply rectified and harmlessly stored in the filter capacitor. However, in a half-wave rectifier circuit only one polarity is rectified. A voltage spike of the other polarity cannot be absorbed by the filter capacitor. Instead, the potentially destructive spike appears across the rectifiers. Placing a capacitor across each rectifier helps to limit reverse spikes. A better solution is to connect a metal-oxide varistor across each half-wave rectifier—or to use a full-wave rectifier circuit.

Electrolytic Capacitor Equalizing Resistors

A resistor's voltage rating takes precedence over its power rating. One-watt carbon-composition resistors have a maximum voltage rating of 350 V. For example, it takes 469 V to dissipate 1 W in a 220-kΩ resistor ($E=[PR]^{0.5}$). In the past, some amplifier engineers decided that 220-kΩ, 1-W carbon-composition resistors would make good (and cheap) voltage-equalizing resistors for 450-V electrolytic capacitors—considerable overvoltage for 1-W parts! When a carbon-composition resistor is operated above its maximum voltage rating it changes resistance—exactly what you don't want in a voltage divider. Capacitor failure is likely in a string of equal-value electrolytic capacitors connected in series when the voltages across the capacitors is not the same. Even when they are operated within their voltage rating, carbon-composition resistors change resistance with age. Thus, 2-W carbon-composition resistors, which are rated at 500 V, are not the answer. Metal-oxide-film (MOF) resistors are far superior to carbon-composition resistors. A 3-W, 100-kΩ MOF resistor makes an excellent equalizer resistor for 450-V capacitors. Lower values of resistance create extra heat—something that electrolytic capacitors do not tolerate well.

Biasing

The operating bias in most amplifiers is not adjustable; a single Zener diode is typically used. The resulting zero-signal anode current (the idling current) is seldom optimum. Adjustable bias would be nice. The solution: obtain the operating bias from a series string of forward-biased rectifier diodes. By switching the number of diodes in and out with a rotary switch, the bias can be changed in approximately 0.7-V increments.

Another area that could be improved on is the method of bias switching between receive and transmit. In this modern age there is no reason to use a pokey, noisy mechanical relay to switch bias. An opto-isolator coupled to a transistor switch can do this job better and cheaper. An electronic bias switch is more than fast enough to keep up with modern high-speed RF relays.

Electronic bias switches that are RF actuated create two problems. The amplifier tube switches between linear bias and nonlinear bias during softly spoken syllables of speech, causing choppy-sounding audio and splatter. These two problems are eliminated when the electronic bias switch is controlled by the current that passes through the RF-relay's coils.

High-Speed Relays

The switching time of a conventional relay is 15 to 25 ms—switching in a somewhat stentorian manner. Such relays have traditionally been used for RF and bias switching in HF amplifiers. This was acceptable when transceivers also used conventional relays. Currently manufactured transceivers are designed for AMTOR, QSK CW, and reasonably quiet SSB-VOX operation. Such transceivers switch quickly and quietly. Japanese transceivers often use a Matsushita (Panasonic) NR-HD-12V reed relay to switch the RF output. Provided that the SWR isn't ridiculous, this relay can dependably switch 150 W of RF. It works well in an HF amplifier when it is used to switch the input RF signal. This relay is available in the US as a spare part for Kenwood and Yaesu radios.

Although Matsushita refuses to sell its NR-HD-12V relay to US Amateur Radio

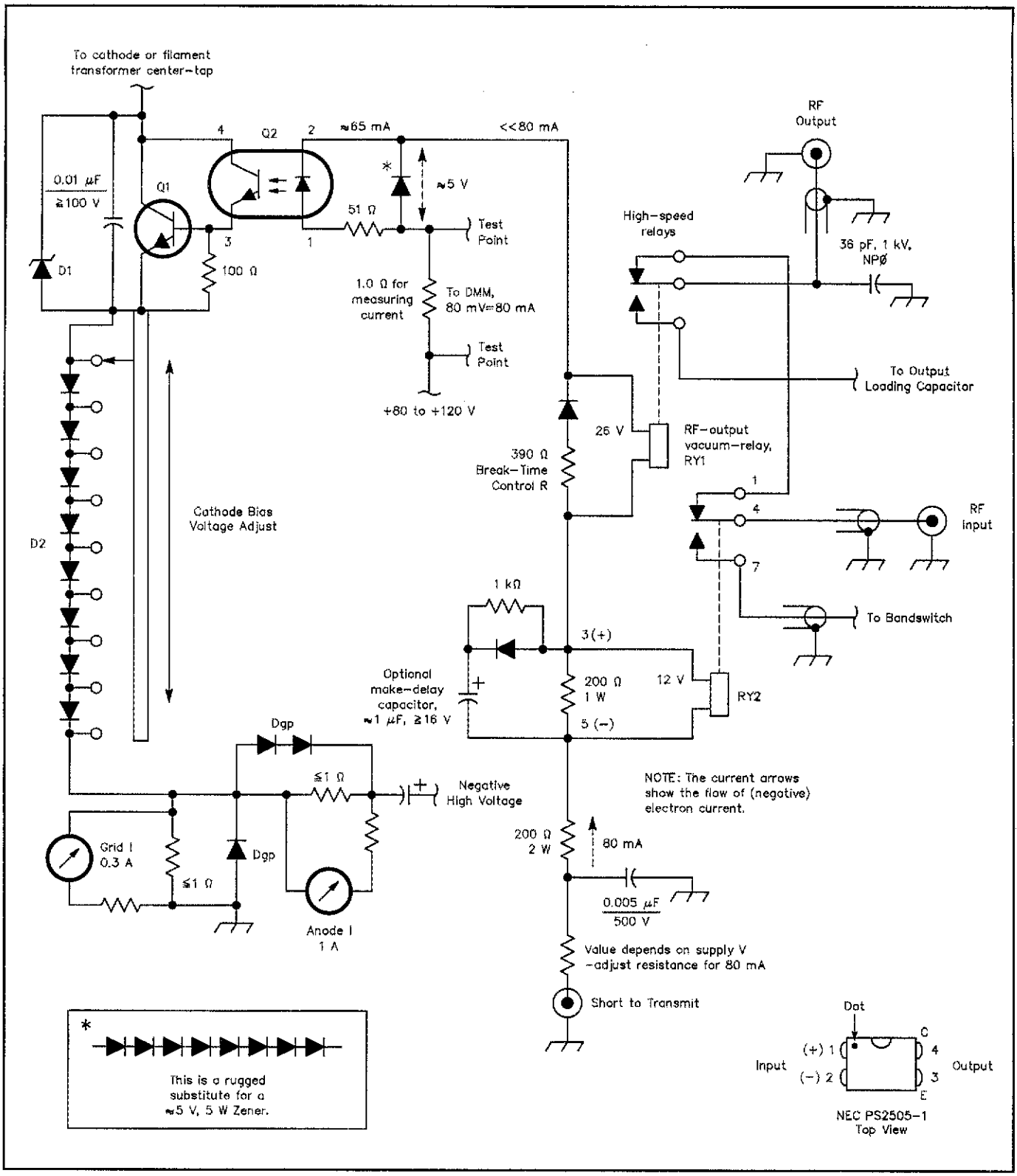


Fig 3—Adjustable electronic cathode bias switch for cathode currents up to 3 A.

D1—30- to 51-V transient voltage suppressor (Digi-Key part 1.5KE51CA-ND or similar; Digi-Key's toll-free number is 800-344-4539).

D2—For collector currents between 1 and 3 A, use 1N5401 diodes. The number of diodes making up D2 may have to be increased in some amplifiers.

Dgp—Glitch-protection diode (1N5401 or similar, 200-A peak or greater).

Q1—NPN, 80 to 100 V, 10 A (TIP 33B, TIP 33C, etc). (The collector-to-emitter voltage drop across Q1 is about 1.4 V on transmit. On receive, the drop depends on the supply voltage to the tubes and also on the particular tubes used; typically the drop on receive is 24 to 30 V. Q1 needs only a minimum heat sink.)

Q2—NEC PS2505-1 optoisolator, input-protected, 80-mA maximum input, Vce=80 V, gain of 300% or greater.

RY1—Kilovac HC-1 or Jennings RJ-1A (7 A maximum at 32 MHz).

RY2—Matsushita NR-HD-12V reed relay (Trio-Kenwood part number S51-1429-05; $21 plus shipping and handling, as of August 1993).

The unspecified diodes are 1-A or greater, 200 V PIV (1N4003, 1N5401, etc).

The unspecified resistors are ¼-W.

equipment manufacturers, a US reed relay manufacturer could probably come up with a similar relay, if there were enough demand. Jennings and Kilovac manufacture high-speed relays that will switch kilowatts of RF. The Jennings relay is the RJ-1A; Kilovac's is the HC-1. I have been using these two relays for many years to switch the output in my amplifiers. When mounted with silicone rubber, they are fairly quiet. When used with a speed-up circuit, either relay can switch in under 2 ms. I use a speed-up/sequencing circuit that prevents them from being hot-switched, and have not had a relay fail in this circuit.

It makes little sense to be currently building—or buying—an amplifier that switches in 25 ms. If such an amplifier is used with a modern radio, it would be technically more correct to say "hot-switches in 25 ms."

VHF Stability

On page 72, the 1926 edition of the ARRL's *The Radio Amateur's Handbook* told us how to build an improved VHF parasitic suppressor—one that provides better VHF stability than ordinary parasitic suppressors. The logic was elementary. A suppressor is supposed to dampen a circuit. Since low Q is synonymous with high dampening, build a suppressor with low Q. Instead of using a conductor with a high Q at VHF—such as copper or silver—use a conductor with low Q at VHF—resistance wire. The 1926 *Handbook* said, "The combination of both resistance and inductance is very effective in limiting parasitic oscillations to a negligible value of current."

After 1929, someone forgot to include this information in the *Handbook*. In those days, the oversight probably didn't matter very much. Electron tubes generally had poor amplification at VHF, so VHF instability was not much of an issue. During the ensuing decades, Amateur Radio operators and amplifier manufacturers got into the habit of using parasitic suppressors made from copper—or, even worse—silver-plated copper. This was an easy habit to get into; copper and silver can be soldered easily and cheaply. Meanwhile, the VHF amplification of electron tubes kept improving. Modern tubes need 1926-vintage parasitic suppressors with a low Q at VHF!

VHF parasitic oscillation can cause bandswitch arcing, tuning-capacitor arcing, and a large pulse of grid current. The pulse of grid current is so large that a powerful magnetic force is exerted between the grid and filament. In a 3-500Z, this force is capable of bending the hot tungsten filament helices and causing a filament-to-grid short. Of course, there is a trade-off to using suppressors with a low Q at VHF. On the 10-meter band, they reduce amplifier output by roughly 0.08 dB. This should come as no surprise: anything that dampens VHF resonance is bound to have some effect at 29 MHz. A VHF suppressor that does not get hot on 10 meters isn't doing its job.

Even though much has been published about VHF parasitic oscillation, amplifiers are still being built without the benefit of suppressors with a low Q at VHF. Some amplifier manufacturers presently take a dim view of using such suppressors. Even if you have signs of parasitics, such as intermittent bandswitch arcing, they will void the warranty if you remove their suppressors with a *high* Q at VHF and install replacements with a *low* Q at VHF.

Step-Start

Large power supplies need something to soften the shock of start-up. A 10-A DPST (normally open) or a 10-A DPDT relay and two 25-Ω, 10-W resistors are just about all that's needed to add a good step-start circuit to the average 1500-W amplifier. The step-start circuit belongs in series with the main fuses or circuit breakers. This way the filaments will also enjoy the benefit of a gentle start-up.

Is More Gain Always Better?

Today, the more or less standard in transceiver output is 100 W. There are amplifier tubes that can easily be ruined by 100 W of drive. A good example is the 3CX800A7. Using 100 W of drive will eventually strip flakes off the cathode. The flakes can become lodged between the cathode and the grid cage—creating a short. Even a pair of 3CX800A7s is clearly overdriven by 100 W. Doing so probably won't flake the cathodes, but it can cause rotten splatter. The fix is simple: connect a 40-Ω resistor in series with each 3CX800A7 cathode. These (cathode RF negative feedback) resistors reduce gain. As a result, the amplifier won't be driven above its absolute maximum ratings—and into nonlinearity—by a 100-W transceiver.

Cathode RF negative feedback resistors are better than having a matched pair of 3CX800A7s—the cathode currents automatically equalize themselves. And unlike all ALC circuits, cathode feedback resistors work instantaneously—eliminating ALC's generic flaw—leading-edge splatter on SSB. (Amplifier-to-transceiver ALC only works properly on modes with a constant signal level, such as RTTY and FM.) When a single 3-500Z is driven by 100 W, it also splatters. Although the rated drive is around 55 W, manufacturers of amplifiers with a single 3-500Z give the green light to driving their amplifiers to an anode current of up to 550 mA—a feat that requires using about 100 W of drive. On SSB, this produces distortion and splatter. Eimac rates the anode current at 400 mA *absolute maximum*. It takes a 25-Ω cathode feedback resistor to make a 3-500Z happy with 100 W of drive. The resistor goes in series with the cathode coupling capacitor.

It would be nice if amplifiers were designed to be compatible with 100 W of drive.

Adjustable Tuned Inputs

Modern MF/HF transceivers with a solid-state output stage use an untuned push-pull RF output stage. In order to meet FCC requirements on spurious emissions, passband LC filters are used. Such filters introduce inductive and capacitive reactance at various frequencies within their passbands. In other words, the output impedance of a modern transceiver is seldom $50 \pm j0\ \Omega$. This is of no consequence unless you happen to be driving a tuned input in a grounded-grid amplifier. In this case, the filter reactance interacts with the reactance of the input capacitor in the pi-network tuned input. The length of the coax between the filter and the tuned input affects the way the reactances interact. As a result, the input SWR can suffer. If the SWR is too high, the transceiver will automatically cut back on power.

For example, to obtain Eimac's recommended Q of 2, approximately 200 pF of input capacitance is needed for a tuned input on the 10-meter band. In actual practice, however, a 50-pF input capacitor may produce the best SWR with a particular model transceiver and a particular length of coax. A different model transceiver or a different length of coax may require a different-value input capacitor.

It would be nice if an amplifier's input capacitors on the tuned inputs could be readily adjusted.

Summary

Here is a list of the various features discussed in this article and the approximate cost of including them in an amplifier design.

- Adjustable filament voltage and a simple filament voltmeter using the existing multimeter, $10 to $20.
- Step-start relay circuit, $7.
- Adjustable electronic bias switch, $2.
- High-speed RF relays, $90.
- Parasitic suppressors with a low Q at VHF, $1.
- Separate high-voltage and filament transformers—preferably potted; metal-oxide film equalization resistors for electrolytic capacitors; no so-called equalizers on high-voltage rectifiers, $60.
- Make the amplifier compatible with 100 W of drive, $1.
- Glitch-protection diodes for the meter circuits and the negative high-voltage circuit, 30 cents.
- A 10-Ω, 10-W glass-coated resistor in series with the positive lead of the high-voltage power supply, 76 cents.
- Adjustable input capacitors on the tuned inputs, $6.

Obviously there are other important elements to consider in amplifier design. The elements discussed above are ones that are frequently overlooked. If you have any questions or comments, please call. My new telephone number is 805-386-3734. QST

Computer-Controlled Electronic Test Equipment

Part 2[1]—This month, we build the motherboard and power supply—the physical foundation for all the test-equipment projects to come. As promised, the first of those projects is an L-C meter, also in this installment. We've got lots to do!

By Ron Portugal
52 Susan Lane
North Haven, CT 06473

In Part 1, we laid the groundwork for a number of pieces of computer-aided test equipment that work *with* the computer, but aren't installed *inside* the computer. This approach avoids using the much-needed expansion slots of the host PC. It also eliminates loading the PC's power supply and eliminates the potential of a test-equipment accident from crippling the computer. In this installment, we'll cover *two* projects: the Z8671 microcomputer's motherboard/power supply combination and an inductance/capacitance (L-C) meter.

Z8671 Microcomputer Motherboard and Power Supply

Connecting components to a microprocessor is frequently a chore involving a mess of wires, cables, power supplies and sundry items. In an effort to *almost* eliminate these inconveniences for the Z8671 test-equipment system, I developed a motherboard/power-supply platform. See Figs 1 and 2. The 12.5- × 7-inch single-sided PC board[2] supports nine male 50-pin headers (JP3-JP11) to accept 5- × 6-inch PC project boards and includes one 50-pin female socket (JP12) for bus expansion.

Also on the motherboard are three power supplies: +9 V @ 2.5 A unregulated, and regulated ±15 V @ 0.45 A; see Fig 3. A capacitor-input full-wave bridge configuration is used for the +9-V supply, and a dual output, step-up, flyback, switching regulator provides the ±15-V sources. Other than the transformers, 50-pin headers, 50-pin socket and the angle brackets, all the parts can be obtained from electronic component suppliers such as Mouser and Digi-Key.[3]

U1 is an adjustable switching regulator. Input voltage and ground are brought to U1 on pins 5 and 3, respectively. Pin 4, the switch output, drives the primary of T2, a 200-µH flyback transformer. T2's center-tapped secondary winding feeds two half-wave rectifier circuits (D3-D4, C5-C6 and R5-R6) that provide the ±15-V outputs. The +15-V output feeds a voltage divider (R3 and R4, a trimming pot) that connects to U1's feedback input (pin 2). R4 (**±15 V DC ADJ**) adjusts the amplitude of the ±15-V supply outputs. R2 and C4 stabilize U1.

U1 has built-in thermal-shutdown and current-limiting protection. Switching regulators usually don't dissipate much power. When I tested the circuit with a 0.55-A load attached to both 15-V outputs with a 120-V ac line input, however, U1's case got a little hot. A simple U-shaped heat sink keeps it cool.

Mechanical Assembly

Six power-cord strain-relief holes are provided on the PC board. Each of the ac power cord's three wires is woven through two of the holes provided it, then fed into the third row of solder-pad holes for attachment. Two holes marked **POWER SWITCH** connect the ac line to a front-panel power switch. Holes labeled **LED+** and **LED–** provide for connection of D2, the **POWER ON** LED.

For stability and strength, the motherboard's size demands that it be mounted on a chassis or frame. Plexiglas, aluminum or

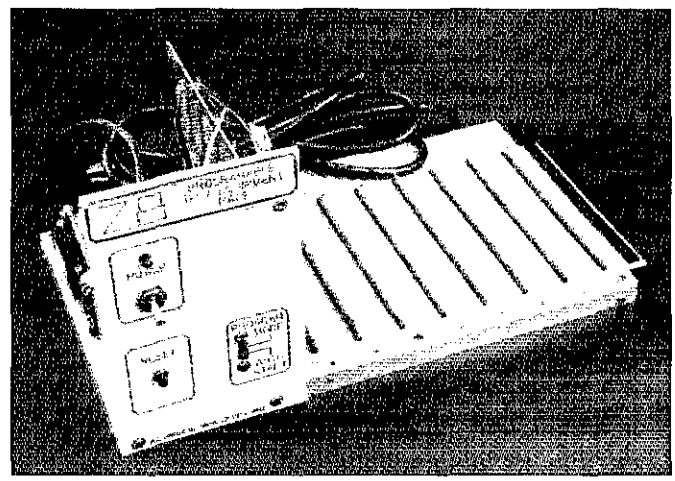


Fig 1—The panel supports the **POWER SWITCH**, **POWER ON** LED and the Z8671 CPU board's **RESET** and **AUTO/PROGRAM** controls. When finished, the L-C meter described in this month's installment will plug into the motherboard socket next to the CPU board and have a narrow front panel of its own. A section of split tubing added across the tops of the panels adds rigidity.

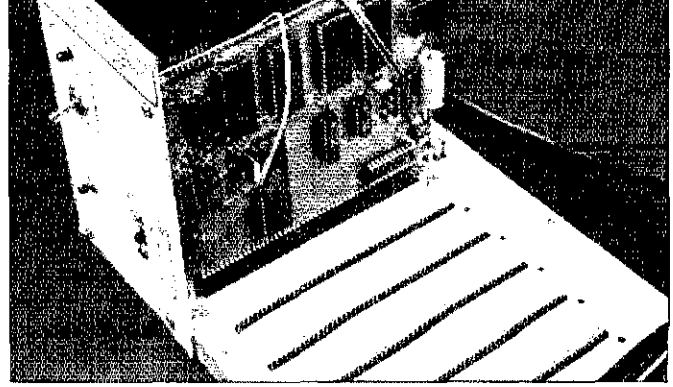


Fig 2—A side shot showing the power supply section on the motherboard.

[1]Notes appear on page 41.

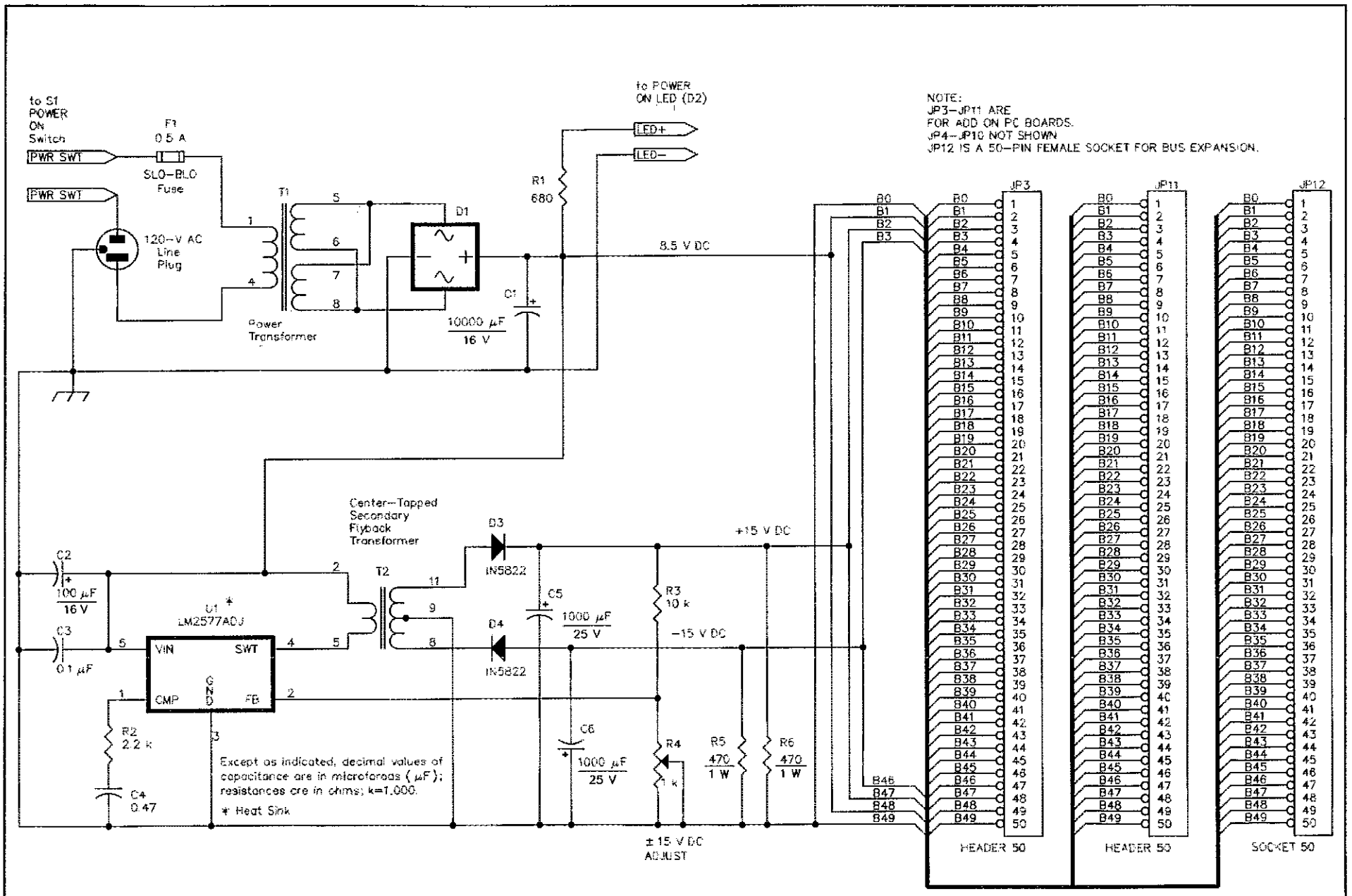

to S1
POWER
ON
Switch
F1
0.5 A
PWR SWT
SLO-BLO
Fuse
PWR SWT
120-V AC
Line
Plug
T1
Power
Transformer
D1
C1
10000 µF
16 V
R1
680
to POWER
ON LED (D2)
LED+
LED-
8.5 V DC
NOTE:
JP3-JP11 ARE
FOR ADD ON PC BOARDS.
JP4-JP10 NOT SHOWN
JP12 IS A 50-PIN FEMALE SOCKET FOR BUS EXPANSION.
JP3
JP11
JP12
HEADER 50
HEADER 50
SOCKET 50
Center-Tapped
Secondary
Flyback
Transformer
T2
D3
IN5822
D4
IN5822
+15 V DC
-15 V DC
C2
100 µF
16 V
C3
0.1 µF
U1 *
LM2577ADJ
VIN
SWT
CMP
GND
FB
C5
1000 µF
25 V
C6
1000 µF
25 V
R2
2.2 k
C4
0.47
R3
10 k
R4
1 k
R5
470
1 W
R6
470
1 W
± 15 V DC
ADJUST
Except as indicated, decimal values of capacitance are in microfarads (µF); resistances are in ohms; k=1,000.
* Heat Sink

Fig 3—Schematic of the power-supply/motherboard circuit. Unless otherwise specified, resistors are ¼-W, 5%-tolerance carbon-composition or film units. The 50-pin male headers (JP3-JP11) are on 1-inch centers and two grounded mounting holes are provided for securing each PC board to the motherboard. Use Keystone Electronics Corp mounting brackets (part numbers 612 or 621).

D1—50-PIV, 3-A bridge rectifier.
D2—LED.
D3, D4—1N5822.
F1—0.125-A, 125-V fuse.
JP3-JP11—Male 50-pin header (Samtec TSW-150-14-L-S).
JP12—Female 50-pin socket (Samtec BCS-150-L-S-HE).
S1—SPST toggle switch (not shown).
T1—Power transformer (Magnetek-Triad part number F16-2250, 36-VA, 115-V, 50/60-Hz primary, dual 8-V RMS @ 2.25-A secondaries.
T2—Dual-secondary flyback transformer. (According to National Semiconductor, T2 is available from at least three sources: Renco Electronics Inc, 60 Jeffryn Blvd, Deer Park, NY 11729, tel 516-586-5566, part no. RL-2581; Pulse Engineering, PO Box 12235, San Diego, CA 92112, tel 619-268-2400, part no. PE-65301; AIE Magnetics, 2801 72nd St N, St Petersburg, FL 33710, tel 813-347-2181, part no. 330-0202.)

plastic angle brackets or an aluminum picture frame are a few options. If you mount the motherboard on a metal frame, *don't short the bus lines!* Insert a piece of Mylar or other insulating material between any metal chassis supports and the motherboard. T2 is relatively hefty, so support it with a couple of standoffs affixed to the right-hand transformer mounting screws.

The **POWER SWITCH, POWER ON** LED and the Z8671 CPU board's **RESET** and **AUTO/PROGRAM** controls are mounted on a small front panel. This panel is a 4-inch wide plate affixed to the left-front section of the motherboard. The panel's vertical dimension depends on the height of the chassis or frame used. An angle bracket secured between the upper mounting hole of the Z8671 board and the front panel keeps the assembly rigid and stable.

Power-Supply Adjustment

The 9-V supply requires no adjustment. When you're ready to test the switcher supply, however, first *set R4 to its maximum value*, 1 kΩ. The feedback-input pin voltage is compared to U1's 1.23-V reference. When R4 is set to 1 kΩ, the ±15-V supplies deliver about ±13.5 V. As R4's resistance is *decreased*, the output voltages *increase*. Meter the +15 V line and adjust R4 for a reading of +15 V. Then check the −15 V line to ensure that its voltage is also correct.

The L-C Meter

L-C meters are handy to have.[4] Nowadays, you can find commercially made L-C meters priced at about $60 and more. Usually the meters don't cover the full range of L-C values of interest to amateurs. Also, there's always the question of calibration: How accurate is the reading and what's the resolution of the reading?

Our computer-aided L-C meter has a resolution of better than four significant digits over the following ranges: capacitance, 1 pF to 10,000 µF; and inductance, 1 µH to more than 5 H.

The meter's accuracy depends on the components used during calibration. Importantly, both instruments can be calibrated (via programing) to compensate for variables that affect the instruments' readings.

Capacitance is measured in two ranges: 1 pF to 1 µF and 1 µF to 10,000 µF. Inductance is measured using a single range, 1 µH to 5 H. The capacitance meter can be made to be autoranging.

Inductance Measurement

Fig 4 is the L-C meter schematic. Let's start by examining the inductance-meter oscillator circuit in the lower left-hand corner of the drawing. Our inductance-measurement procedure first measures the frequency of an L-C oscillator having a known capacitance value, then, using the resonant frequency equation:

$$f = \frac{1}{2\pi\sqrt{LC}} \qquad \text{(Eq 1)}$$

we compute the value of L:

$$L = \frac{1}{(2\pi f)^2 C} \qquad \text{(Eq 2)}$$

With the number-crunching power of a Z8671 microcontroller and a PC available, the value of L can be computed because we know the values of pi, the two capacitors and the oscillator frequency. If, instead of frequency, the *period* of the oscillator is known, Equation 2 becomes:

$$L = \left(\frac{T}{2\pi}\right)^2 \times \frac{1}{C} \qquad \text{(Eq 3)}$$

Measuring the period of a signal is done with three 4-digit counters: U9A, B, and C (the 82C54 triple-counter chip).[5] Two of the counters, U9C and U9B, are series connected and count a gated train of 7.3728-MHz clock pulses generated by the crystal oscillator located on the Z8671 CPU board. U9A counts 1000 periods of the oscillator and, in conjunction with U11A, a J-K flip-flop, generates the clock gate for cascaded counters. The number that ends up in U9C and U9B represents 1000 periods of the inductance-meter oscillator frequency.

At the end of the period measurement, the contents of the cascaded counters are massaged by the Z8671 and then sent off to the PC for further processing, correction and display. The conversion operations change the BCD numbers in the two 4-digit counters to ASCII format. Since the 82C54's counters count down from 9999d before ASCII conversion, each digit has to be subtracted from 9d. The whole process is done with a few lines of a BASIC/DEBUG program; more about this later.

The inductance and capacitance measurement processes are controlled by U14, a "subinstruction register." Appropriate bit combinations are sent to U14 from the Z8671 CPU under program control.

U12A (¼ of a CMOS quad **NAND** gate) is used as the amplifier portion of the Colpitts L-C oscillator. By connecting a high-value resistor, R23, from the input to the output of the gate, a linear gated amplifier is formed. Gated? Yes, the second input to the gate still controls the output; a zero on pin 1 of U12A disables the gate and causes its output, pin 3, to go high (+5 V).

This L-C oscillator configuration generates a square wave that complies with the resonant frequency equation:

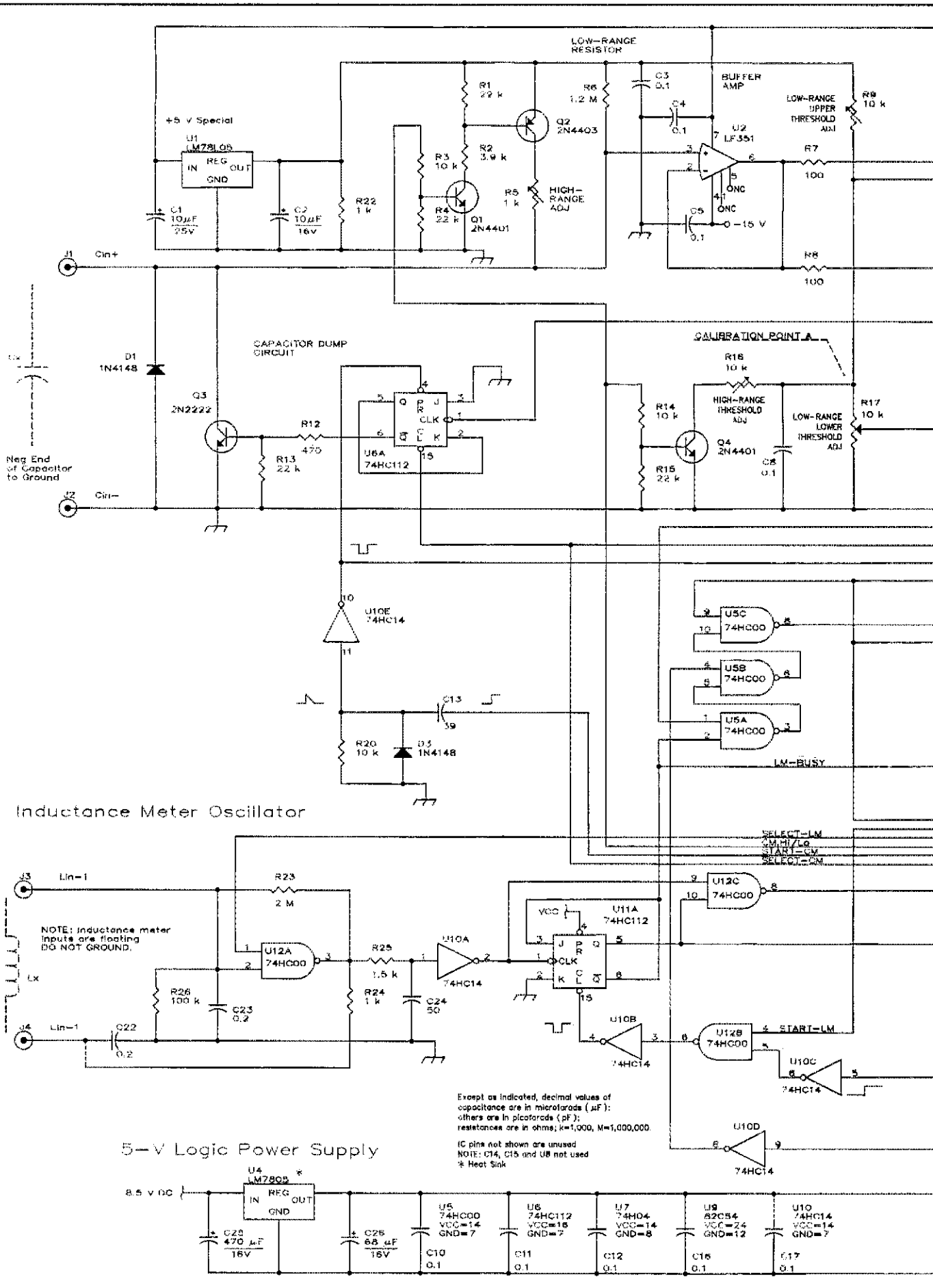
$$f = \frac{1}{2\pi\sqrt{L(C/2)}} \qquad \text{(Eq 4)}$$

Equation 4 assumes that C22 and C23 are identical in value. When C22 and C23 are 0.2-µF capacitors, the oscillator operates from about 100 Hz to over 1.8 MHz, enabling inductance measurements to be made from 1 µH to over 5 H. R24 is a drive-limiting resistor; R26 ensures that the oscillator is quiescent when the L_X inputs are floating. A low-pass filter consisting of R25 and C24 (with a 2.1-MHz −3 dB point) and a Schmitt trigger circuit, U10A, prevent high-frequency ringing from generating spurious trigger pulses.

Capacitance Measurement

The capacitance-measurement strategy depends on the fact that when a capacitor is charged from a known, fixed voltage through a known, fixed resistance, the time interval between two predetermined threshold levels along the charging curve is directly proportional to the value of the capacitor (see Fig 5).

The time interval between V_L and V_U is:


Inductance Meter Oscillator
5-V Logic Power Supply
LOW-RANGE RESISTOR
BUFFER AMP
+5 V Special
U1 LM78L05
IN REG OUT GND
R1 22 k
R2 3.9 k
R3 10 k
R4 22 k
R5 1 k
HIGH-RANGE ADJ
R6 1.2 M
Q1 2N4401
Q2 2N4403
C1 10µF 25V
C2 10µF 16V
C3 0.1
C4 0.1
C5 0.1
U2 LF351
R7 100
R8 100
R9 10 k
LOW-RANGE UPPER THRESHOLD ADJ
-15 V
R22 1 k
J1 Cin+
J2 Cin-
Lx
Neg End of Capacitor to Ground
D1 1N4148
CAPACITOR DUMP CIRCUIT
Q3 2N2222
R12 470
R13 22 k
U6A 74HC112
CALIBRATION POINT A
R16 10 k
R14 10 k
R15 22 k
HIGH-RANGE THRESHOLD ADJ
Q4 2N4401
C8 0.1
R17 10 k
LOW-RANGE LOWER THRESHOLD ADJ
U10E 74HC14
C13 39
R20 10 k
D3 1N4148
U5C 74HC00
U5B 74HC00
U5A 74HC00
LM-BUSY
J3 Lin-1
J4 Lin-1
R23 2 M
NOTE: Inductance meter inputs are floating DO NOT GROUND.
U12A 74HC00
R25 1.5 k
U10A 74HC14
R26 100 k
C23 0.2
R24 1 k
C24 50
C22 0.2
U11A 74HC112
U12C 74HC00
U10B 74HC14
U12B 74HC00
START-LM
U10C 74HC14
U10D 74HC14
SELECT-LM
M HI/LO
START-CM
SELECT-CM
Except as indicated, decimal values of capacitance are in microfarads (µF); others are in picofarads (pF); resistances are in ohms; k=1,000, M=1,000,000.
IC pins not shown are unused
NOTE: C14, C15 and U8 not used
* Heat Sink
8.5 V DC
U4 LM7805 *
C25 470 µF 16V
C26 68 µF 16V
U5 74HC00 VCC=14 GND=7
U6 74HC112 VCC=16 GND=7
U7 74H04 VCC=14 GND=8
U9 82C54 VCC=24 GND=12
U10 74HC14 VCC=14 GND=7
C10 0.1
C11 0.1
C12 0.1
C16 0.1
C17 0.1

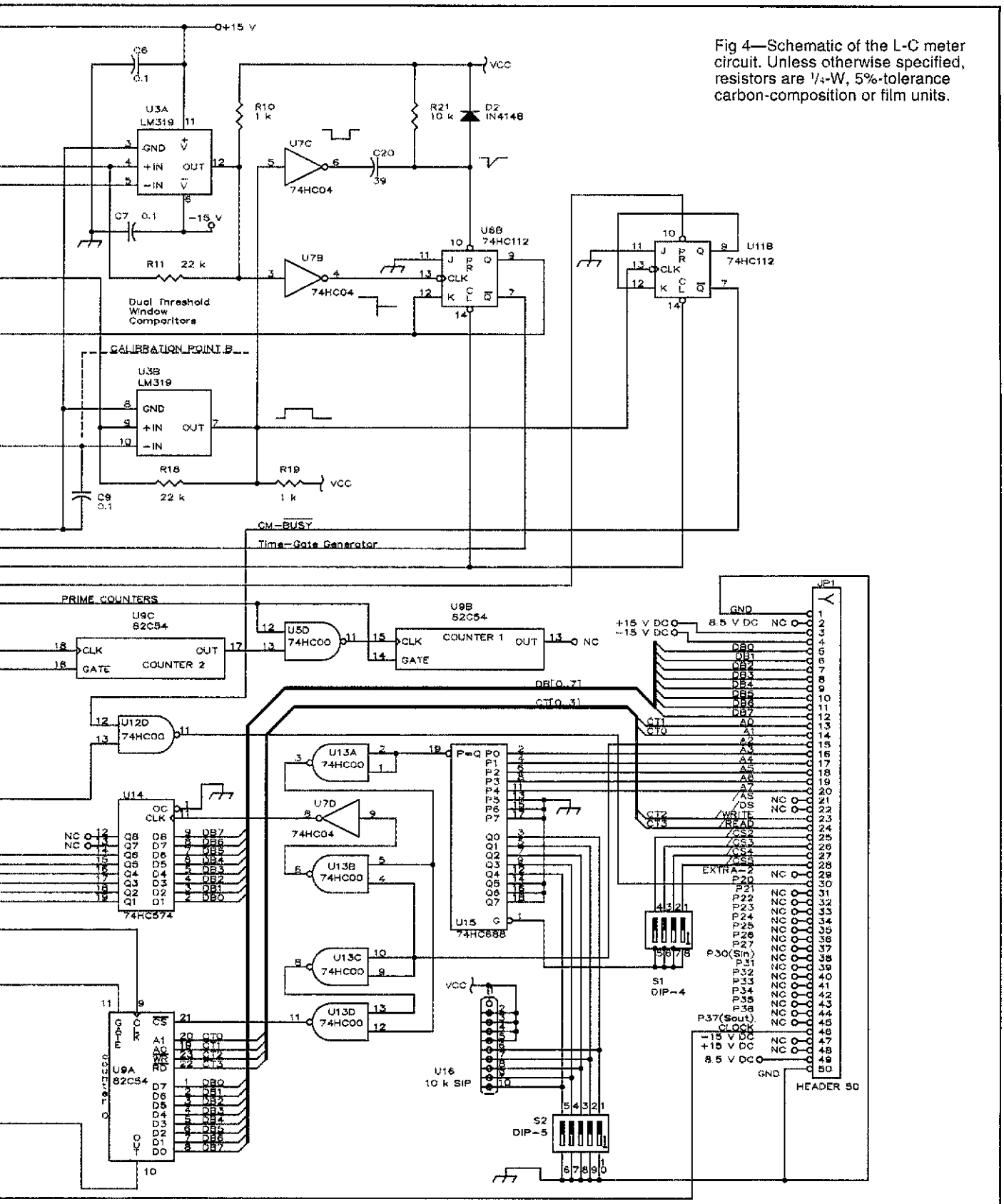


Fig 4—Schematic of the L-C meter circuit. Unless otherwise specified, resistors are ¼-W, 5%-tolerance carbon-composition or film units.

$$\Delta T = RC \ln\left(\frac{E - V_L}{E - V_U}\right) \quad \text{(Eq 5)}$$

Since R, E, C, V_L and V_U are all constants,

$$\Delta T = K \times C \text{ and } C = \frac{\Delta T}{K} \quad \text{(Eq 6)}$$

where

$$K = R \ln\left(\frac{E - V_L}{E - V_U}\right) \quad \text{(Eq 7)}$$

All we do is pick values for E, R, V_L and V_U, devise a way of measuring the time interval between the two threshold points along the charging curve, and we're all set.

The upper part of Fig 5 contains the circuit details for performing the time-interval measurement. The unknown capacitor must be discharged below the lower threshold voltage; Q3 and J-K flip-flop U6A; perform that discharge. R5 and R6 take care of the two known charging resistors for the two capacitance ranges and the output of U1, a LM78L05 voltage regulator, generates the fixed known voltage (E) needed for the measurement. By turning off Q3 via flip-flop U6A, the unknown input capacitor, C_X, is allowed to charge through either R5 or R6, depending on the level of the CM, Hi/Lo control line.

Since the charging current through R6 (1.2 MΩ) is low (<4.2 μA), any loading on the capacitance-charging circuit will cause errors in the final reading. By buffering the voltage across C_X with a BiFET op amp (U2, an LF351), the loading problem is avoided. R9 and R17 take care of the low-range thresholds; R16 is used to adjust the high-range thresholds. These threshold divider resistors are referenced to E, the fixed charging voltage.

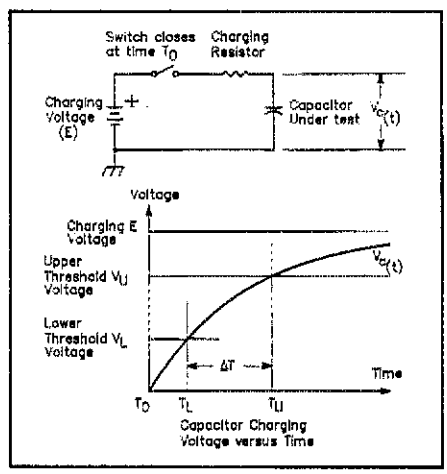


Fig 5—Capacitor charging curve.

The threshold voltages and the output of the buffer amp, U2, are fed to a dual voltage comparator chip, U3A and U3B (LM319). Both comparators are set up as Schmitt triggers and trip (change from the low to high state) when the output of the buffer amplifier exceeds their respective threshold levels. When the lower threshold is exceeded, U3B's output goes high turning on J-K flip-flop U6B (the time-gate generator). When the upper threshold is exceeded, U3A's output goes high and through inverter U7B, turns off U6B.

Flip-flop U6B's output gates the Z8671 CPU clock into the two cascaded 4-digit counters, almost the identical procedure followed for the inductance-meter period measurement. In this case, though, the time interval between two voltage thresholds (not the period of a square wave) is measured. The resulting numbers in the cascaded counters are BCD corrected and converted to ASCII, as before, and sent off to the PC for further processing.

Control/Addressing Decoding Logic

Before we can program and use the L-C meter, one more block of circuitry is needed. The lower right-hand portion of Fig 4 does the trick. First, how many I/O ports are used by the L-C meter? Five; four for the 82C54 counter chip and one for the sub-instruction-register, U14. U14 is an eight-bit latch that provides the L-C meter with the appropriate control signals needed by the L and C portions of the instrument. It obviously has to have a unique port name, or number, so the Z8671 CPU knows where to send the instruction byte. The same is true for the 82C54 counter. However, as mentioned earlier, the counter uses up four ports, one for setting up the operating modes of each counter and three for presetting and reading each 16-bit counter.

Where do these I/O ports come from? Remember the memory map of the Z8671 CPU board? The memory, 64 kbytes, is divided into eight groups of 8 kbytes each. Four of the groups are assigned to the four Z8671 CPU boards' memory chips; the remaining four are fed to the 50-pin I/O connector and labeled $\overline{CS2}$, $\overline{CS3}$, $\overline{CS4}$ and $\overline{CS5}$. When one of the CS lines is asserted it directs the Z8671 data bus (DBØ-DB7) to any one of 8192 addresses (ports).

By decoding all or some of the address lines (AØ-A12), we can select a single port, or a group of contiguous ports, from the 8192 designated by the activated CS line. In this particular address-decoding scheme, I chose to ignore the upper eight address lines, A8-A12. As a result of this choice, each CS line can select only 256 I/O ports instead of 8192 ports.

So how do we select the five ports we need for the L-C meter? S1 selects one of the CS lines, S2 selects one of the 32 possible groups of eight ports selected by the CS line. A2 divides the selected group of eight ports into two groups of four. Finally, AØ and A1 divide each group of four into four individual ports. Three of the second group of four ports, in this case, are superfluous; we only need one port to address U14. The selection of the CS line is simply a dip-switch setting.

The group of eight addresses is more complicated, using an 8-bit comparator chip (U15). Only five of the eight comparator lines on each input byte to U15 are used to perform the comparison operation: Remember, $2^5 = 32$, one of 32 possible groups of eight ports. When the two groups of five bits are equal, pin 19 of U15 is asserted low and is fed to a **NAND** gate wired as an inverter (U13A). The remainder of the logic, U7D, U13B, U13C and U13D, combine the group-enable signal (from U15) and address line A2 to form chip-select signals for U14 (instruction latch) and the counter chip. The counter chip has an internal 2-line to 4-line decoder that selects one of the four possible states of AØ and A1 to select the chip's registers.

The range of I/O ports that can be activated when $\overline{CS2}$ is selected by S1 while S2 is set to all zeros is shown in Table 1.

Now let's specify the actual addresses of the five ports needed to operate the L-C meter, assuming that S1 selects $\overline{CS2}$ and S2 is set to zero; see Table 2.

Since any address from 4004h to 4007h activates the instruction latch, let's arbitrarily assign address 4004h to the latch. Now that the port addresses are known and assigned, what do they do? Consider the easy one first, the instruction latch. Fig 4 provides us with the following information:

Instruction Register

Bit Number	*Function*
Q1: DBØ Select-CM	Selects capacitance meter function.
Q2: DB1 Start-CM	Starts capacitance-meter measurement.
Q3: DB2 CM,Hi/Lo	Selects high/low capacitance range.
Q4: DB3 Select-LM	Selects inductance-meter function.
Q5: DB4 Start-LM	Starts inductance-meter measurement.
Q6: DB5 Prime-Counter pulse	High to low to high.
Q7: DB6 and Q8: DB7	not used

Each of the control lines is self-explanatory, with the exception of Q6. Due to a few quirks in the structure of the 82C54 chip, a pulse has to be sent to the clock and gate inputs of counters connected in series, and this control line provides the required pulse under program control. To select the L meter, first Q4 of U14 is brought to a logic 1 and to start the measurement, Q5 of U14 is brought high.

Programing Considerations

A few more bits of information are needed before you're ready

Table 1
I/O Port Range Selection

Z8671 CPU Address Lines															Port
A15	*A14*	*A13*	*A12*	*A11*	*A10*	*A9*	*A8*	*A7*	*A6*	*A5*	*A4*	*A3*	*A2*	*A1*	*A0*	*Address*
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4000h
S1 (/CSn)			These bits are					S2 selects					0	0	1	4001h
selects			ignored by the					these bits					0	1	0	4002h
these bits			decoding logic										0	1	1	4003h
													1	0	0	4004h
													1	0	1	4005h
													1	1	0	4006h
0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	4007h

Table 2
Port Addresses Needed to Operate the L-C Meter

Port Address	*Port Function*
4000h	82C54, Counter zero
4001h	82C54, Counter one
4002h	82C54, Counter two
4003h	82C54, Control word register
4004h	Instruction latch U14
4005h	Instruction latch U14
4006h	Instruction latch U14
4007h	Instruction latch U14

to program the L-C meter. We have to program the 82C54 triple-counter chip. First, the three 16-bit counters are down counters. Starting at 0000d, following the first input pulse, they go to 9999d, then 9998d, and so on. Each counter can be independently programed to count in BCD or binary format, and each counter has six possible modes of operation. They can be preset to any number starting with 0, 1 or 2, depending on the operating mode, up to 10,000d or FFFFh, depending on the counting format. The contents of each counter can be read and sent off to the Z8671 MCU.

Let's talk about counter 0, the one used to accumulate 1,000 periods of the inductance-meter oscillator. This counter has to count down from 1,000 to 0. When it reaches zero, it provides a signal indicating that the measurement is complete. This type of operation falls into the "Interrupt on Terminal Count Mode," Mode 0. Here is the programing sequence: (1) Send a control word to the Control Word Register that specifies counter 0. (2) Send the counter preset value, 1000d, to counter 0's least-significant byte first, then the most-significant byte.

Here's what the BASIC/DEBUG instructions look like:

Line Number	*Instruction*	*Comments*
100	@%4003 = 31h	Sets mode for CT(0)
110	@%4000 = 00d	Sets ls byte of CT(0) to 00d
120	@%4000 = 10d	Sets ms byte of CT(0) to 10d

The same type of instruction sequence has to be sent to the Control Word Register for Counters 1 and 2. However, the operating mode for Counter 2 has to be changed to Rate Generator Mode: MODE 2. Counter 1 is set to the Terminal Count Mode, Mode 0, the same as counter 0. The instruction sequence looks like:

Line Number	*Instruction*	*Comments*
130	@%4003 = 71h	Sets mode for CT(1)
140	@%4001 = 99d	Sets ls byte of CT(1) to 99d
150	@%4001 = 99d	Sets ms byte of CT(1) to 99d
160	@%4003 = B5h	Sets mode for CT(2)
170	@%4002 = 99d	Sets ms byte of CT(2) to 99d
180	@%4002 = 99d	Sets ls byte of CT(2) to 99d

To send an instruction word to the L-C's Instruction Register (U14), use the following instruction format:

Line Number	*Instruction*	*Comments*
190	@%4004 = xxh	Sets bits of U14 to xxh (Range of xxh is 0 to FFh or 0 to 255d)

Armed with this information, we can start to develop a "verbal" description of the *two* programs that are needed to run the L-C meter. Why two programs? One for the PC and one for the Z8671 CPU. Details of the PC and Z8671 operating and calibration programs are included with the L-C meter parts kit.

Wrap Up

You've got enough to keep you busy for awhile. Our next installment, which will appear in an upcoming issue, is a frequency-synthesized, 1- to 10-MHz sine- and square-wave generator.

Notes

[1]Part 1 appears in the December 1993 issue of *QST*.

[2]PC boards and parts kits are available from the author. The PC motherboard is $30. Add $3 for shipping charges in the continental USA; elsewhere, add $5.

A PC-board template, drilling template and part-placement diagram are available for $10. Power-supply/motherboard parts kit containing the PC board and all components *less:* 3-wire ac line cord, PC-board mounting frame, power switch and power LED, $95. Shipping charges in the continental USA, add $5; elsewhere, add $10. Address all orders to: Ronald J. Portugal, 52 Susan Lane, North Haven, CT 06473. Payment: checks or postal money orders payable in US funds to Ronald J. Portugal.

[3]A part suppliers' list is presented on pages 35-38 of the 1994 *ARRL Handbook*.

[4]The following L-C meter project items are available from the author: (1) 1:1 positive PC-board artwork including the component-side silkscreen, component- and solder-side artwork, part-placement and drilling diagrams, $10; (2) double-sided, silkscreened, solder-masked PC board with plated-through holes, $20; (3) a complete kit including the PC board and part-placement diagram, all on-board components, ICs, IC sockets, connectors and hardware; price $75. On orders up to $50, please add $4; on orders over $50, please add $6. Foreign orders add an additional $3. Please make your checks or money orders payable in US funds to Ronald J. Portugal. Mail all orders to: Ronald J. Portugal, 52 Susan Lane, North Haven, CT 06473, tel 203-239-0942. Allow 4 to 6 weeks after receipt of order for delivery.

[5]For full details of the operation of the 82C54 triple counter, see the device manufacturer's specification sheets.

Strays

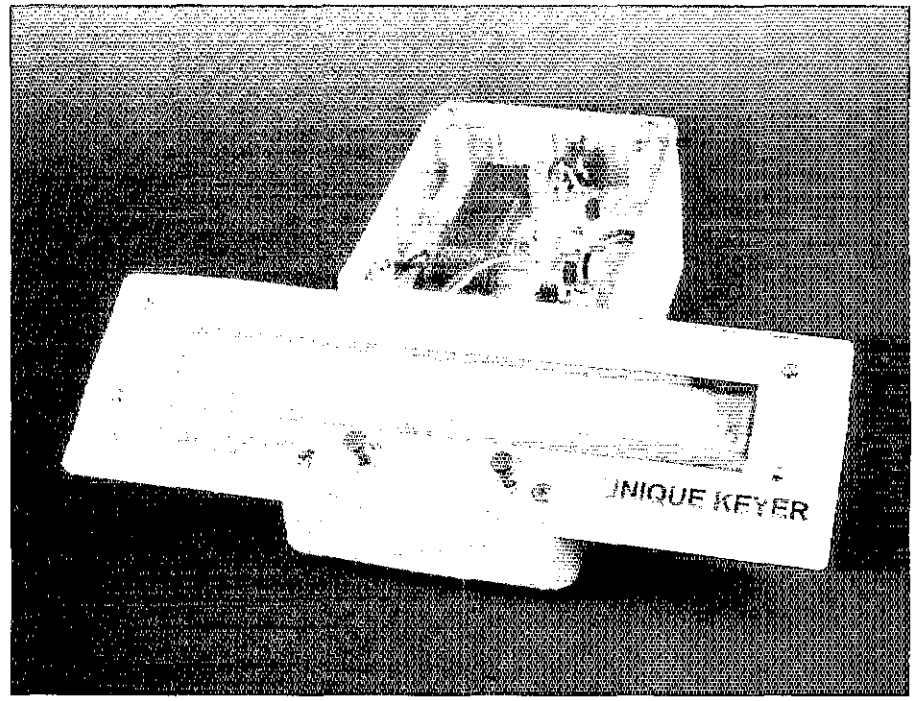
CRANK 'EM DOWN

◊ It pays to crank 'em down: During a winter Nor'easter, a single heavy gust of wind brought down the top half of this crank-up tower. Mike DiPersio, KC2Q, of Bradley Beach, New Jersey, hadn't fully lowered his tower, and his home-brew boomless quad and VHF antennas were virtually destroyed, after nine years of faithful service. *(KC2Q photo)*

Uncle Albert's Unique Keyer

This feature-packed keyer project can help you improve your CW sending and receiving whether you use a straight key, bug or keyer.

By Sam Ulbing, N4UAU
5200 NW 43rd St, Suite 102-177
Gainesville, FL 32606



(photos by Kirk Kleinschmidt, NT0Z)

Many code-practice aids await you if you just want to learn to copy Morse code to pass a test. Audio tapes, computer programs, subliminal approaches—you name it, and it probably exists. Once you've learned to copy enough CW to pass the test, though, you're largely on our own—you just grab your key and pound away. With enough practice, you can send pretty good code—or can you?

I recall that when I was a Novice, other operators kept begging off with "SRI QRN" and bidding me a hasty 73—even when the copy was good on my end. Did the other guy really have QRN or was my fist just hard to copy? After I joined a CW net and heard the wide variety of fists represented there, I *really* started to wonder how my sending sounded. Then, after taking a community college course in microcontrollers, I found that I knew enough to design a circuit that could send code and tell me how well I was sending. The result is Uncle Albert's Unique Keyer.[1]

What It Can Do

An 87C51 microcontroller and a two-row, dot-matrix liquid-crystal display (LCD) serve as the basis for the keyer. I wrote a program for the 87C51 that allows it to function as:

- An 8- to 40-WPM iambic keyer with one 47-character memory,
- A code-speed calculator,
- A CW reader that displays what you send, and
- A random-character code-practice generator that displays what it sends.

Code Reader

To me, the most unique feature of Uncle Albert's Unique Keyer is its ability to copy and display the code you send, whether you do it with the Keyer's on-board iambic keyer or an external keying device (keyer, bug or straight key). The CW-reader subroutine samples the code you send, translates it into characters by means of a look-up table, and displays it on the LCD. Then you can see what your code sounds like to the operators you work. You can see right away if you're running letters together or sending characters incorrectly—quite an eye-opening experience if you think your code is already perfect! (It helps my sending another way: I'm a poor speller, but I can do a better job if I can see the words as I spell them.) The letters scroll across the top line of the keyer's display, from right to left. The keyer displays common Amateur Radio procedural signals (*prosigns*) as shown in Table 1.

Table 1
How Uncle Albert's Unique Keyer Displays Procedural Signals

Meaning	*Character*	*Display*
End of Work ($\overline{SK}$)	···—·—	#
End of Message (AR)	·—·—·	+
Double Dash ($\overline{BT}$)	—···—	=
Wait ($\overline{AS}$)	·—···	>
Go Only ($\overline{KN}$)	—·——·	(
Uncopiable Character		&

Speed Calculator

In calculating your sending speed, Uncle Albert's Unique Keyer keeps track of the lengths of your dots and dashes, and how many spaces you insert between characters and words. (The spaces are important, because extra space between code characters sent rapidly reduces your average sending speed.) The keyer calculates your speed every 40 characters and displays it on the LCD's lower line.

Iambic Memory Keyer

The iambic-keyer subroutine lets you set the element speed with your paddles and displays the speed as you adjust it. The keyer remembers the speed you've set, so when you later power the keyer back up or change modes by pressing **RESET**, the keyer comes up ready to run at that speed.

You can load the keyer's programmable memory via your paddles or external key,

[1]The keyer uses an 87C51 microcontroller chip, which must be programmed before use. *The 87C51 source code for the Uncle Albert's Unique Keyer program is unavailable.* A basic package, which includes a predrilled PC board, programmed 87C51, construction information and operating instructions, is available from the author for $38. A convenience package, which includes a predrilled PC board, programmed 87C51 microcontroller, all parts (except an enclosure, jacks, mounting hardware and power source) and construction and operating instructions, is available for $60 with a 16 × 2 display or $67 with a 40 × 2 display. Prices subject to change; Florida residents, add 6% sales tax. Order from Sam Ulbing, N4UAU, 5200 NW 43rd ST, Suite 102-177, Gainesville, FL 32606.

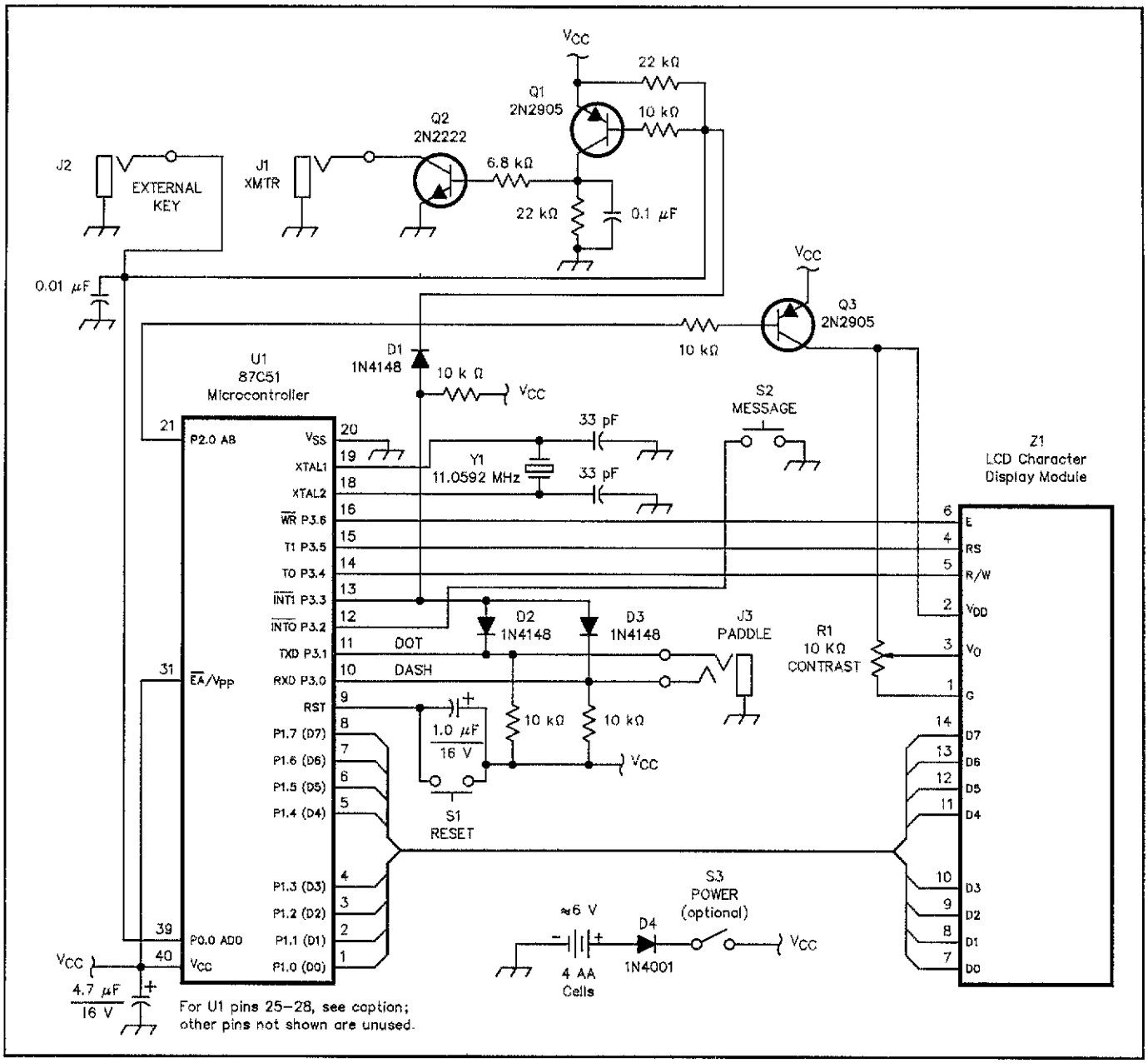


Fig 1—An 87C51 microcontroller and dot-matrix LCD character-display module (Z1) contain most of the Uncle Albert's Unique Keyer circuitry. The 87C51 must be programmed before use and is available, along with most of the other keyer parts, from the author as described in Note 1. The polarized capacitors in this circuit are electrolytics; the other fixed-value capacitors are disc ceramics. Aside from R1, which is a PC-board trimmer, the circuit's resistors are ¼-watt, carbon-film units. The text and Table 2 suggest modules suitable for Z1. Use the jacks appropriate for your station setup for J1, J2 and J3. IC pins not shown are unused, except for pins 25-28, connections to which are display-dependent, as described in the construction information available per Note 1.

and send the message at the keyer's set speed by pushing the **MESSAGE** button. The memory remains intact as long as you don't turn off the power. You can rewrite the message whenever you want to.

For transmitter and antenna testing, Uncle Albert's Unique keyer lets you use your dash paddle as a straight key. (The keyer can't display or calculate the speed of any code you send in this mode, however.)

Random-Code Generator

The random-code-generator subroutine can send as slowly as 5 WPM and features Farnsworth spacing below 18 WPM. That is, for keyer speeds below 18 WPM, the random-code generator sends characters at 18 WPM and spaces them to achieve the set sending speed. You can tell the program to send code in random five-character (*cipher*) groups or just a character at a time. In the cipher-group mode, the program sends until the display fills and stops to let you check your copying accuracy. Pressing a paddle starts the next session.

In the single-character mode, the program stops after each character. Pressing the dot paddle sends the next character. If you want to listen to the same character again, press the dash paddle.

Uncle Albert's Unique Keyer accomplishes all this with just two push buttons and your dot and dash paddles. A power switch is unnecessary because the 87C51 goes into the Power Down mode after a period of nonuse, drawing only 5 μA from its battery in this condition. (If you're concerned about this Power Down drain, you can add a switch to entirely disconnect the keyer from its battery.) During normal operation, the keyer's current demand averages around 6 mA. Four AA batteries should last a long time in this service.

The Circuit

Fig 1 shows the Uncle Albert's Unique Keyer schematic. The 87C51 microcon-

troller's clock uses an 11.0592-MHz crystal (Y1), a standard computer part. The **PADDLE** inputs connect to the 87C51's pins 11 and 10. Q1 and Q2 buffer the keyer's output (pin 39) for connection to a transmitter (or a practice oscillator). The keyed device should have a negative ground. The **EXTERNAL KEY** jack connects directly to Q1's drive line. The keyer accepts commands from the first input (**EXTERNAL KEY** or **PADDLES**) you activate after pressing **RESET**.

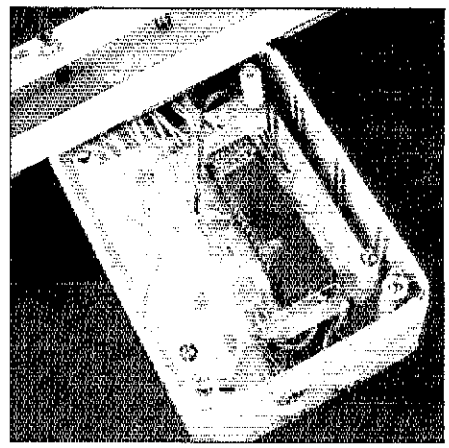
All the capacitors except C1 suppress transients—that is, reduce the keyer's sensitivity to noise spikes and interference from transmitted RF. C1 is necessary to reset the computer at power up. It allows the 87C51's **RST** pin to remain at V_{CC} for at least 2 ms after the power is applied—a condition necessary for smooth start-up. The three 1N4148 diodes (D1, D2 and D3) allow key/paddle closures at the **EXTERNAL KEY** and **PADDLE** inputs to "wake up" the 87C51 when it's in the Power Down mode.

Eleven lines run from the 87C51 to the dot-matrix LCD module, Z1. Eight of these lines provide data; the other three control circuitry in the display. R1 controls the display's contrast. Q3 controls the power to the LCD. When the 87C51 enters the Power-Down mode, it turns off Q3 to interrupt the LCD's supply. S1, **RESET**, starts or restarts the 87C51. S2, **MESSAGE**, stops and starts the memory message. Both switches work in conjunction with the paddles or straight key to communicate instructions to the 87C51.

I power my keyer with four AA cells through a 1N4001 diode (D4). Although the diode protects the circuit from reverse polarity, its main purpose is to keep V_{CC} below the 87C51's absolute maximum supply voltage (6.5 V). Four fully charged alkaline batteries can provide nearly 6.4 V, a level I consider to be too close to the 87C51's absolute maximum. Using only three batteries and no diode would power the 87C51 at the lower edge of its supply range, a situation that might lead to glitches as battery voltage falls. So, the 1N4001 is a compromise: Its voltage drop (about 0.6 V) limits the 87C51's maximum supply to around 5.8 V when four fully charged alkalines are used.

Display Choices

To permit builders freedom in choosing a display, the keyer has been programmed to drive 16 × 2, 20 × 2, 24 × 2, 32 × 2 and 40 × 2 displays (a jumper wire sets the IC to operate with a particular display configuration). Uncle Albert's Unique Keyer will work with many different LCD modules—for instance, the Hitachi LM052L, a 16 × 2 display that's quite small. On the other hand, the Optrex PWB40218 40 × 2 display (used in the keyer shown in the photographs) can show 40 characters at a time, permitting you to see more of what you're sending. (Visitors who cannot copy CW by ear find it more impressive, too!) The more characters a module can display, and the larger the characters, the more it will cost. Supertwist LCD modules, which afford better contrast over wider viewing angles than standard types, are also more expensive than their standard counterparts.



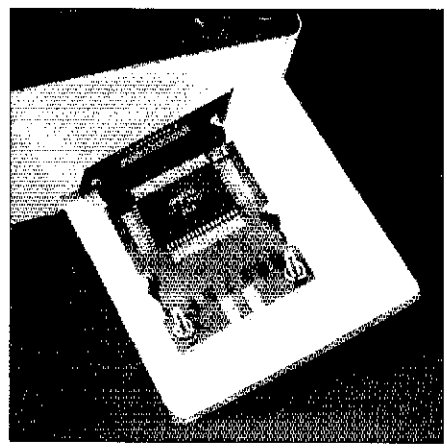
A PC board, available from the author, holds most of the components in this version of the keyer.

Table 2

A Common LCD-Module Pinout

Pin	*Function*
1	Ground (or V_{SS})
2	V_{CC} (or V_{DD})
3	V_O (Contrast)
4	RS (Register Select)
5	R/W (Read/Write Select)
6	E (Enable/Disable)
7	D0 or DB0 (Data Bit 0)
8	D1 or DB1 (Data Bit 1)
and so on to	
14	D7 or DB7 (Data Bit 7)

This listing shows the pinouts of LCDs carried by Digi-Key Electronics (Varitronix Limited character-display modules) and Mouser Electronics (Rohm and Epson character-display modules). Modules with this pinout and successfully used by the author include the Hitachi LM018L and LM052L, Philips LTN211-R, Optrex PWB40218, Varitronix MDL16265, an untraceable bought-used part marked *SLM22403BSA (242-HI-OAL)* and an Optrex PWB16230-CEM.



Surgery on a Radio Shack blue-plastic project box—here painted eggshell white—allows the box to hold a large LCD. A single formed piece of Lexan acts as the box top, display mask and keyer control panel.

Getting the Parts

Getting the parts for Uncle Albert's Unique Keyer is easy. The only Uncle Albert's Unique Keyer parts not available from Radio Shack are the 87C51 microcontroller, PC board, crystal and the LCD display. As detailed in Note 1, the programmed 87C51, PC board, LCD and other components are available from me if you wish to avoid shopping around. So far, I've built all of my keyers into plastic boxes and had no trouble with RF interference to the keyer. You may need to use a metal box and add bypass capacitors to your keyer's input and output lines if you run into difficulty with RF-induced keyer glitches.

If you decide to shop for an LCD module yourself, you'll find that many manufacturers make LCD modules. The modules I've seen appear to be identical in operation and pinout. (Of the six different displays I've used, all have worked well, although one [a Philips LTN211-R] needed a 1-µF capacitor across its power line to reduce the electrical noise it generates at start-up.) As Table 2 shows, the pinout of LCD character-display modules seems to be standard—at least for the modules available through two suppliers well-known to hams (Digi-Key and Mouser). Between these and other firms, and ham flea markets, you should have no problem buying a display for your keyer.

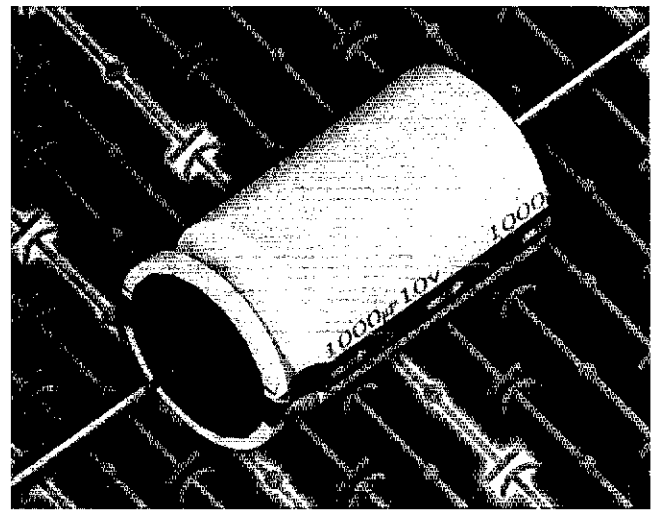
Construction

With so few parts, this project is quite simple to build. The LCD modules include LSI ICs that handle all the manipulations involved with driving the 5 × 7 dot matrix displays—all you do is hook them up and add a few other parts. Then all you need to do is power up the keyer and adjust the LCD "brightness" with R1—a setting that will depend on your viewing angle. Then you're ready to press the **RESET** button, set your keying speed and get on the air with Uncle Albert's Unique keyer! QST

SOUNDS LIKE OL' STEVE IS HOLDING HIS MICROPHONE UPSIDE DOWN, AGAIN

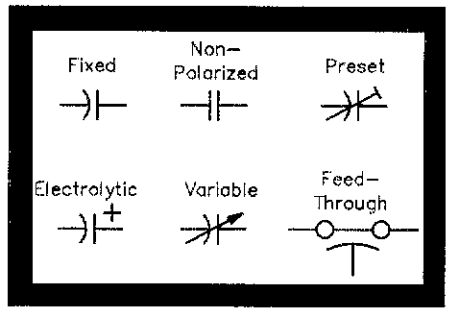
Under the Hood III: *Capacitors*

In this, the third in a series of articles aimed at providing a glimpse of the many components that go into our communications gear, we examine capacitors —how their construction and characteristics influence selection, use and circuit design.

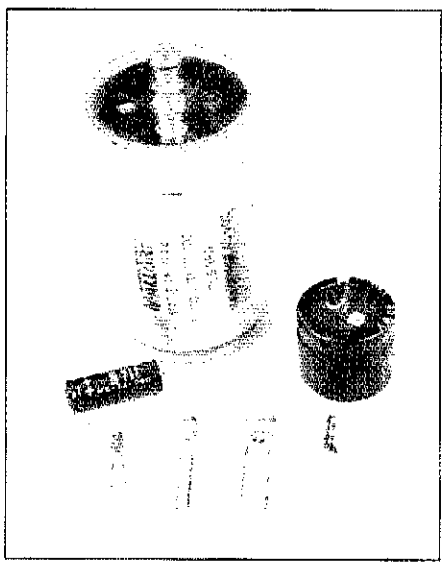


By Bryan Bergeron, NU1N
Decision Systems Group
75 Francis St
Boston, MA 02115
E-mail: bergeron@hstbme.mit.edu

Capacitors are common in electrical and electronic equipment because what they do is so essential: They temporarily store energy electrostatically and release it in a variety of ways, depending on the applied voltage, frequency and associated circuitry. Capacitors resonate with inductors to form tuned circuits, filters and impedance-matching networks; interact with resistors to filter signals and set time constants; allow ac energy to pass while blocking dc; divide voltages and currents; and assist in turning ac into dc. Capacitors do their job across an enormous range of voltages, currents and frequencies—at levels ranging from that of radio impulses received from distant stars to the metal-melting might of interstate power grids.



Like resistors, capacitors can be fixed or variable in value. In this Under the Hood, I'll cover some of the fixed and variable capacitor types used in Amateur Radio communication.



Electrolytic capacitors span the large (a Mallory computer-grade part) to the tiny (a dipped tantalum, lower left). *(photos by Kirk Kleinschmidt, NT0Z)*

Capacitor Basics

In simplest form, a capacitor consists of two conductors, often generically called *plates*, separated by an insulator generically known as a *dielectric*. The capacitor stores energy in an electrostatic field between the plates. The plates' size and proximity, and the characteristics of the dielectric, determine the capacitor's *capacitance* —its ability to store energy—the basic unit of which is the *farad* (F), named after Michael Faraday. Less plate-to-plate spacing means more capacitance, as does greater mutual plate surface area. Connecting two or more capacitors in parallel increases the effective surface area and number of plates, and therefore directly sums their capacitance.

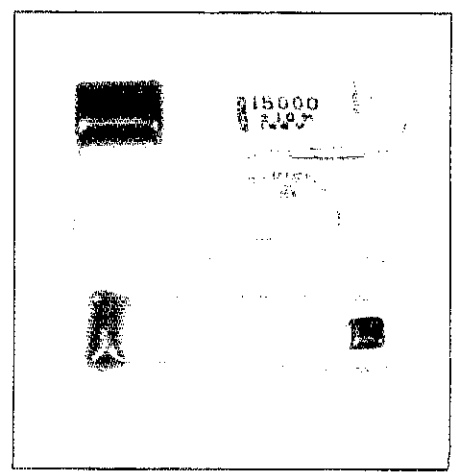
For a given plate spacing and size, a capacitor dielectric determines monolithic capacitance according to its *dielectric constant*—a number that corresponds to how much the dielectric increases capacitance compared to an equal thickness of air. For example, an air-dielectric capacitor that exhibits 100 pF at 60 MHz would increase in value to 260 pF if its dielectric were entirely replaced by polystyrene (dielectric constant = 2.6 at 60 MHz).

Capacitor Classification

Look at a parts list for almost any circuit that uses capacitors, and you'll see capacitors grouped according to their dielectric types and/or plate materials—air variable, ceramic, electrolytic, film, mica, oil, paper and more. Whatever they're made of, capacitors also vary widely in physical form, as the photos show.

Air

If you don't intentionally evacuate the space between a capacitor's plates, or fill it



Film capacitors: two polystyrenes (silver), a Mylar/paper (lower left) and two metallized-films.

with a gas, liquid or solid, that capacitor will be an air-dielectric type. Most air-dielectric capacitors are variable, although fixed air capacitors are sometimes used in high-power transmitting applications, and can be easily built by experimenters.

Ceramic

Ceramic capacitors have long been used for RF tuning and bypass applications, in part because of their low series inductance. Popular ceramic-capacitor types include disc, monolithic and multilayer. Disc-ceramic capacitors, easily recognized as the ubiquitous thin, tan, coin-shaped components common on many PC boards, are formed by two thin sheets of silver, nickel, or other metal that are separated by titanium dioxide or another ceramic dielectric. The resulting sandwich is either encased in a thin shell of ceramic or dipped in flame-retardant epoxy for protection against humidity.

Multilayer ceramic capacitors and surface-mount ceramic chip capacitors are formed by sandwiching layers of metallic-ink-on-ceramic electrodes. Monolithic ceramics have the highest capacitance per unit volume, in part because of their thin dielectric (on the order of 13 µm thick for a 16-V capacitor). Ceramic capacitors are available with voltage ratings of several kilovolts.

Electrolytic

Aluminum electrolytic capacitors are so named because (a) they are made of two aluminum conductors separated by an acid or salt electrolyte or (b) they use an electrolytically deposited dielectric film. In either case, the dielectric consists of a thin layer of solid aluminum oxide on the sheet destined to be the anode. Each foil sheet is electrochemically roughened for increased surface area which equates to greater capacitance. Aluminum electrolytic capacitors are common in power-supply filtering, interstage coupling and bypassing applications.

Because their aluminum-oxide dielectric insulates only against current flow in one direction, standard aluminum electrolytics are said to be *polarized*, and their leads are marked + and – accordingly. Although applying voltage with the wrong polarity can cause violent and permanent damage to an aluminum electrolytic, most have the ability to heal themselves following minor damage. Special designs, referred to as *computer-grade* and *high-ripple* electrolytics, are available for applications in which high alternating currents flow through the capacitor. *Bipolar* aluminum electrolytics are designed for applications in which polarity reversal is possible, or circuits in which short-duration ac voltages appear across the capacitor.

Tantalum electrolytic capacitors use a tantalum anode, a manganese-oxide dielectric and graphite-and-silver-paste cathode. The popular teardrop-shaped solid tantalum electrolytics are encapsulated in a flame-retardant epoxy coating that provides uniform lead spacing and protection against mechanical damage and moisture.

Like aluminum electrolytic capacitors, tantalum electrolytics are polarized and are designed to work in relatively low-voltage circuits. Although tantalum capacitors tend to be expensive, their compactness, low dc leakage and high capacitance have made them the most popular of surface-mount capacitors.

Film

Film capacitors use a plastic-film (commonly, polypropylene, polyester, polycarbonate, polystyrene, and polysulfone) dielectric. Film capacitors are commonly made by winding aluminum, tin, or other metal together with a plastic ribbon into cylindrical form. Alternatively, a metal film can be vacuum-deposited onto the plastic. Metallized polypropylene capacitors, useful in timing applications because of their stability and low leakage, are constructed in this way. Film capacitors are relatively inexpensive and provide capacitances up to a few microfarads at voltage ratings up to several hundred volts.

Mica

The popular *silver-mica* capacitors, used extensively in RF output circuits, are composed of a slab of mica sandwiched between two conducting plates. Mica's high dielectric strength and low dielectric loss makes such capacitors suitable for high-voltage and RF applications. *Postage-stamp* micas, so named because of the size and shape of their plastic packages, were common in RF tuning, coupling and bypassing applications before the appearance of disc ceramics.

More Types Available, More on the Way

The capacitor types I've mentioned so far are those most common in Amateur Radio equipment. Given the ongoing evolution of capacitor technology, it's perhaps best to think of those types only as rough guides of what a given capacitor type can do. Hybrids of, and expansions on, the major capacitor types are common, as new materials and new ways of applying established materials appear. For instance, Fig 1 shows how four capacitor types have been adapted for surface mounting.

Other capacitor types you may hear about include

- *Oil-dielectric capacitors*, still used in high-voltage power supplies to filter dc;
- *Paper-dielectric capacitors*, usually based on oil-impregnated paper, were common in audio coupling and RF/IF-amplifier-bypassing applications in pre-World-War II ham and broadcast receivers, but are now used mainly in dc and line-frequency applications because of their relatively high inductance;
- *Memory backup capacitors*, available in values up to *several farads* as alterna-

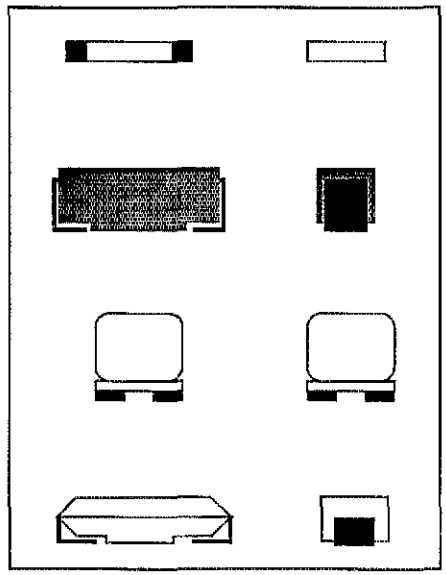
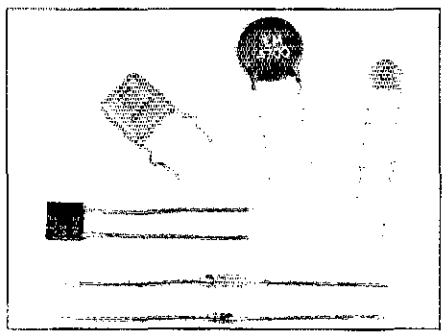
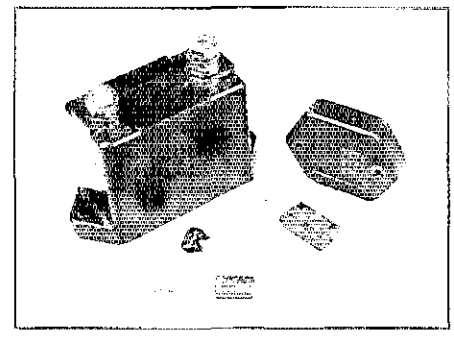


Fig 1—Virtually all capacitor types are available in surface-mount configurations. The surface-mount capacitor types shown here are, from top to bottom, ceramic chip, tantalum, aluminum electrolytic, and metallized-polyester film. Typical package dimensions for ceramic chip and tantalum-electrolytic surface mount capacitors are on the order of 2 or 3 mm on end.



Ceramic capacitors: glass-encapsulated (the cylindrical pair), two discs and two monolithics. Ceramics are also available in axial packages that resemble film resistors.



Mica capacitors: Two large transmitting units (one of which carries a rating for current as well as voltage), two "postage-stamps" and a dipped silver-mica (directly below the *6032*).

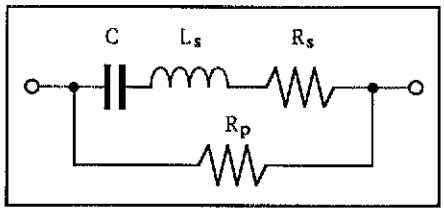


Fig 2—The equivalent circuit of a real capacitor reveals the presence of parasitic series inductance (L_S); series resistance due to wire leads, contact terminations, and electrodes (R_S); parallel resistance due to the finite resistivity of the dielectric and case materials (R_P); and the capacitance of the part (C). R_P is high in all but electrolytics. Dissipation due to R_S determines the maximum current that a capacitor can safely handle. At the frequency where L_S and C resonate, a capacitor presents a pure resistance; above this frequency, it behaves more like an inductor. A tantalum electrolytic of a few microfarads has a resonant frequency somewhere near 100 kHz.

tives to memory-backup batteries;

• *Feedthrough capacitors*, used to convey power or control lines through bulkheads, panels and chassis while bypassing the lines to ground for RF and noise;

• *Vacuum capacitors*, fixed and variable, in which a vacuum serves as the dielectric to provide high-voltage, low-loss performance in relatively small packages;

• *Doorknob* capacitors—large, cylindrical ceramics used in high voltage/current coupling, filtering and tuning applications.

A good long-term tactic in understanding, using and replacing capacitors is to learn to appreciate the significance of the functional characteristics used to describe all capacitors. Not only will your junkbox become more valuable to you, but you might be able to save a few dollars at your local parts store by substituting a cheaper, but equally capable, capacitor design for another.

Capacitor Characteristics

Aside from their physical properties, capacitors are functionally characterized in terms of their electrostatic capacity, dielectric loss, rated voltage, insulation resistance, operating frequency range, stability, reliability, and precision. Some of these characteristics can be better understood by referring to the functional equivalent of a capacitor (Fig 2). There is considerable overlap in the functional characteristics of most capacitor types.

Capacitance

The basic unit of capacitance is the farad (F), but a farad is so large compared to the capacitances common in radio and electronics that smaller and more practical microfarad ($\mu F = 10^{-6}$ F) and picofarad ($pF = 10^{-12}$ F) values are standard. Temperature, applied voltage and (for ac) frequency all affect a capacitor's actual value to varying degree, and its detailed specifications may reflect this. Like resistors, fixed capacitors are manufactured in standard values, for example, 1 μF, 2.2 μF, 4.7 μF, and 6.8 μF.

Tolerance

Depending on manufacturing tolerances, temperature, applied voltage and other factors, a capacitor's actual capacitance can vary greatly from its marked value. For the most part, tolerance is limited by the capacitor type. For example, disc-ceramic and metallized-polycarbonate-film capacitors are routinely available with 5% tolerances; mica capacitors, to within 0.5% (1% and 2% are typical). Electrolytic capacitors and general-purpose ceramics often carry wide tolerances—−10% to +80%, for example. One possible variation is the label *GMV* (guaranteed minimum value)—a specification, equal to a range of −0 to +100%, useful in bypassing and decoupling applications.

Rated Voltage

The rated voltage is the highest voltage that can be continually applied to a capacitor within a specified operating temperature range. Capacitors may be rated for ac, dc (usually as *working voltage dc* [WVDC]), or both. Contrary to ham lore, capacitors not rated for ac-line use—high-voltage dc types, for instance—should *not* be used in across-the-line or line-to-ground service because ac subjects capacitors to internal stresses that do not occur in dc service.

Equivalent Series Resistance (ESR)

Often specified for electrolytic capacitors, ESR sums a capacitor's ac and resistive losses as the value of a single equivalent resistor.

Dissipation Factor

Often specified for ceramic, film and mica capacitors, dissipation factor reflects ac loss as the ratio (expressed as a percentage) of ESR to the capacitor's reactance ($X_c = 1 \div 2\pi fC$). Examples of typical dissipation factors include 0.1% at 1 kHz for a polypropylene capacitor and 1% at 1 kHz for a metallized-film capacitor. Dissipation factor is sometimes expressed as its inverse, *Q* (quality factor), especially for capacitors specified for use in tuned circuits. The lower this number, the lower the capacitor's ac loss.

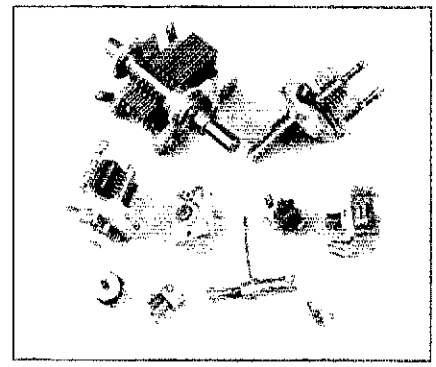
Tangent of Loss Angle (tanδ)

Commonly specified for electrolytic capacitors, tanδ, another measure of a capacitor's energy loss, is a capacitor's power loss divided by the reactive power

Variable Capacitors

Making a capacitor variable involves moving parts—moving the plates connected to one capacitor electrode relative to the plates connected to the other capacitor electrode. Historically, this motion has generally been achieved with rotating shafts, with one set of plates (the *rotor*, attached the shaft), moving, and the other set of plates (the *stator*) fixed, with air, ceramic, oil, plastic or a vacuum serving as the dielectric. The plates may be parallel planes that mesh laterally, or concentric tubes that mesh axially. Whatever the design, the more fully the plates mesh, the greater the capacitance.

Air-dielectric variable capacitors—"air variables"—were once common in receiving and transmitting applications. With the standardization of RF interconnections at 50 ohms and the introduction of digital frequency synthesis and broad-band, solid-state RF amplifiers, the need for air variables has significantly decreased. Even so, many types of mechanically variable capacitors appear in up-to-date RF designs. You'll find modern variable capacitors tuning transmitter-output, receiver-input and RF-matching and phase-shift networks, resonating filters, and adjusting oscillator



circuits to frequency. High-voltage air and vacuum variables continue to find use in RF matching networks—*antenna tuners*—and medium- and high-power RF amplifier circuitry, especially where vacuum tubes are used. Nonsynthesized broadcast receivers, and many ham and experimenter projects, continue to use low-voltage variable capacitors in many forms.

Arguably, though, *trimmer* capacitors—variables intended for set-and-forget service—are the most common variable capacitors today. Available in panel-mount, through-hole-PC-board and surface-mount form, they may use air, ceramic, film or mica dielectrics.—*NU1N*

present when the capacitor is subjected to a sinusoidal voltage at a specific frequency. The lower this number, the lower the capacitor's ac loss.

Frequency Ratings

Although the useful frequency ranges of various capacitor types considerably overlap, and capacitor packaging becomes increasingly important as frequency rises, you may find a few wide generalizations useful:

- Electrolytics are generally used at audio frequencies down to dc.
- Depending on packaging and value, ceramic capacitors are used from dc to the low VHF range (parts with wire leads) or into the UHF range and beyond (surface-mount and chip capacitors).
- Mica capacitors (*not* postage-stamp types, though) are used from dc up into the lower VHF range.
- Depending on packaging and construction, film capacitors are useful from dc to the gigahertz range.

Operating Temperature

Capacitors are generally rated at a specific operating temperature. In addition, an operating-temperature *range*, typically −40 °C to +85 °C for electrolytics and −55 °C to +125 °C for ceramics and silver micas, may be specified. As is generally true of electronic components of all types, higher operating temperatures generally mean shorter capacitor life.

Expected Lifetime

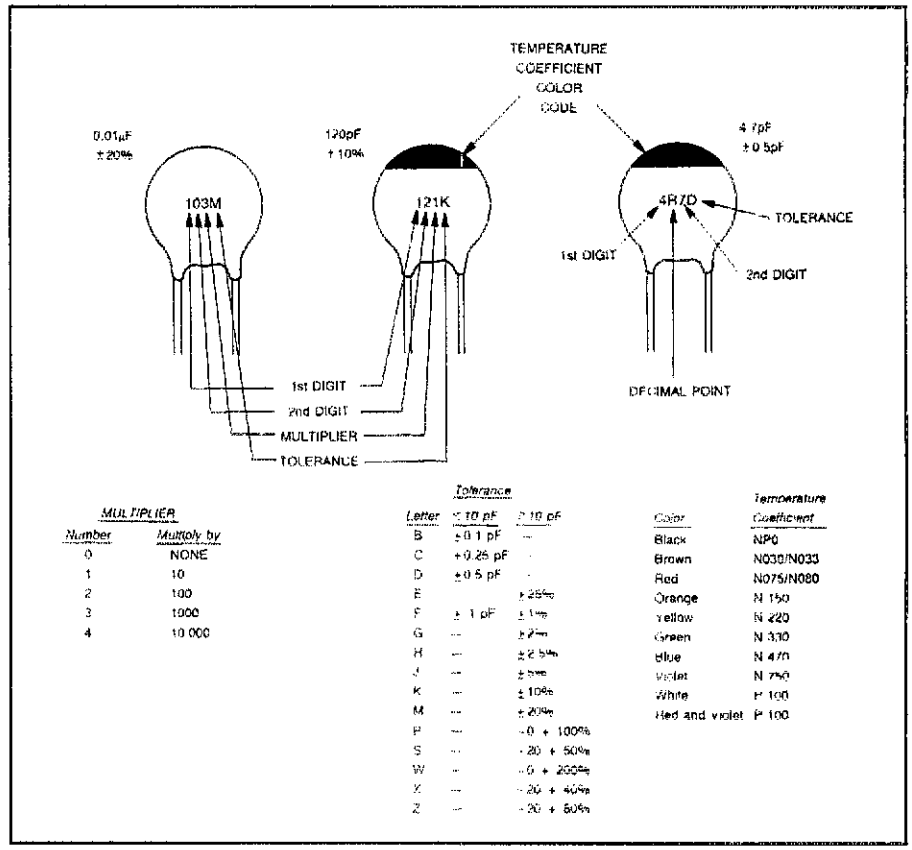
The service life of capacitors is generally specified in terms of temperature and voltage, for example, 100,000 hours at 85 °C and 16 V. Lower temperatures and working voltages can significantly lengthen a capacitor's expected lifetime.

Leakage Current

The executive summary is that capacitors "block dc," but the long answer is that some capacitors, especially electrolytics, leak *some* dc. This characteristic is particularly important in energy-storage and timing applications, and in battery-powered equipment. Capacitor specifications sometimes list a related characteristic, *insulation resistance*.

Temperature Coefficient

Every capacitor's capacitance varies somewhat with temperature. The change can be positive (increasing temperature translates to more capacitance) or negative (increasing temperature translates to less capacitance). A capacitor's temperature coefficient expresses how much (usually in parts per million) and in which direction (+ or −) its value changes per unit of temperature change (usually in terms of degrees Celsius). Capacitor temperature coefficient is particular important in oscillator and timing circuits, as Wes Hayward described in December 1993 *QST*'s "Measuring and Compensating Oscillator Frequency Drift." Capacitors are available in a wide range of temperature coefficients, including temperature-stable types that change value very little across wide temperature swings.



MULTIPLIER	
Number	Multiply by
0	NONE
1	10
2	100
3	1000
4	10 000

Tolerance		
Letter	≤ 10 pF	> 10 pF
B	±0.1 pF	—
C	±0.25 pF	—
D	±0.5 pF	—
E	—	±25%
F	± 1 pF	±1%
G	—	±2%
H	—	±2.5%
J	—	±5%
K	—	±10%
M	—	±20%
P	—	−0 + 100%
S	—	−20 + 50%
W	—	−0 + 200%
X	—	−20 + 40%
Z	—	−20 + 80%

Color	Temperature Coefficient
Black	NP0
Brown	N030/N033
Red	N075/N080
Orange	N 150
Yellow	N 220
Green	N 330
Blue	N 470
Violet	N 750
White	P 100
Red and violet	P 100

Fig 3—The disc-ceramic capacitors in your radio likely carry value markings applied according to this or a similar system. Plastic-film and tantalum electrolytic capacitors are often similarly marked, but without the temperature-coefficient indicator. Aluminum electrolytics, and some tantalums, often carry "plain text" markings indicating their value, operating-temperature range and polarity.

Power-Handling Capability

Power-handling capability, usually stated in volt-amperes, is rarely an issue for small capacitors intended for signal and bypassing/decoupling use, but may be a critical in components that operate in high-power circuits. Capacitors specifically intended for use in high-RF-current service may be labeled to indicate their current-handling ability versus frequency. Capacitors that mysteriously fail in high-power RF circuits—in transmission-line filters or when used as dc-blocking/output-coupling capacitors in vacuum-tube amplifiers, for instance—may do so because of current-dependent overheating even when operated well within their *dc* ratings.

Capacitor Labeling

A capacitor's capacitance, voltage rating, tolerance, temperature characteristics and (if applicable) polarity can be indicated in a variety of ways. Surface-mount capacitors use an alphanumeric code printed on the capacitor body. Disc ceramics are usually marked with alphanumeric indicators of capacitance, voltage rating, and temperature characteristics. (Fig 3 shows one system you're likely to encounter in some form.) Alphanumeric or color labels may convey the characteristics of many smaller tantalums, ceramics, and micas. A dark strip or band may mark the negative electrode of aluminum electrolytics, the positive electrode of tantalum electrolytics, and the outer-foil lead of film capacitors.

Summary

Now that you've glimpsed the world of capacitors, a peek inside your radio can show how much their contribute to a radio's interior look: Their vibrant colors, sleek coatings and great variability in packaging bring even the most conservative PC board layout to life.

So ends Under the Hood's coverage of capacitors—the parts that store energy electrostatically. Next in Under the Hood, we'll look at components that store energy *magnetically*. See you then. QST

Mother Nature's Radio

Despite our modern understanding of radio phenomena, the study of the Earth's natural VLF radio emissions is hardly out of its infancy. The best part is—you can get involved!

By David Schneider, AD4CC
Northern Kentucky University
Dept of Physics and Geology
Highland Heights, KY 41076

If Mother Nature had made our ears capable of hearing electromagnetic radiation instead of audible sounds—in our normal auditory hearing range of 20 Hz-20 kHz—what could we hear? As it turns out, a lot! We'd hear "chorus," "hiss," "tweeks," "whistlers" and other exotic sounds. See the sidebar, "The Sounds of Natural VLF Radio."

What are these sounds and where do they come from? They're natural sounds *generated in the audio-frequency range of* the electromagnetic spectrum. The audio-frequency range of the spectrum covers the same range of frequencies as the audio-frequency (sound) portion, but electromagnetic waves travel at the speed of light, not at the speed of sound. In other words, our ears can hear a 10-kHz audio sound, but we can't hear a 10-kHz electromagnetic (radio) wave unless it's electronically converted to an audible sound (hence the need for *radio receivers!*).

These sounds are associated with disturbances in the Earth's atmosphere. They're initiated by lightning and by the charging of the atmosphere by the Sun.[1] The frequencies that produce these unusual sounds reside, for the most part, between a *few hertz and several hundred kilohertz.*

This broad range of frequencies is broken down into three main segments (see Table 1). Most of the naturally occurring radio effects from lightning have a maximum frequency of about 5 kHz, so these sounds usually fall into the Very Low Frequency (VLF) part of the electromagnetic spectrum.

HF-and-higher *frequencies refract* through the ionosphere, allowing communication over great distances. The lower ionosphere, the D layer, is about 80 km above the surface of the Earth. This means that about 4000 full waves at 20 meters (14 MHz) can fit between the Earth and the *lowest layer of the ionosphere.*

At VLF, however, only a few waves (or a fraction of a wave) can fit in this space. For example, a 5-kHz VLF signal has a wavelength of 60 km—it's barely able to fit in the D-layer waveguide! (The D-layer waveguide, or the Earth-ionosphere waveguide, are terms that describe the 80-km space between the surface of the Earth and the bottom of the D-layer.)

Armed with this knowledge, you'd probably think that naturally occurring VLF radio waves travel only short distances, at least by conventional propagation.

Well, by more conventional propaga-

[1]Notes appear on page 51.

Table 1
Wavelength and Frequency

Description	*Abbreviation*	*Frequency*	*Wavelength*
Extremely Low Frequency	ELF	3 Hz-3 kHz	100,000-100 km
Very Low Frequency	VLF	3-30 kHz	100-10 km
Low Frequency	LF	30-300 kHz	10-1 km

The Sounds of Natural VLF Radio

As the Earth races on its complicated path through the heavens, powerful and mysterious planetary forces work their magic. The result: a cacophony of "natural radio" sounds:

❑ *Chorus:* Chorus sounds like a flock of chirping birds! It occurs most frequently in the morning hours, hence its nickname "dawn chorus." Increasing tones between 1 and 5 kHz seem to be most common. Chorus is usually accompanied by other VLF phenomenon such as hiss or whistlers.

❑ *Hiss:* Hiss sounds just like its name. A continuous band of frequencies denotes VLF hiss. Sonograms of hiss signals have shown cutoff frequencies ranging from 2 to 30 kHz. Hiss has also been associated with enhancements in auroral activity.

❑ *Tweeks:* Tweeks are believed to result from "spherics" that echo back and forth in the Earth-ionosphere waveguide. They usually sound pure in tone, much like a note from a musical instrument. The tone sometimes resembles a "ping" sound.

❑ *Whistlers:* Whistlers tend to be most common at night or just before dawn. They are also more frequent at mid-latitudes, peaking between 40-55 degrees geomagnetic latitude. See the text for more details.

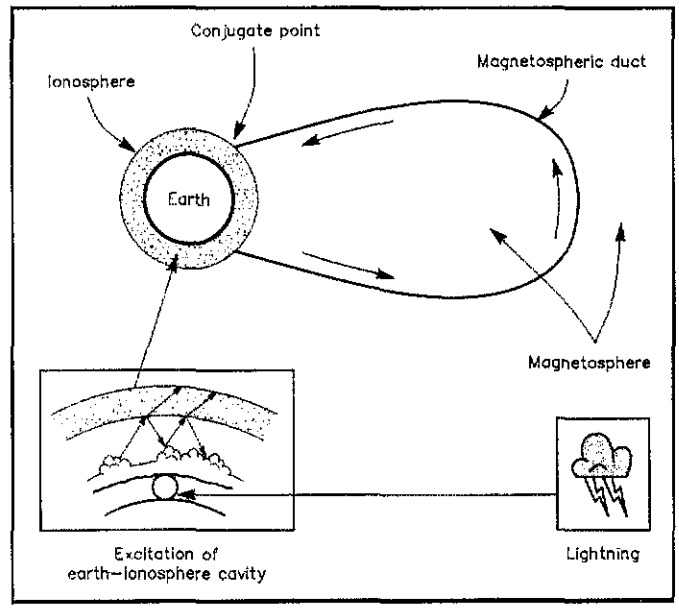


Fig 1—Schematic showing the generation and propagation of ducted whistlers.

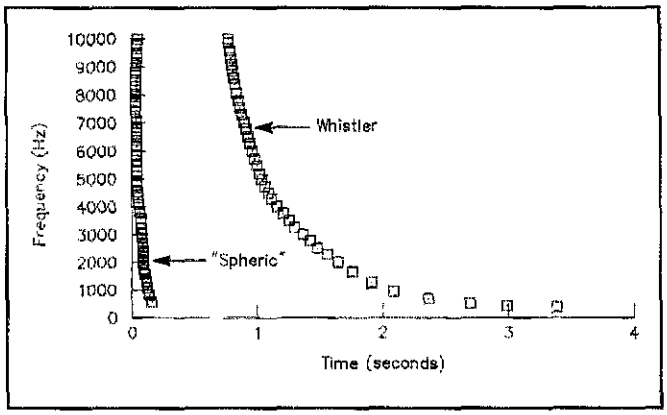


Fig 2—A lightning "spheric" followed by a "ducted" whistler.

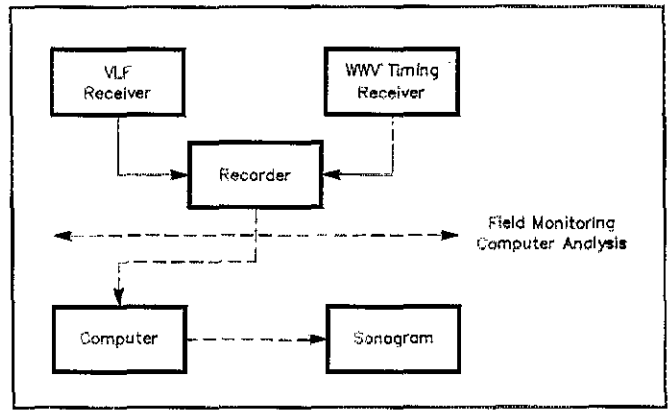


Fig 3—A typical whistler recording and analysis setup.

tion modes, VLF signals *do* travel relatively short distances, but even early experimenters proved that VLF waves can traverse large distances.[1] In fact, VLF waves can travel from one hemisphere to the other and back again!

Although HF radio waves sometimes travel thousands of miles from transmitting antenna to receiving antenna, VLF radio waves can travel more than 100,000 miles from a lightning stroke to a receiving antenna. The mechanism that propagates these VLF waves isn't the more-familiar ionosphere, it's the Earth's *magnetosphere*.

Planetary magnetospheres resemble magnetic dipole fields, but their currents flow in the plasmas that extend from the outer ionosphere to thousands of miles in space. These currents, resembling the familiar horseshoe-shaped magnetic flux lines, result in part from solar winds that reach the Earth and from the rotation of the Earth about its axis.

A wealth of information can be gained from the study of natural VLF waves. Propagation information, electron densities in the ionosphere and magnetosphere and the location of the lightning strikes that cause particular VLF waves are a few of the studies that are under way.

Man-made VLF signals are exploited by several groups, especially the US Navy. The Omega signals broadcast at various places around the Earth are used as maritime and aviation navigation aids. Man-made VLF generally falls in the 10-40 kHz range. These predictable signals can be used in conjunction with naturally occurring VLF to help us better understand their propagation characteristics.

Whistler VLF Theory

Whistlers are interesting and informative natural VLF radio waves (see Fig 1). A whistler is a VLF wave that originates with a lightning strike. Generally, there are at least two wave events associated with the lightning pulse. The first event is a short-lived wave that propagates from the lightning strike through the Earth-ionosphere waveguide to the receiver. This event is called the *atmospheric*, or simply *spheric*.

The second event is the whistler itself. The whistler wave travels up to and through the ionosphere, enters the magnetosphere and follows the Earth's magnetic field through a relatively narrow magnetic "duct" to the opposite hemisphere. After arriving in the opposite hemisphere, it again traverses the ionosphere, exits and propagates in the Earth-ionosphere waveguide to the receiver.

This is called a "one-hop" whistler; you can see the reason for its delay time relative to the spheric. A "two-hop" whistler is one in which the hemisphere where the lightning stroke originated also receives the whistler wave after it's ducted twice in the magnetosphere.

Under the right atmospheric conditions, this "hopping" between hemispheres can happen many times, sometimes several hundred! The number of hops determines the delay between the lightning strike that produces the original spheric and the whistler event.

Ducts that direct the whistler wave to the opposite hemisphere end up at a conjugate point on the Earth's magnetic field. A whistler that originates in the Northern Hemisphere will be ducted to the Southern Hemisphere to a point in the Earth's magnetic field equal in magnitude to the magnetic field where it originated.

The physical consequence of traveling thousands of miles through magnetic ducts is that higher frequencies arrive at the receiver before the lower frequencies (see Fig 2). The more hops the whistler takes, the greater the time between the higher- and lower-frequency arrivals (that is, the dispersion increases).

An accurate measurement of the dispersion can lead to an understanding of the whistler's propagation path, as well as the whistler's spectral shape. In addition to being fun to listen to, a deeper understanding of the composition of the ionosphere and the magnetosphere (ion density, electron density, electron temperature, and so on) can be realized.

Whistler VLF Experiment

One way to study whistler phenomena is to simultaneously record whistlers at sites hundreds or even thousands of miles apart. This technique can provide information on whistler propagation by directly comparing the spectra of the same whistler recorded simultaneously at distant sites.

For example, a one-hop whistler must traverse the ionosphere at least twice and enter at one place into the ionosphere from the magnetosphere. By comparing the spectra of the same whistler at receiving stations thousands of miles apart, we can look for changes in the wave form.

This may manifest itself in one spectra as a missing or attenuated segment that may be caused by absorption as the whistler wave travels from its exit point in the ionosphere to a distant receiver.

Noting which frequency components have been attenuated can lead to information about which part of the ionosphere—the D, E or F region—caused the effect. As you may guess, receiving a whistler that has propagated through the gray line—the line separating day from night—could give

How to Get Involved in Whistler Research

Hams took part in receiving natural VLF signals across North America this past year, and you can participate in this monitoring program and directly contribute to scientific endeavors of great interest to NASA, the Navy and the scientific community.

Further analysis of whistlers and their sonograms is ongoing. Northern Kentucky University and VLF monitoring teams across North America will make additional recordings in March 1994.

Our goal is to expand our efforts to other parts of the globe and incorporate VLF recordings from as many different geomagnetic locations as possible. If you'd like to take part in this scientific team effort, please write me at the address shown at the beginning of this article. We'd like to hear from you!

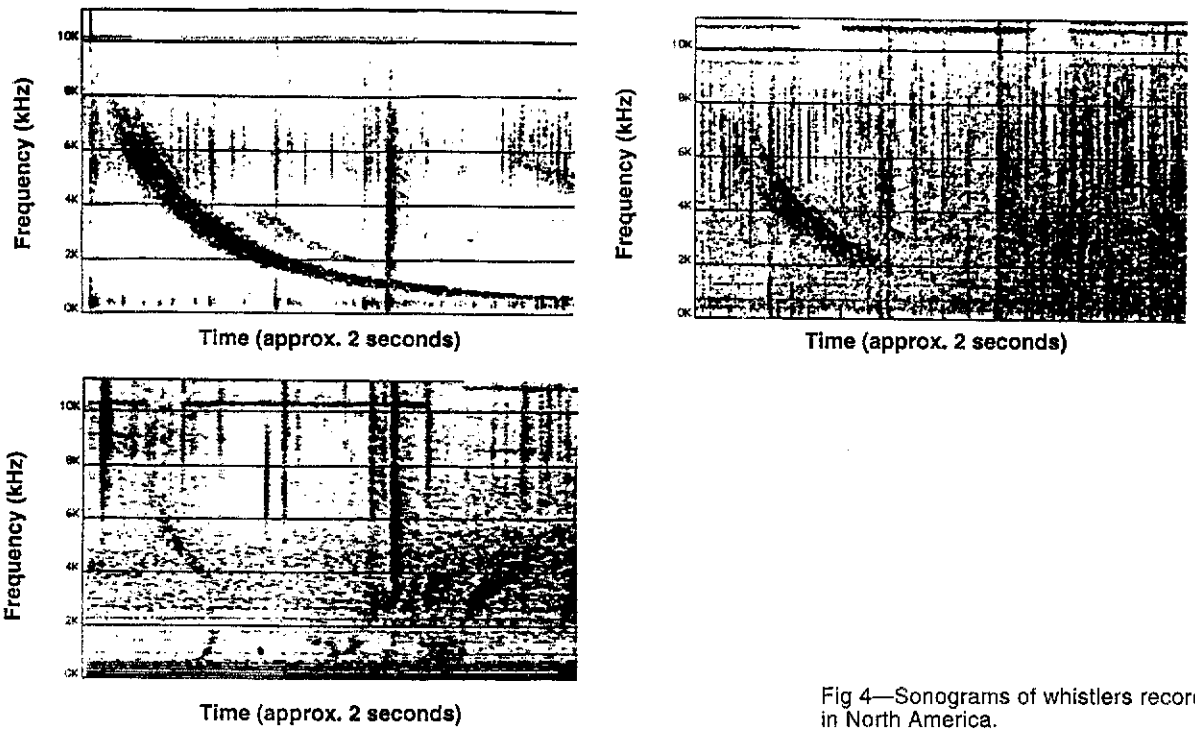


Fig 4—Sonograms of whistlers recorded in North America.

details about the density of ions and electrons in the D region, which is most pronounced on the daylight side of the Earth.

Fig 3 shows a schematic for a typical VLF monitoring and analysis station. The basic configuration consists of the VLF receiver and antenna, a timing device (usually WWV's 5, 10, 15 or 20-MHz time signal broadcast from Ft Collins, Colorado) and a stereo cassette or VHS recorder.

One channel of the stereo recorder will record WWV, and the other channel will record the natural VLF phenomenon. Using a single timing source makes it possible to accurately compare recordings made simultaneously at several locations.

VLF receivers can be purchased from Conversion Research for about $70 (complete with an antenna), or you can make one from inexpensive parts.[2] Computer analysis can then be accomplished with commercial software and hardware, such as *Sound Edit* and *Mac Recorder* on an Apple Macintosh computer. Display and analysis of sonograms can also be done with counterpart software on an IBM-compatible PC.

Whistler sonograms recorded March 22, 1993, are shown in Fig 4. These sonograms, recorded at several points in North America, are of the same whistler. The horizontal lines near 10 kHz are man-made Omega broadcasts. The vertical lines are spherics from local lightning discharges. The variation in cutoff frequencies for this whistler at various locations provides clues to its propagation characteristics in the Earth-ionosphere waveguide.

Acknowledgments

The success of this VLF program is possible because of dedicated participants at Northern Kentucky University and across the US. Contributors include Dr Mike McPherson, Dr Bill Wagner, Dan Spence, Toxanne Barnes, Steve Phelps and Justin Rains. Special thanks goes to Dr Dennis Gallagher of the Magnetospheric Physics Branch of NASA's Marshall Space Flight Center.

Funding for the VLF project is provided by the Kentucky Space Grant Consortium (KSGC) and NASA.

David Schneider has been licensed since his sophomore year in high school. His previous call signs were KA4LHP and N4RAM. He holds a BS in physics and mathematics from Northern Kentucky University, an MS in atomic physics from the University of Connecticut and a PhD in chemical physics from the University of Cincinnati.

He's assistant professor of physics at NKU and consults for the specialty chemicals industry. This past summer, he spent 10 weeks at NASA's Marshall Space Flight Center in Huntsville, Alabama, where he started a three-year project to study VLF.

David says his early involvement in Amateur Radio was a major influence in his choosing a career in the sciences.

Notes:

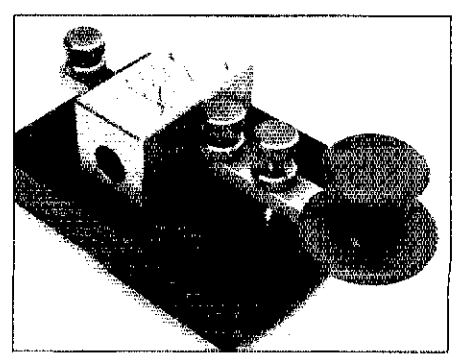
[1]See, for example, R. A. Helliwell, *Whistlers and Related Ionospheric Phenomena*, Stanford University Press, Stanford, California (1965).

[2]An excellent description of whistlers and other VLF phenomenon, plus instructions on how to build a VLF receiver, can be found in the July 1992 issue of *Science PROBE!* The article is titled "Listening to Nature's Radio," by Michael Mideke. QST

New Products

JONES STRAIGHT KEY

◊ A new hand key, produced by Peter Jones Engineering of England, shares many features with the Jones dual-paddle key, including a heavy steel base with a brilliant red finish, rotary ball bearings and tension spring enclosed in a solid machined-brass block, instrument-knurled heads on all adjustment screws, serial number engraved on the brass block and heavy duty construction throughout. The Jones hand key comes with a standard "Navy" knob. The pure copper electrical contacts under the base will key any transmitter, and a solid touch is provided by the key's 3¼ pound weight. Retail price $118 plus $4 s/h. Palomar Engineers, PO Box 462222, Escondido, CA 92046; tel 619-747-3343, fax 619-747-3346. QST



Where are the Novices?: League Members Respond

Will the Novice license go the way of the dinosaur? Our readers respond....

Compiled by Kirk Kleinschmidt, NTØZ
QST Assistant Managing Editor

In the July 1993 editorial, ARRL Executive Vice President David Sumner, K1ZZ, opened a can of worms by penning "Where are the Novices?" After presenting data from the FCC, the ARRL/VEC, and a recent survey of licensed hams (League members and nonmembers alike), Dave asked for reader input on the apparent decline in Novice on-the-air activity.

The floodgates opened, resulting in a three-inch stack of replies. Most were emotional and passionate—and many of the letter writers voiced similar concerns. By far the most common response was that getting a ham license today is too easy. Some writers noted that the Novice license attracts many young people who are busy with school and just growing up, but who will come back to the hobby some day. Others noted that the 10-year renewable license may be the culprit; in the days of the one-year (and later, two-year) nonrenewable license, it was "up or out." Still others saw the need for simpler, less expensive equipment; the need for more experienced hams to help newly licensed people to become *active* hams; the need for additional, more attractive Novice frequency allocations; and the need for additional beginner-oriented publications.

Although the July editorial—and all of its statistics and survey results—specifically focused on Novice issues, many who responded raised concerns about the state of ham radio in general and about the codeless Technician license. Rereading the July editorial should help you to clarify the responses printed here.

Because of space limitations, we can print only a few of the responses received. As with letters received for our Correspondence column, those printed here have been edited for edited for length so that we could present more members' views.

If It's Broke, Fix It

◆ The July *QST* editorial outlines a set of statistics derived from a recent poll that paints a picture of a rather uninterested and uninvolved group of Novices: Despite record numbers of Novice licensees, the majority are inactive, "paper" hams, and those who are active devote little time to Amateur Radio and its activities.

According to the editorial, the most recent Novice Roundup garnered only one-sixth the participants of those held 10 years ago. The editorial closes with the question of how to reverse this trend. Here's my opinion.

Over the last decade, getting your first license or upgrading to a higher class of amateur license has become progressively easier. First came the VE program, then the proliferation of so-called study guides that give applicants all the exam answers. Finally, the no-code license became reality.

It was no longer necessary for prospective amateurs to crack the books, learn electronics or Morse code, or even leave one's hometown to take an exam. Obtaining today's Novice license has become almost as easy and convenient as cutting a coupon from a box of cereal. And that, my friends, is precisely the problem.

That which we work for we cherish; that which is given to us has diminished value.

Studying and learning the code were never serious impediments to those who were motivated and truly wanted to become hams. As the old saying goes, you get out of something only what you put into it.

"Cheapening" what it means to be a ham in an effort to play a numbers game has attracted many largely unmotivated newcomers who are unlikely to be active participants in the hobby. Their increasing numbers have had a negative influence on those who might have truly valued the ham experience for what they get out of it.

It is entirely possible that the recent easing of the skill and licensing requirements has been a "turn-off" to many of the intelligent, motivated individuals we counted on as prospective hams. These folks want to associate with and learn from their peers; they're not interested in the intellectual equivalent of playing Pac-Man on a radio appliance.

So far, I've tried to define the problem. The solution isn't easy, but, in general terms, I believe we need to reform our image and substance, and in the process, a few toes will likely be stepped on.

To not repel the prospective hams we want to attract, we need to get away from the warm and fuzzy promotion of ham radio as a pursuit "everyone" can participate in. The image of the happy ham family chatting on 2-meter hand-helds is not likely to attract the high school honors grad with the scholarship to MIT.

Instead, we need to promote a perception that ham radio is a good way to interact with the engineers, scientists and leaders in our modern high tech society—much like today's computer networks.

We need to follow through on this promotion by helping it become reality. Toughen licensing procedures. Replace the "gimme" and intellectually dishonest licensing exams with those designed to be "motivation filters."

Sure, our numbers will probably shrink, but only to a core of active participants. More importantly, our stature will grow in the eyes of the public, government and industry. We'll improve our ability to provide a commodity of value to society instead of merely consuming spectrum with mindless drivel, and in the process, we'll attract those looking for a quality life experience.

The survey's results paint a picture of an increasingly moribund Amateur Radio service. It seems clear that our present strength-in-numbers mentality is eventually doomed to failure, and that our best hope for the survival of Amateur Radio in the 21st century is to provide a quality, intellectually stimulating life experience for those who will follow us.—*Bill Kleronomos, KDØHG, Lyons, Colorado*

New Privileges?

◆ In a recent *QST* editorial, the decline of the Novice license is decried. Actually, the trend is easy to understand. It's clear that the no-code Technician license has thoroughly supplanted the Novice license as the entry vehicle into our hobby.

This has attracted large numbers of quality people into the hobby, reinvigorating it. Unfortunately, it has mainly done so on the VHF bands. The no-code Tech and Tech-Plus tickets give substantial and desirable privileges, but mainly on VHF. They do not encourage operators to upgrade.

Before no-code, the Novice license was the way just about everyone entered the

hobby. The privileges granted centered on HF code privileges on 80, 40 and 15 meters. Most Novices, to get on the air, worked HF CW. And once an operator starts working CW on the air, getting up to 13 WPM is fairly easy.

One of the striking things about the many Techs (not enough, but many!) who upgrade to General class is that most of them seem to learn CW from code tapes. That's a long, hard slog compared to on-the-air QSOs, and it filters out all but the most enthusiastic. This is not desirable.

Today, there's an absolute schism between HF and VHF operations. Ham radio's almost become two separate hobbies. Just listen to the HF bands: I'll bet 80% of the operators are over age 60. And listen to the call signs: mostly W and K 1 by 3s, which the FCC hasn't issued for decades!

Listen to any 2-meter repeater. You will hear a much more representative group, many with Technician 2 by 3 call signs. Some of these Techs will eventually migrate to HF. But not enough. What to do?

Let's open up *small* Tech-Plus subbands on 80, 40 and 17-meter SSB. Perhaps 25 kHz or so. This could only help 40 and 80, which have gone almost completely geriatric. And Lord knows we need more activity on 17 meters.

My reasoning is simple: Give Tech-plus hams an incentive to go out and buy an HF rig. Once they get hooked on HF, they'll upgrade.

If we don't do something like this, the current unacceptable deterioration of the HF segment of our hobby will continue. *—Roger Buffington, KD6IX, Glendale, California*

Think Temporary

◆ In July *QST*'s Editorial, the writer seems to think all should be well because of the multitude of privileges the modern Novice enjoys. The statistics, however, show that all is not well.

When the Novice license was introduced in 1951, licensees had few privileges: The one-year license was non-renewable and the Novice operator was limited to 75 watts input and a crystal-controlled CW transmitter to be used in limited portions of several bands. Privileges were restricted and time was limited because this license was meant only as a temporary entry to Amateur Radio.

There was great incentive for Novices to be active on the air and study theory: If they didn't, they would be off the air at the end of the year. Hence, the Novice bands were full of activity and there was a lot of enthusiasm among Novice licensees.

Today's Novice, with all of the new privileges, can take his time. Unfortunately, he may lose interest before he gets around to upgrading. Or, he may decide that he doesn't need to upgrade since he can already work SSB and FM on certain bands. This lack of challenge leads to loss of interest.

It should be clear by now that receiving privileges without having to work for them does not make things better. The statistics show just the opposite. What can be done to reverse the trend? That's simple! Return the Novice license to what it started out to be: a temporary entry to Amateur Radio, with limited privileges and plenty of incentive to upgrade. It would certainly be nice to hear the Novice bands as active as they were 20, 30 and 40 years ago!—*David J. Lowenstein, N7AF, Tempe, Arizona*

Everything's Too Easy!

◆ Nowadays, a ham license has become too easy to obtain. People have tried it and quickly lost interest, like a child with a Christmas toy. By the first week in January, the little one wants another toy, no longer content with the presents that are a week old.

I would rather have a smaller number of new hams who will remain active. *—Richard Sherman, KA5PVT, Pipe Creek, Texas*

Novice Privileges are Limited

◆ In order to tackle this problem, we must recognize that Novice privileges will sustain a person's interest in Amateur Radio for only a limited period of time. This is the central factor in devising a strategy to prevent dropouts.

First, we should encourage entry at the Technician level for as many people as possible. The Technician license is infinitely more attractive, allows full participation in most club activities, and makes one part of the gang on 2 meters. There are many Technicians of years' standing. I don't feel that it takes much more effort to teach Novice plus Technician theory than Novice theory alone. In return for that small extra effort, we get a "full-fledged" ham who is much more likely to remain active—and, eventually, to upgrade.

Second, we must, as individuals and as organizations, make sure that those who do become Novices get the Elmering they need to upgrade quickly. In any other profession or activity, where there is a novice there is a teacher. When we hold a licensing class or a VE session and help get someone a Novice license, we must realize that we are accepting an obligation to help them. If they drop out, *we* have failed.—*Dave Finley, N1IRZ, Socorro, New Mexico*

It's Too Expensive

◆ Where are the Novices? Your editorial speaks of surveys, curve extrapolations, trend reversals and percentages. Why should our hobby read like a third quarter business report? Ham radio will find its own natural balance while it competes with other hobbies and the economy.

Ham radio requires too much time and money to enjoy fully. Too many households are struggling to exist in this economy. They cannot afford the time or money for ham radio.—*Lester Wahl, WA9WJB*

Worth the Wait

◆ Hey Dave, being a Novice myself, and having lived through the waiting period, I have operated for about a month dedicating at least three hours a day to the airwaves and have had a lot of fun doing it.

I have two solutions. First, cut down the time from the exam to the receipt of the new radio license. I remember fondly the days I spent sitting next to the rig, playing Jekyll and Hyde, wanting to set the heater switch to ON, tune up and send that ever-glorious CQ—but knowing that my Elmer would execute me on the spot if I did.

Second is getting the Novice more involved in the fun stuff. Already I'm getting the bug for contesting and QSL cards. I'd like to see more of that stuff for the Novice and Technician. Special Events can be a really neat thing. Maybe getting that new Novice just out of his exam into a club and assigning an older ham to help him get on the air, or getting him involved in a club activity or special event operation, could help the retention both in the clubs and on the air.

I think that a more personal interest in the welfare of the Novice in all aspects of Amateur Radio is the answer.—*Doug Baker, KE4CBB, Goose Creek, South Carolina*

The Waiting Game

◆ As a Technician, some 36 years ago, I used a Gonset Communicator on 2 and 6 meters. We had to advance to Tech in those days because the Novice license was good only for a year. When I moved to California, I sold my gear and foolishly let my license lapse.

In 1991, I suffered a heart attack, and while I was recuperating, I found myself with plenty of free time. I had always longed to work phone DX, and when I heard that Novices were allowed to work 10-meter phone-with a 10-year ticket-I went for it.

During the next year, I worked some 40 countries. But now the party's over. Ten meters is virtually dead and I do not have the patience to upgrade.

Two meters does not thrill me and CW is of no interest at all. When 10 was hot, I not only worked foreign countries, but almost every state. I also joined the 10-10 club.

Now you know where the Novices are. They are waiting for 10 meters to come alive again, or for Novices to be granted phone privileges on other HF bands. I hope I live long enough to see either alternative.—*Hal Rattner, KC6LBC*

What Would You Do?

◆ Novices have, by tradition, been given some of the worst HF spectrum: a noisy 80 meters, a broadcast infested 40 meters, an admittedly fair 15 meters—when it's open—and 10 meters, the "all or nothing" band. What would you do if your HF allocations were as lousy?

Let's not blame the Novices for their lack of devotion to the HF spectrum. Let's look instead at their reasons for choosing the relatively less crowded VHF/UHF portions. *—Alan Applegate, KØBG, Lakewood, Colorado*

Do Amateur Radio (and Yourself) a Favor

Help protect your privileges for the future: Make Amateur Radio *National Policy*. Here's how!

By Rick Palm, K1CE
Field Services Manager

Make this your New Year's Resolution *Number One*: Write a letter NOW to your representative and senators asking them to sign on to a bill that would make Amateur Radio a congressionally recognized, national resource. This measure, if passed, would recognize amateurs' efforts in emergency communications, support us as "national policy" and would call for regulations that "facilitate" Amateur Radio operation as a "public benefit." This is not a "motherhood and apple pie" motion. There is real substance here, with significant, tangible benefits for Amateur Radio. (For the complete text of the joint resolution, see July 1993 *QST*, page 74, or write to ARRL HQ for a copy.)

There's only one way it will happen: if *you* make it happen. Here's the story of Senate Joint Resolution 90/House Joint Resolution 199, and how you need to be a part of it.

Q. What's the big deal? Why is it so important?

A. To put it bluntly, the new law as proposed would be a big arrow in our quiver for use in our constant battle against interests that would seek to take our spectrum away, or otherwise limit our operating ability. This measure affects all of us—not just a single special-interest group within our hobby—who need access to the radio frequency spectrum, the protection of which should be our number one priority. You don't believe there's a threat? Just look at the loss of 220-222 MHz a few years ago. More challenges will follow.

The proposed law would also be useful, literally, in our own backyards, when it comes time to put up our towers and operate our stations. Having a copy in hand when defending that new tower before a public hearing in a zoning board of appeals room won't hurt.

COSPONSORS
S J Res 90 and H J Res 199
The Amateur Radio Service Joint Resolution
November 30, 1993
(States with 100% of the delegation represented are marked with *)

ALABAMA
Sen. Howell Heflin (D)
Sen. Richard Shelby (D)
Rep. Sonny Callahan (R, 1)
Rep. Terry Everett (R, 2)
Rep. Spencer Bachus (R, 6)

ALASKA
None yet

ARIZONA
Sen. Dennis DeConcini (D)
Sen. John McCain (R)
Rep. Bob Stump (R, 3)
Rep. Jon Kyl (R, 4)

ARKANSAS
Rep. Tim Hutchinson (R, 3)

CALIFORNIA
Rep. John Doolittle (R, 4)
Rep. George Miller (D, 7)
Rep. Bill Baker (R, 10)
Rep. Fortney Pete Stark (D, 13)
Rep. Norman Mineta (D, 15)
Rep. Don Edwards (D, 16)
Rep. Sam Farr (D, 17)
Rep. Richard Lehman (D, 19)
Rep. Elton Gallegly (R, 23)
Rep. Edward Royce (R, 39)
Rep. Jerry Lewis (R, 40)
Rep. Jay Kim (R, 41)
Rep. Ken Calvert (R, 43)
Rep. Robert Dornan (R, 46)
Rep. Duncan Hunter (R, 52)

COLORADO
Rep. Dan Schaefer (R, 6)

CONNECTICUT
Rep. Sam Gejdenson (D, 2)
Rep. Nancy Johnson (R, 6)

DELAWARE
Sen. William Roth (R)

FLORIDA
Sen. Bob Graham (D)
Rep. Pete Peterson (D, 2)
Rep. Tillie Fowler (R, 4)
Rep. Michael Bilirakis (R, 9)
Rep. Tom Lewis (R, 16)
Rep. Peter Deutsch (D, 20)
Rep. Alcee Hastings (D, 23)

GEORGIA
Rep. Buddy Darden (D, 7)

*HAWAII**
Sen. Daniel Inouye (D)
Sen. Daniel Akaka (D)
Rep. Neil Abercrombie (D, 1)
Rep. Patsy Mink (D, 2)

IDAHO
Sen. Larry E. Craig (R)
Rep. Michael Crapo (R, 2)

ILLINOIS
Rep. Henry Hyde (R, 6)
Rep. Jerry Costello (D, 12)
Rep. Dennis Hastert (R, 14)
Rep. Thomas Ewing (R, 15)
Rep. Lane Evans (D, 17)
Rep. Glenn Poshard (D, 19)

INDIANA
Rep. John Myers (R, 7)
Rep. Frank McCloskey (D, 8)

IOWA
Rep. Jim Leach (R, 1)
Rep. Fred Grandy (R, 5)

KANSAS
Rep. Pat Roberts (R, 1)
Rep. Jim Slattery (D, 2)
Rep. Jan Meyers (R, 3)

KENTUCKY
Rep. Romano Mazzoli (D, 3)
Rep. Jim Bunning (R, 4)

LOUISIANA
Sen. John Breaux (D)
Rep. Jim McCrery (R, 5)

MAINE
None yet

MARYLAND
None yet

MASSACHUSETTS
None yet

MICHIGAN
Sen. Carl Levin (D)
Rep. Bart Stupak (D, 1)
Rep. Dave Camp (R, 4)
Rep. James Barcia (D, 5)
Rep. David Bonior (D, 10)
Rep. Joseph Knollenberg (R, 11)
Rep. Sander Levin (D, 12)

MINNESOTA
Rep. Jim Ramstad (R, 3)
Rep. Martin Sabo (D, 5)
Rep. Collin Peterson (D, 7)
Rep. James Oberstar (D, 8)

MISSISSIPPI
None yet

Q. Great! What are the particulars?

A. Two identical versions of the bill are presently in Congress: Senate Joint Resolution 90 was introduced in the Senate on May 7, 1993, by Sen Charles Robb (D-VA); the House version is House Joint Resolution 199, presented by Reps Mike Kreidler (D-WA) and Jim Cooper (D-TN) with 13 initial cosponsors. If we don't get enough cosponsors, the bill may die this year.

Q. What does all that gobbledygook mean exactly?

A. It means that these elected representatives—the same ones who debate NAFTA, the national debt, and foreign policy in war-torn corners of the globe—felt strongly enough about Amateur Radio to propose to their colleagues a resolution commending amateurs and establishing Amateur Radio as a national resource, much like they do for National Parks!

Each version must pass its own house before the law can be enacted. But it must happen soon.

Q. But they'll never get to it when they have such weighty priorities as a national health-care plan, no?

A. We (*you*) must act quickly. We need to obtain a simple majority of the members on each side to sign on as cosponsors of the bill, and/or obtain legislative committee review and approval, before it can become law.

Q. How many senators and representatives do we need?

A. We need 50 senators and 218 representatives to sign on as cosponsors of the legislation. Remember your high school political science course? There are two senators from each state comprising the Senate, and one representative from each of 435 congressional districts that comprise the House of Representatives. The bills, with identical language, must pass both houses.

If we get a favorable report from the legislative committees that may consider the measures, we could go to the floor with fewer cosponsors. But if we get these majorities, we could theoretically bypass the committees, saving valuable time.

Q. How many do we have so far?

A. We have as cosponsors 124 representatives and 22 senators. Not bad, but we've got a long way to go. Remember, we are aiming for 50 senators, and 218 or more representatives.

Q. What can I do to help get this passed?

A. It's as easy as 1-2-3:

(1) Check the list of senators and representatives in the sidebar.

(2) If your senators and/or representatives are NOT on the list, please send them a letter asking for support as a cosponsor. Explain that Amateur Radio is a noncommercial radio service of volunteers who step in to provide communications to the public in emergencies and contribute to the advancement of technology through our tradition of experimentation. Give some examples from your state, such as that tornado that ripped through your town, or the floods that swamped neighboring farmland. If you can't come up with a local example, tell them how much hams helped out in the recent flood in the Midwest (see December 1993 *QST*, page 21, and quote some of those stirring words from the hams who helped out). If you can't send a letter, send your QSL card, annotated on the back along these lines.

Please do it now so that your letter will be waiting for him/her when he/she returns to Capitol Hill for resumption of the 103rd session of Congress. (Your senators and representatives are listed in your

MISSOURI
Rep. Ike Skelton (D, 4)

MONTANA
Rep. Pat Williams (D, at large)

NEBRASKA
Sen. J. James Exon (D)

NEVADA
None yet

*NEW HAMPSHIRE**
Sen. Judd Gregg (R)
Sen. Robert C. Smith (R)
Rep. Bill Zeliff (R, 1)
Rep. Dick Swett (D, 2)

NEW JERSEY
Rep. Robert Andrews (D, 1)
Rep. Jim Saxton (R, 3)
Rep. Herbert Klein (D, 8)
Rep. Dean Gallo (R, 11)

NEW MEXICO
Sen. Pete V. Domenici (R)
Rep. Steven Schiff (R, 1)

NEW YORK
Rep. Geo. Hochbrueckner (D, 1)
Rep. Rick Lazio (R, 2)
Rep. Gary Ackerman (D, 5)
Rep. Carolyn Maloney (D, 14)
Rep. Hamilton Fish, Jr. (R, 19)
Rep. Michael McNulty (D, 21)
Rep. Maurice Hinchey (D, 26)
Rep. Louise Slaughter (D, 28)
Rep. John LaFalce (D, 29)

NORTH CAROLINA
Rep. Howard Coble (R, 6)
Rep. Bill Hefner (D, 8)
Rep. Alex McMillan (R, 9)

NORTH DAKOTA
Sen. Kent Conrad (D)

OHIO
Rep. Paul Gillmor (R, 5)
Rep. Marcy Kaptor (D, 9)
Rep. John Kasich (R, 12)
Rep. James Traficant (D, 17)

OKLAHOMA
None yet

OREGON
Rep. Elizabeth Furse (D, 1)
Rep. Robert Smith (R, 2)
Rep. Mike Kopetski (D, 5)

PENNSYLVANIA
Rep. Tim Holden (D, 6)
Rep. Curt Weldon (R, 7)
Rep. John Murtha (D, 12)

RHODE ISLAND
Sen. John H. Chafee (R)
Rep. Ronald Machtley (R, 1)
Rep. Jack Reed (D, 2)

SOUTH CAROLINA
Rep. Arthur Ravenel (R, 1)
Rep. Floyd Spence (R, 2)
Rep. John Spratt (D, 5)

SOUTH DAKOTA
Sen. Larry Pressler (R)

TENNESSEE
Sen. Harlan Mathews (D)
Rep. James Quillen (R, 1)
Rep. Jim Cooper (D, 4)
Rep. Bob Clement (D, 5)
Rep. Bart Gordon (D, 6)

TEXAS
Rep. Charles Wilson (D, 2)
Rep. John Bryant (D, 5)
Rep. Joe Barton (R, 6)
Rep. Jack Fields (R, 8)
Rep. Bill Sarpalius (D, 13)
Rep. Ronald Coleman (D, 16)
Rep. Larry Combest (R, 19)
Rep. Martin Frost (D, 24)

UTAH
Rep. James Hansen (R, 1)

VERMONT
Sen. James M. Jeffords (R)

VIRGINIA
Sen. John Warner (R)
Sen. Charles Robb (D)
Rep. Owen Pickett (D, 2)
Rep. Lewis Payne (D, 5)
Rep. James Moran (D, 8)
Rep. Leslie Byrne (D, 11)

WASHINGTON
Sen. Slade Gorton (R)
Rep. Jolene Unsoeld (D, 3)
Rep. James McDermott (D, 7)
Rep. Jennifer Dunn (R, 8)
Rep. Mike Kreidler (D, 9)

WEST VIRGINIA
Rep. Robert Wise (D, 2)
Rep. Nick Joe Rahall (D, 3)

WISCONSIN
Rep. Steve Gunderson (R, 3)
Rep. Tom Petri (R, 6)
Rep. Toby Roth (R, 8)

WYOMING
Rep. Craig Thomas
(R, at large)

*AMERICAN SAMOA**
Del. Eni Faleomavaega (D)

DISTRICT OF COLUMBIA
None yet

GUAM
None yet

PUERTO RICO
None yet

*VIRGIN ISLANDS**
Del. Ron de Lugo (D)

TOTAL 22 senators
124 representatives

Additional House Bill Also Needs Your Support: Amateur Radio Volunteer Services Act of 1993 Would Protect Field Volunteers

Recognizing the need for legislation to limit the liability of participants in volunteer programs established by the government for the benefit of Amateur Radio, the ARRL was recently able to convince legislators to introduce such a measure: House Resolution (HR) 2623 would amend the Communications Act of 1934 to "facilitate utilization of volunteer resources on behalf of the Amateur Radio service." Hams have been sued in connection with their volunteer activities, even though their activities are provided for in the Communications Act of 1934, the country's radio law. This measure would limit volunteers' exposure.

The Volunteer Examiner system, and the Volunteer Monitoring program have seen program participants scurrying for protection from exposure to liability in this lawsuit-happy nation. The Volunteer Examiner program and the Volunteer Monitoring program were established by Public Law 97-259, the Communications Amendments Act of 1982.

Each of these programs has saved the FCC many thousands of dollars and man-hours in administration of the Amateur Radio Service, which even prior to their inception required the least regulation of any of the radio services licensed by the FCC.

The Volunteer Monitoring program, implemented by the FCC under the name of the Amateur Auxiliary to the Field Operations Bureau, involves the use of Official Observers to monitor amateur frequencies for rule violations, and a reporting arrangement through FCC. Such volunteers are often used as witnesses in license-revocation proceedings, and in other enforcement proceedings.

However, the main problem addressed by this immunity legislation is the general unwillingness of many individuals to participate in these valuable volunteer programs that benefit both the Amateur Radio Service and the FCC, because of the potential exposure of those individuals to defense costs and potential liability from allegations by others. With respect to the Volunteer Examiner program, which uses teams of three examiners to administer examinations for Amateur Radio licenses, potential volunteers are often reluctant to participate for fear of actions brought against them by disgruntled candidates.

To eliminate an obstacle to volunteer participation in these valuable programs, and to protect volunteers from personal financial risk when acting in good faith, this legislation is essential.

Please check the list. If your representative is not on it, please write to him immediately, even if it's just a simple note penned on the back of your QSL card, and ask him/her to support this measure as a cosponsor. For more information, see October 1993 *QST*, page 81. For a copy of the bill, contact ARRL HQ.

COSPONSORS
HR 2623
The Amateur Radio Volunteer Service Act of 1993
(as of November 30, 1993)

SPONSOR: Rep. Slattery

ALABAMA
Rep. Sonny Callahan (R, 1)

CALIFORNIA
Rep. Ken Calvert (R, 43)

FLORIDA
Rep. Peter Deutsch (D, 20)

GEORGIA
Rep. Buddy Darden (D, 7)

ILLINOIS
Rep. Dennis Hastert (R, 14)

INDIANA
Rep. John Myers (R, 7)

KANSAS
Rep. Dan Glickman (D, 4)
Rep. Pat Roberts (R, 1)
Rep. Jim Slattery (D, 2)

MASSACHUSETTS
Rep. Barney Frank (D, 4)

MINNESOTA
Rep. Rod Grams (R, 6)

NEW JERSEY
Rep. Robert Andrews D 1
Rep. Herbert Klein D 8 NJ

NEW YORK
Rep. Sherwood Boehlert (R, 23)
Rep. Maurice Hinchey (D, 26)
Rep. Edolphus Towns (D, 10)

OHIO
Rep. Marcy Kaptur (D, 9)
Rep. John Kasich (R, 12)

OREGON
Rep. Elizabeth Furse (D, 1)
Rep. Robert Smith (R, 2)

TEXAS
Rep. Richard Armey (R, 26)
Rep. Joe Barton (R, 6)
Rep. Greg Laughlin (D, 14)

VIRGINIA
Rep. Lewis Payne (D, 5)

VERMONT
Rep. Bernie Sanders (I, at large)

WASHINGTON
Rep. Mike Kreidler (D, 9)
Rep. Jolene Unsoeld (D, 3)

WEST VIRGINIA
Rep. Nick Rahall (D, 3)
Rep. Robert Wise (D, 2)

TOTAL: 28 representatives

phone book's "blue pages" under US Government, or use the simplified address, The Honorable John Doe, Senate Office Building, Washington, DC 20510, or The Honorable Jane Doe, House Office Building, Washington, DC 20515).

And now the easy, but very important step: (3) Pat yourself on the back for being a part of the democratic process and helping make your government work for Amateur Radio! QST

Strays

HAM RADIO IN THE BLOOD

◊ Amateur Radio is a multigenerational family affair for Ed Folz, K9HVI, of Evansville, Indiana. Ed was licensed in 1955, and his brothers-in-law, Ted Gorski, N9AWA, and Lou Gorski, KB9HD, soon followed. When they got old enough, his sons, Bob Folz, N8KQM, of Cincinnati, Ohio; Marty Folz, KA9HTT, of Fraser, Michigan; Ed Folz Jr, NQ0P, of St Charles, Missouri; Ken Folz, N8OZA, of Cincinnati; and Rodney Folz, N9COX, of Durham, North Carolina, joined him—even Rodney's wife Emily Folz, N0KQN, and Ed's nephew, Scott Folz, KB9EAB, of McAllen, Texas, got into the act.

Although they're now spread throughout the East and Midwest, the Folz family often meets on the MID-CARS net (7.258 MHz LSB) and in Ohio each April at the Dayton HamVention.—*Stephen Beaven, State Journal-Register, Springfield, Illinois*

Before Spark

Sure that long-distance wireless communication was just around the corner, early researchers telegraphed through water, air and earth by various means that sometimes tantalizingly resembled radio.

By Gil McElroy, VE1PKD
1037 Lucknow St, Apt 12
Halifax, NS B3H 2T2
Canada

In spring 1992, while reading the local newspaper, I stumbled upon a short Associated Press report describing a pop singer's efforts to have his grandfather officially acknowledged as the true inventor of radio. The report stated that, in 1892, Nathan B. Stubblefield of Murray, Kentucky, had apparently publicly demonstrated an invention he called "wireless telephony."

Nathan B. *who*?

Knowing little of radio's origins beyond what I'd learned of Marconi's work, I decided to do a little investigating.

The idea of "wireless" communication could be argued to date back to at least the sixteenth century, when it was believed that a "sympathy" existed between needles touched by the same magnet, and that deflection of one would cause a corresponding deflection of the other.

But it wasn't until the nineteenth century that serious experimentation and investigation began. The notion of using an earth or water return to complete electrical circuits had been experimentally verified in mid-18th-century Germany, but it wasn't until 1811 that the next crucial step took place. At that time, the German scientist S. T. Sommering replaced wires with water and succeeded in transmitting telegraphically across basins in his laboratory.

Samuel F. B. Morse

Sommering eventually concluded that his experiments had no practical application. But others would not be similarly deterred. Among them was Samuel Morse, inventor of the telegraph. After a ship's anchor ruined a public demonstration of telegraphic transmission by cutting through a submerged cable, Morse began experimenting with ways of eliminating the cable and transmitting through the water itself.

He succeeded on December 16, 1842. Along one bank of a canal in Washington, DC, Morse had laid a long wire, connected to a battery and key, parallel to the water. On the far bank he placed a receiving apparatus, similarly arranged. Both ends of each wire were attached to large copper plates submerged in the water of the canal opposite one another. Although he communicated across only a short distance with this initial arrangement, Morse later succeeded in transmitting nearly a mile across a river.

James Lindsay, a Scot, independently discovered this same method of transmission by conduction through water. Using a system almost identical to Morse's, Lindsay, a talented inventor whose interests ranged to linguistics and astronomy, succeeded in transmitting across the river Tay—a distance of about ¾ mile—in 1854. Though his ideas for establishing similar systems for use in communicating with continental Europe and the United States had the support of the likes of Michael Faraday, Lindsay's work never passed beyond the experimental stage. In 1860, after staging another successful demonstration across the Tay, he ceased public work on his system. Lindsay died two years later, firmly convinced of the soundness and merit of his ideas.

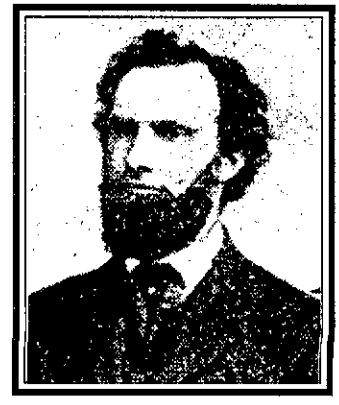
Others would carry on working with the ideas of conductive communication, including the Reverend Henry Heighton. Heighton developed a system once again similar to Morse's, and, like Lindsay, felt that the Atlantic Ocean could be bridged with a large enough system (though he acknowledged that laying a cable would probably be cheaper and simpler). Indeed, one of Heighton's systems found practical use, as a similar method was developed by Sir William O'Shaughnessy for use in communicating across some of India's larger rivers when telegraphy was introduced there.

Telegraphy Without Conductors

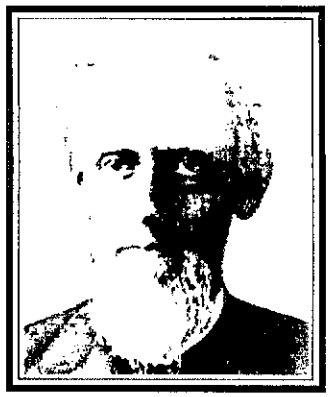
The experiments I've mentioned so far replaced the conductivity of metal with that of water, so they can be considered "wireless" only to a point. Experimenters on the trail of what we now call radio sought to do away with intervening conductors altogether.

An article in February 1979 *QST* profiled Dr. Mahlon Loomis and his ingenious method of wireless communication that functioned independently of any artificial power source. A dentist, Loomis first publicly demonstrated his invention at the close of the Civil War in 1865. From two mountaintops 14 miles apart in Virginia, Loomis flew two kites connected to ground, one equipped with a galvanometer (an early device for detecting small electrical currents), the other with a means of breaking the circuit. By making and breaking the earth contact of one kite, Loomis was successful in deflecting the galvanometer attached to the other.

In his patent, granted in 1872, Loomis stated that his system drew upon "atmo-



Mahlon Loomis



Amos Dolbear

Sir William Preece

spheric electricity," and was meant

> to disturb the electrical equilibrium, and thus obtain a current of electricity, or shocks or pulsations, which traverse or disturb the positive electrical body of the atmosphere between the two given points by connecting it to the negative electrical body of the earth below.[1]

Loomis seems to have come close to the fundamental idea of system resonance, for he noted that his antennas had to be flown at equal heights for his system to function. His transmitting and receiving antennas would therefore have been tuned to the same frequency, low as it may have been.

Nothing came of Loomis's efforts to develop commercial applications for his invention. His appeal to the government for funding was unsuccessful. It is worth noting, though, that Loomis's 1865 demonstration was repeated in 1909 at the London Telegraph Training College. In the midst of a hailstorm, successful communication was made over a distance of three miles.

The invention of the telephone and its introduction into widespread use added a new twist to efforts toward wireless communication. Alexander Graham Bell had used this invention in his experiments in conductive communication. In 1878 he successfully transmitted across the Potomac River using the telephone as a detector in place of the galvanometer. By rapidly making and breaking the circuit, Bell induced a musical tone in his receiver.

Induction Communication

But it was the telephone's commercial application that ironically gave impetus to wireless experimentation. It had been noticed that transmissions along one set of wires could be plainly received in nearby parallel sets of wires. Though the phenomenon had first been detected in the early years of telegraphy, the increasingly common use of the telephone—a far more sensitive receiving instrument than a telegraph sounder—made it into a real problem. QRM was born!

Joseph Henry had discovered the underlying principle in 1832, and Michael Faraday had independently done the same thing at about the same time. James Clerk Maxwell finally gave it a name: *induction*. The suggestion that communication by induction might be possible dates back to 1845. It was then that John Wilkins, a superintendent of British railway telegraph lines, proposed a method of communicating between England and France.

But Wilkins' ideas remained theoretical, and it was an American, John Trowbridge, who would claim the honors of first successfully communicating via electromagnetic induction in experiments he carried out in 1891. Trowbridge's work involved ship-to-shore communication, and practical difficulties—the enormous size of the wire coils required to communicate even short distances, for one—led him to conclude:

> It is hardly probable that any electric method could be devised in which air or the ether of space could advantageously replace a metallic conductor for signalling over considerable distances.[2]

Though Canadian-born Reginald Aubrey Fessenden is commonly credited with the first wireless transmission of the human voice (on December 11, 1906), an American, A. E. Dolbear, could offer a challenge. Appearing in March of 1882 before the Society of Telegraphy Engineers and Electricians in London, England, Dolbear demonstrated his invention, the "electrostatic telephone," transmitting the sound of his assistant's voice from one room to another. Indeed, Dolbear could also claim to have made the first true broadcast, for on the same occasion, and as further evidence of the abilities of his invention, Dolbear employed a cornet player to regale the listeners in the next room!

Though this demonstration of his system was limited in distance, Dolbear persisted with his efforts, finally claiming to have successfully transmitted a distance of 13 miles.

Dolbear also experimented with the idea of communicating with moving trains, a problem that had preoccupied many. But Thomas Edison would pick up the idea and run with it. By 1885 Edison had worked out a system of inductive communication with moving trains that rather cleverly put existing telegraph line located along railroad tracks to double duty. Edison patented his invention in 1891, but the system was a commercial failure and the few existing commercial installations quickly fell into disuse.

Edison had been aided this work by Willoughby Smith, a successful inventor in his own right. Smith had been long involved with the infant communications industry. He had, in fact, taken part in the laying of the first transatlantic cable between Ireland and Newfoundland in 1865, and was also involved in the laying of the second cable a year later.

In 1893 Smith had proposed in a written paper a method of communicating inductively with moving trains, but after his later involvement with Edison's unsuccessful system, turned his attention toward communication by conduction through earth or water. In 1887 he patented a system similar to Alexander Graham Bell's, which he first successfully tested in 1882 and then permanently installed at a lighthouse off the coast of England, where underwater cables were persistently broken by wave action.

Ten years earlier, Sir William Preece had successfully tested yet another similar system, and for much the same reason. A cable crossing the Solent, the body separating mainland England from the Isle of Wight, had broken. Before it could be repaired, Preece had successfully demonstrated his system of conductive transmission that employed submerged 6-foot square copper plates.

Preece continued his experiments, eventually working with inductive methods of communication. In 1898, at the request of the British government, Preece tested and permanently installed one such system across the Bristol Channel, a distance of just over three miles.

The first real commercial application of Preece's inductive system had been made three years before. The cable laid between the Isle of Mull and mainland England had broken, and for two weeks all commercial traffic was handled by Preece's system: a 1½-mile-long wire, laid along the English coastline, acting inductively upon an existing telegraph line on the island two miles distant.

Which brings us back to Nathan B. Stubblefield. The first *documented* demonstration of his "wireless telephone" occurred on January 1, 1902 (though Stubblefield claimed to have demonstrated it as early as 1892), in downtown Murray, Kentucky. His invention, patented in 1908, was another system of communicating inductively—similar to the system Edison

[1]Notes appear on page 59.

had patented the year before—for use with moving trains or from ship to shore.

Though Stubblefield's invention did not use tuned circuits, he seems to have recognized and acknowledged that as an implicit limitation, for he planned to invent a means of tuning the system so as to permit several communications to occur at the same time without interfering with one another. In this respect, he, too, succeeded in anticipating radio.

But Stubblefield's claim to have invented radio was backed by no less than the Kentucky Legislature. In 1944 it issued the following resolution:

> Be it resolved by the General Assembly of the Commonwealth of Kentucky: That the General Assembly of the Commonwealth of Kentucky hereby publicly recognized Nathan B. Stubblefield...as the true inventor of radio, and it is that sentiment of the General Assembly that said Nathan B. Stubblefield is entitled to the highest honor and respect at the hands of the people of this Commonwealth and of this nation for his outstanding service.[3]

Stubblefield died in 1928, having years earlier abandoned the possibility of capitalizing on the commercial possibilities of his invention.

Spark Comes

Prior to the invention of spark-generated radio transmission, the commercial potential of any form of wireless communication had come to nothing, despite minor successes of isolated applications. Certainly, commercial telegraphy and transatlantic cable companies had closely followed any effort made to render them obsolete. But they had hardly been concerned about any real threat.

And so it was with spark. Transatlantic cable offices were in the habit of exchanging Christmas greetings, and in 1901, less than two weeks after Marconi's first successful east-west transatlantic transmission, the staff of the Sydney, Nova Scotia, cable station (ironically, located not far from Marconi's eventual installation at Glace Bay) sent the following tongue-in-cheek Christmas message to officers in Liverpool:

Best Christmas greetings from North Sydney,
Hope you are sound in heart and kidney,
Next year will find us quite unable,
To send exchanges o'er the cable:
Marconi will our finish see,
The cable co's have ceased to be;
No further need of automatics,
Retards, resistances and statics.
I'll then across the ether sea,
Waft Christmas greetings unto thee.

Came the reassuring British response:

Don't be alarmed, the cable co's,
Will not be dead as you suppose.
Marconi may have been deceived,
In what he firmly has believed.
But be it so, or be it not,
The cable routes won't be forgot;
His speed will never equal ours;
Where we take minutes, he'll want hours.
Besides, his poor weak undulations,
Must be confined to their own stations;
This is for him to overcome,
Before we're sent to our long home.
Don't be alarmed my worthy friend,
Full many a year precedes our end.[4]

How wrong they were.

Notes

[1]J. J. Fahie, *A History of Wireless Telegraphy 1838-1899* (New York: Dodd, Mead, and Co, 1900), p 74.

[2]Ellison Hawks, *Pioneers of Wireless* (London: Methuen and Co, 1927), p 128.

[3]Larry Kahaner, "Who Invented Radio?" *73 Magazine*, Dec 1980, p 40.

[4]Donald McNicol, *Radio's Conquest of Space* (New York: Murray Hill Books Inc, 1946), pp 142-143.

Additional References

G. Blake, *History of Radio Telegraphy and Telephony* (London: Chapman & Hall Ltd, 1928).

R. Naslund, "QRN Communication—Myth or History?" *QST*, Feb 1979, p 51.

G. Shiers, "The Induction Coil," *Scientific American*, May 1971, pp 80-87.

The images of Morse, Loomis, Dolbear and Preece are reproduced from Orrin E. Dunlap Jr's *Radio's 100 Men of Science* (New York: Harper & Brothers, 1944), which is available in reprint form from Antique Radio Classified, PO Box 2, Carlisle, MA 01741, tel 508-371-0512, fax 508-371-7129. QST

New Books

MOBILE 2-WAY RADIO COMMUNICATIONS

By Gordon West, WB6NOA

Master Publishing Inc, 14 Canyon Creek Village, MS 31, Richardson, TX 75080;

tel 214-907-8938. Paperback, 8½ × 5½ inches, 128 pp, illus. Copyright 1991. $6.99 from Radio Shack stores.

Reviewed By Brian Battles, WS1O
QST *Features Editor*

Amateur Radio instructor and author Gordon West, WB6NOA, has prepared an easy reading book that provides an overview of mobile operating in several radio services in the US. It begins with chapters that describe the radio spectrum and the modes and emissions used in mobile radio, then explains the basics of a mobile transceiver.

Many people get into ham radio after exposure to other services, and many hams and scanner enthusiasts are aware of other services by tuning the nonham frequencies, but don't understand the privileges and uses allowed on those frequencies. Chapters feature the Business Radio Service, Mobile Telephone Service (cellular, noncellular and marine), the General Mobile Radio Service (GMRS), Citizen's Band (CB), the Marine Radio Service and Amateur Radio. If you've have never been involved in nonham communications, your eyes may be opened by the scope of and restrictions applied to "the other guys" on VHF and UHF frequencies. The final chapters examine Mobile Antenna Installations, Going on the Air, and Equipment Installation Techniques. The appendix provides a summary of required FCC licenses and forms, a list of FCC office addresses and Amateur Radio Volunteer Examiner Coordinators.

If you have any interest in using or monitoring two-way radio from your car or boat for a variety of purpose, this book will help you understand the uses, purposes and rules covering the various services available to users in the US. With its 12 chapters, an appendix, glossary and index, there isn't much left out, and there's enough information here to get you on the air—except that Amateur Radio requires an examination, which this book doesn't attempt to prepare the reader to take (the other services mainly just require prospective users to file an application with the FCC and/or pay a fee). There's also little discussion of services not normally used by private citizens, such as public service (police, fire, ambulance, civil preparedness, etc), government, military, railroad, utilities or aviation communications. The numerous diagrams, charts and photographs illustrate the concepts discussed in the text, and make it easy to understand how everything fits together. The frequency charts may be of value to hobbyists getting started in monitoring the airwaves or to hams who might need to indentify interfering signals.

This isn't a ham radio book and it's far from the best text to introduce people to Amateur Radio. If you can spare $7, however, this a concise handy reference. It can be a resource of practical value and interest to beginning scanner hobbyists, licensed amateurs and anyone contemplating a personal or commercial mobile radio application that can be accommodated by one of several two-way radio services. QST

Correspondence

Conducted By Kirk Kleinschmidt, NTØZ
Assistant Managing Editor

FROM CYPRUS, WITH LOVE

◊ I am a 17-year-old Cypriot Radio Amateur licensed for the last three years. My call sign is 5B4WN. I was introduced to Amateur Radio by other hams at my school: The English School in Nicosia (5B4ES), and since then I have been quite active in all aspects of Amateur Radio (construction and operating). My enthusiasm for operating came from using my club's equipment—a student's budget does not allow the purchase of new, sophisticated equipment. Even the cost of a good second-hand radio in Cyprus is very, very high.

It was then that I decided to seek help abroad. While talking to John Welch, KV8H (52 Castlewood, Howell, MI 48843), I asked him if he could help me find a good second-hand HF rig in the US. My brother is studying nearby at the University of Michigan.

I got a lot more than I expected! John not only located a good Yaesu FT-101EE, which he checked himself, he also (without being asked) raised a considerable amount of money from his local club to cover part of the expenses.

The rig is an excellent performer, though a bit older than me! To date, I've worked more than 2200 QSOs with it, more than 1500 on CW—my favorite mode!

These people make me proud to be a radio amateur. They prompted me, even at my young age, to get involved and introduce others to the amateur but altruistic world of ham radio. Their example is now my guide—and should be a guide for every ham.

The motto, "The Amateur is friendly...Slow and patient sending when requested, friendly advice and counsel to the beginner, kindly assistance, cooperation and consideration for the interests of other; these are, indeed, marks of the Amateur Spirit," has been fulfilled. To the hams in the Howell, Michigan, club: I thank you!—*Marios Nicolaou, 5B4WN, Nicosia, Cyprus*

MAKE FRIENDS THE EASY WAY

◊ As a recently licensed Tech, your October article, "Nobody Talks to Me!" was written for and about me. It was uncanny in how it described my problem. True, it can be difficult—nearly impossible—to find someone to talk to. Here's the quickest, easiest, most essential way: Join a local club or meet a group of members for coffee.

After face to face contact, talking with your new friends on radio follows easily and quickly. From time to time I review the article to hone my ability to make contacts as advocated in this excellent piece. —*Byron Dillon, KB7YWH, Bullhead City, Arizona*

CREDIT WHERE CREDIT IS DUE?

◊ Regarding N3RW's article, "Yagi: The Man and His Antenna," in the October issue: Hidetsugu Yagi and Shintaro Uda have each published a wealth of scientific articles. This makes them *co-inventors* of a very special and extremely popular type of antenna.

I think it would be good practice for textbooks, radio and otherwise, including handbooks such as the League's, to refer to the Yagi-Uda antenna, not the Yagi antenna.

So, let us no longer talk about "Yagi: The Man and His Antenna," but always about, "Yagi and Uda: The Men and Their Antenna."—*Dr Karl Lickfeld, DL3FM, Ruhr, Germany*

SAGE ADVICE REVISITED

◊ Your November article "Remedial Radio" was long over due.

A year ago, I returned to the air after a 45-year absence. You published my comments and observations in the February Correspondence column ("Sage Advice").

This past year, I have worked WAC many times on 20-meter CW. I clearly remember the rare DX I lost when operators didn't send QRL? before transmitting. Thank you for reminding everyone when two stations are conversing, frequently, you can only hear one of them. Operators use this as an excuse for not sending QRL? and thinking the frequency is clear.

I have found a solution to this problem. It has worked almost 100% of the time for me, and doesn't come across as being ill-mannered. Just attention-getting! If someone starts sending on top of your CW QSO, send QRL QRT. Repeat if necessary. The usual reply is "R" or "Sorry."

In this changing world it's important that all amateurs help preserve our unique hobby by displaying good operating practices. A casual approach will help legislate us to obscurity!

Most of us know good manners make a neighborhood. No wise man will settle where they are lacking.—*Ed Dirling, K5JMN, Dallas, Texas*

CODELESS KUDOS

◊ I would like to express a global thank you and congratulations to all the Technician-class licensees who have upgraded. It's people like you who bring reassurance and a sense of well being to those of us who have been hamming for years.

A lot of hams, myself included, were very concerned that the code-free license would be a dead-end entry into ham radio. We feared that 2 meters would start to resemble a certain other service (which shall remain nameless).

Thank you for proving us wrong. I have many friends who entered as codeless Techs. They have become ace operators, active in club activities, they act as net control stations, and they have upgraded. I can think of at least three individuals, former codeless Techs, who currently hold Amateur Extra Class licenses. Well done, guys.—*William Barfield, KD4AL, Charlotte, North Carolina*

GOOCH'S PARADOX PROVED: "RF GOTTA GO SOMEWHERE!"

◊ The recent articles in *QST* proclaiming that HF mobile operating is alive and well, and the availability of small but mighty transceivers, stirred my 30-years-dormant interest in HF mobiling. I noticed, however, that all of the articles showed large rigs in equally large, mostly metal vehicles....

I recently bought a Saturn, and was more than a little concerned about the ability of a small, mostly polymer car to function as an HF counterpoise, much less have room for HF equipment.

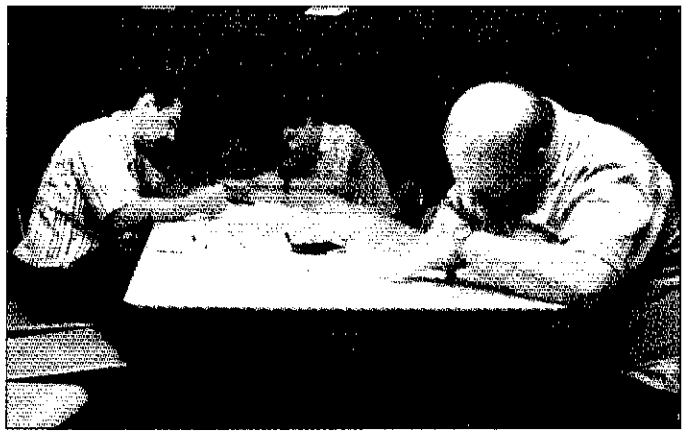
The Saturn has very little room to mount anything much larger than a common 2-meter rig. I did find that the dash cover is adequate to mount a rig the size of the TS-50S, if you don't mind drilling a few holes. Because I plan to keep the car "forever," this posed no problem. The dash cover is easily removed and reinstalled. In fact, if I didn't know better, I'd think the Saturn was designed with the ham in mind.

Routing wires and coax is trivial; there are holes available through the firewall, and the trunk is easily accessible.

The next problem was the antenna: Where and how should I mount an antenna on a plastic car? The Saturn has three pieces of horizontal sheet metal—the hood, the top and the trunk lid. The only viable candidate was the trunk lid, as my car has a sunroof. And, because the car was only a month old and even a die-hard ham wasn't about to cut a hole in a brand-new car, the W3BMW-designed HF mag mount (in December '92 *QST*) proved to be the perfect solution.

The biggest antenna I'm using is a Hustler with the 40-meter super resonator and spring mount at the base. Although the antenna leans a lot at highway speeds, the mount is solid.

The ultimate test is real-life performance. In three weeks of operation I've worked four continents and two new countries as well as many stateside QSOs while driving to and from work. I am more than pleased with the performance. I guess plastic does radiate!—*John Bartucci, K8JB, Stow, Ohio*



NEW HAM COMPANION

"Yeah, the right answer is 428 divided by the operating frequency...or is it 528? If I only could remember!" Ah, those happy memories of license examinations. It makes you want to run to your nearest Volunteer Examiner and sign up for a test, doesn't it? The key to a pleasant examination is all in your mind—as you'll read on page 62. ***(photo by Chet Bowles, AA1EX)***

This Month in *New Ham Companion*

Test Day

Is there anything you can do to soothe those test-day jitters? Here is some helpful advice and valuable insight into the workings of the Volunteer Examiner system.

Chet Bowles, AA1EX

The Doctor is IN

S-meter readings and RST, identifying old tubes, the meaning of those odd solar activity numbers, stacking several antennas on the same mast, the benefits of QSZ and more.

A *Cheap* Way to Hunt Transmitters

Do you own a hand-held transceiver or scanner? How about a cardboard mailing tube and some aluminum foil? If you can answer "yes" to these questions, you have everything you need to get started in transmitter hunting. It doesn't get much cheaper than this!

Glen Rickerd, KC6TNF

Where is My Mail?

One of the great pleasures of packet radio is sending (and receiving) messages from other hams. How does a packet message reach its destination? How long does it take—and why? The answers may surprise you.

Dave Patterson, WB8ISZ

Do You Need an Antenna Tuner?

Antenna tuners are wondrous things—when they're used for the right reasons. Discover how tuners work in your antenna system and pick up a few shopping tips, too!

Steve Ford, WB8IMY

Elsewhere in this issue

In addition to New Ham Companion, there are other articles in this issue that you might find interesting. Here's a quick rundown:

❑ The future of ham radio is in your hands! A Bill in Congress would make Amateur Radio a recognized "national resource," affording our Service unprecedented protection from future politically motivated spectrum sniping. See Rick Palm, K1CE's, **Do Amateur Radio (and Yourself) a Favor** for info on how you can help!

❑ The 1994 **Handy Reference Section** is eight pages of concentrated, helpful information you can use every day in your shack. Turn to page 97 and you'll see what I mean!

❑ Ordering a pizza via your local repeater used to be a violation of FCC rules—but no more! Read about the new Amateur Radio Service "business rules" in this month's **Washington Mailbox** column. I'll have pepperoni....

Test Day

By Chester S. Bowles, AA1EX
RFD 2, Box 335L
Sharon, NH 03458

A license exam isn't the Spanish Inquisition—at least it doesn't have to be! There is a lot you can do to minimize the stress and hassle. It also helps to know what's going on behind the scenes.

Sweaty palms. That sinking feeling in the pit of your stomach. You hear that little voice say, "What if I fail? The ultimate embarrassment! Maybe I should just turn around now and go home."

You can't go home, though. Your family and friends all know you are going to the testing session this morning and they won't believe that the dog ate your car keys. So, you screw up your courage, try to hide your nervousness and walk through the door.

We've All Been There

Sound familiar? It should. If it's any help to you, I can guarantee that anyone who has ever taken a license exam has felt exactly the same way. Unfortunately, the feeling doesn't stop when you pass the exam and get your license. Upgrade exams cause the same anxiety (perhaps even more!) because now all your ham friends *expect* you to pass.

What you are feeling is the effect of adrenaline rushing through your system. It's the "flight or fight" protection system built into our bodies that comes into play every time we face danger or a challenging, stressful situation. The only way to eliminate the effect of the adrenaline is to eliminate the cause—in this case, the stress of the testing environment.

Of course, that's impossible. There will always be stress involved when you are unsure of the outcome. And, no matter how hard you study for the exam, there will always be that nagging doubt that says, "What if I blow it?" However, the better prepared you are, the less stressful the situation.

A Visit with the Expert

Part of getting ready for a license exam is studying the material. That's no surprise. There are many good study aids on the market to help you understand the theory and/or copy the code. However, it is also quite helpful to know what to expect at the testing session.

There's very little written about what happens in an exam room, so I went to visit an expert. Tom Sefranek, WA1RHP, and his team have administered more testing sessions than anyone I know. Since 1990, Tom and his team in Shirley, Massachusetts, have facilitated over 200 test sessions. During that time about 900 people have tested on about 1500 different exam elements! That's dedication to the VE process in anybody's book!

What impresses me most about Tom and his team is the fact that they do everything they can to take the mystery and stress out of the situation. Tom's team is organized, efficient, and they try to put everyone at ease. It's a pleasant environment that makes the examinees (and new licensees!) feel welcome.

Tom has some advice for anyone planning to take an exam:

First, *always* call the contact person listed for the exam session, even if it says walk-ins are accepted.

❑ A phone call can verify times, dates, and locations. Misprints happen.

❑ Ask for directions to the testing site. There's nothing worse than getting lost trying to find that school you thought was just around the corner.

❑ Discuss any questions you might have such as using a computer or typewriter to copy code, whether the VE team uses multiple choice or fill-in-the-blank code tests, any CSCEs (Certificate of Successful Completion of Examination) you hold, or if it's okay to use your calculator. Better to ask now rather than to be disappointed at the testing session.

❑ This is also the time to discuss any infirmities you might have such as poor hearing, or a Physician's Certification letter. The examiners can respond better if they are warned about any unusual situations.

❑ A call also helps the VEs plan for the session by making sure they have enough

The Shirley, Massachusetts, VE team. Left to right: Charlie Cafen, WN1E; Tom Sefrank, WA1RHP; Dan Senie, N1JEB; Bob Levine, KD1GG; Tom Trostel, KD1OU; Norm Rivers, W1BYH; Faith Senie, N1JIT; Marc Nordquest, WR1Q; Dana Fraser, WT1A; Ron Cook, KA1VPK; Tom Duffy, K1JHC; Art Tourigney, WU1D. (*photos by author*)

forms, a large enough room, etc.

Tom's second suggestion is to make sure you have all the paperwork you will need for the session. Test sites rarely have a method of making copies, and failure to have the proper paperwork might mean that you will not be able to take the exam. Bring the following:

❑ Two forms of identification. One must be a photo ID.

❑ Your original Amateur Radio license (if you have one) *plus* a copy.

❑ The original of any unexpired CSCEs you hold *plus* a copy.

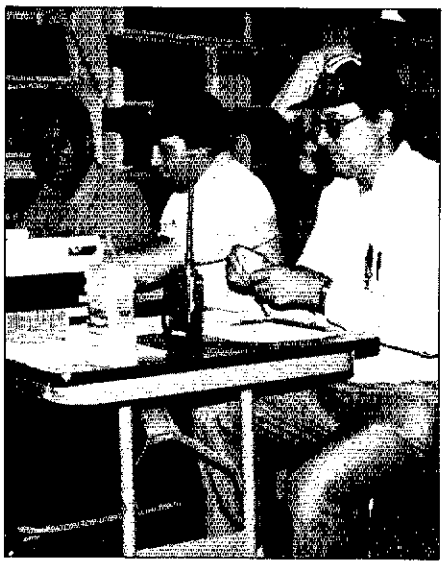
❑ Money for the exam fee. Correct change is appreciated.

Third, you must never be afraid to ask for a quiet place to take your examination. Talking, distracting noises, or construction work can all interfere with your ability to concentrate—particularly when taking a code element. Speak up. Tell the VE team.

Finally, Tom reminds all of us, VEs too, that Amateur Radio is still a hobby. It should be fun! We've all known people who seem to take things too seriously and, as a result, intimidate newcomers. Testing sessions are serious business, and there are many procedures that must be followed. But lighten up and enjoy the experience. We need the new blood to make sure our hobby continues to grow and prosper. First impressions are everything. Let's make sure the impression of the testing session is a pleasant one.

After the Exam

Congratulations! You passed. Now you wait, of course. That's the hard part. Maybe you'll think back over the testing session and all the paperwork involved. There's a lot, isn't there?



Organization is the key to running a successful testing session. Tom, WA1RHP, and his team do everything they can to put everyone at ease.

In the early days, the Federal Communications Commission did all testing for Amateur Radio licenses. Ask anyone who got their license prior to 1982. They'll be happy to regale you with stories about their license examination. For example, my trip to the FCC offices in Kansas City occurred in 1967 and let me tell you... No, I'll save that for a different article.

The year 1982 saw the passage of the Goldwater-Firth Bill. It was signed into law by President Reagan and amended the Communications Act of 1934 to permit the FCC to accept the "voluntary and uncompensated services of licensed radio amateurs in preparing and administering examinations."

The terms get a bit confusing. Volunteer Examiner Coordinators (VECs) are organizations such as the ARRL, the W5YI-VEC, and others, that have entered into an agreement with the FCC to coordinate the efforts of more than 30,000 Volunteer Examiners. A Volunteer Examiner (VE) is an individual who has been accredited by a VEC, and is the person who actually administers the examinations. Examination sessions must be coordinated by a VEC, but are conducted by VEs.

At this point, you may be asking yourself, "If the law authorizes voluntary and uncompensated services, why do I have to pay a fee when I take my exam?" The answer is pretty simple: The FCC authorizes VECs to collect a fee from each candidate in order to recover the costs of administering the program. And, as a matter of fact, the FCC establishes a maximum fee limit each year based on annual changes in the Consumer Price Index (CPI).

The wait is worth it! Gwenneth Wallens, N1OJV/AG, just passed her 13-WPM exam to earn her General-class license. (She displays her General-class upgrade CSCE proudly.) Her husband and two children are also hams.

Each examination session requires at least three VEC-accredited Volunteer Examiners. General- and Advanced-class licensed VEs are allowed to test for Elements 1A, 2, and 3A. Exam Elements 1B, 1C, 3B, 4A, and 4B must be administered by Extra-Class VEs.

The flow of paperwork at an exam session is amazing. In addition to ensuring that the application form (FCC Form 610) is prepared accurately, the VEs must also verify the identity of the individual taking the exam and the validity of any prior Amateur Radio licenses or CSCEs held by the examinee. Of course, there are also the papers for the exam elements themselves, which include the exams and the answer keys. And, finally, there are the roster forms and end-of-session report forms that summarize the testing session.

Waiting for your new license may be the hardest part of becoming an Amateur Radio operator. And there are some delays in the system. VE teams recognize this and try to process the paperwork as quickly as possible. For example, VE teams are required to process their paperwork and forward it to the VEC within 10 days. Most teams accomplish this in a week or less. The VEC must then double-check the accuracy of all the information and forward the 610s to the FCC within one week. When this article went to press, the total time from taking the exam to receiving the license was averaging about eight to nine weeks.

Trust me, it takes good organizational skills and a lot of patience to make sure everything runs smoothly at an examination session. The rewards, however, are tremendous. Few things can match the excitement of someone who has just passed his or her exam for a new license. And, when you think about it, VEs get to experience this excitement at every session.

If you would like to become a Volunteer Examiner, call the ARRL at 203-666-1541 and ask for the VEC Department. The VEC staff is happy to answer any of your questions.

The Doctor is IN

Q Paul Huff, N8XMS, asks, "Is there any correlation between my S meter and the strength of the signal I report? Should I base my RST (or RS) report on the S-meter reading?"

A There is usually little correlation between your S-meter reading and the RST (or RS) report that you provide. When you give an RST report, it is based on *your* evaluation of the other station's signal. You might use your S meter to help you, but don't depend on it. S meters measure only relative signal strength and the readings vary from one rig to another. I've witnessed tests where two radios of the same brand were hooked up to the same antenna and were monitoring the same signals. Both displayed different S-meter readings!

The RST system takes factors into account other than the strength of the signal. For example, you may hear an SSB signal that is very strong (+10 dB over 9 on your meter). Despite the strength and the meter indication, noise, interference or poor audio quality may make it difficult to understand what the person is saying. You wouldn't give this station a "5-9" report. A "3-9" would be more accurate.

Q T. J. Tracy asks, "I have a box full of old receiving tubes, but the printed identifications are missing. Can I make them reappear, even for a short time, so that I can reidentify them?"

A It's possible that some of the residue from the tube markings may still be on the glass. One way to find out is to place the tube in the freezer and leave it there for a couple of minutes. Remove the tube, holding it by the tip or pins only (don't touch the sides), and allow the warm air to cause moisture to condense on the glass. If you look closely, you may see the faint outlines of the original tube numbers. Write them down quickly because they'll disappear again as the condensation evaporates.

Q I am confused by the meaning of solar flux, A index and K index. What do these numbers mean in terms of HF band conditions? Where can I get the latest data?

A Solar flux is an index of energy from the sun that correlates with the density of ionization in the ionosphere. In simpler terms, a higher flux value usually translates to a higher Maximum Usable Frequency (MUF) and better HF propagation. Solar flux roughly corresponds to a sunspot number, which is based on the size and number of sunspots on the visible solar disk.

The A and K indices have to do with geomagnetic disturbances. Higher A and K values correspond to greater *absorption* of radio waves, rather than refraction. This is bad news for HF propagation. When conditions are stable, the K index may get as low as one or zero. When conditions are truly awful, it may reach five or even seven. A change of one point in the K index is significant.

The A index is also a measure of geomagnetic stability, but a change of one point is not significant. It is based on the K index for the previous 24 hours. When the K index is three, the A index might be ten. A change of a point or two in the K index may send the A index to 20 or higher. When a severe geomagnetic storm appears and the HF bands shut down, the A index may reach 35 or more.

High A and K indices are typically a result of solar flares or coronal holes on the sun's surface. Both may shoot protons at the Earth, which neutralize the desirable ionization of the ionosphere, cause the geomagnetic field to become unstable and increase absorption of radio waves. To span great distances, you want your radio waves to be refracted (bent) by the ionosphere, not absorbed!

Solar reports are transmitted regularly by W1AW and by "time" stations WWV and WWVH. If you have packet radio capability and a *DX PacketCluster* network nearby, you may find solar reports there as well. Just connect to the system and send the command: SHOW/WWV. *(Our thanks to Tad Cook, KT7H, for supplying this information.)*

Q Everest McDade, W4DYW, asks, "Do you know what QSZ means?"

A A test for the good Doctor! Yes, QSZ means "send each word twice." When the band is noisy or crowded, it often helps to send each word twice to ensure good copy on the receiving end. Rather than, "I LIVE IN MISSOULA, MONTANA," you'd send, "I I LIVE LIVE IN IN MISSOULA MISSOULA, MONTANA MONTANA." QSZ is effective for CW communications, but it is also applicable when the going gets rough on RTTY.

Q When I'm talking to some hams on the local FM repeater, I occasionally miss the first syllables—or even the first words—of their transmissions. It doesn't happen all the time, but it sure is annoying. What causes this?

A There is nothing wrong with your radio or the repeater. Instead, many hams do not realize that there is a slight delay between the time they press the push-to-talk (PTT) button and the point at which the radio actually begins to transmit. In addition, there is often a delay between the time the repeater hears the signal and the time when retransmission begins. We're talking about fraction-of-a-second delays, but if the person begins to speak just as he or she closes the PTT switch, the first utterance falls through the gaps!

A good repeater operating habit is to press the PTT switch and then hesitate just a split second before you begin talking. Then you can be sure that your rig and the repeater are ready to go!

Q I just got started in packet radio and I'd like to exchange mail with other hams. Is there a list available of hams who like to correspond over packet?

A Ray Harkins, KB6LQV, has compiled the *World Wide Packet Pals Directory*. It lists the names, call signs and packet addresses of hams throughout the world who enjoy exchanging packet mail. It even lists their areas of interest. Ray distributes his directory on a regular basis over the packet network. You'll see it in the form of multi-part bulletin messages.

By using the directory, you can easily locate amateurs who share the same interests as yourself. For example, do you enjoy radio-controlled airplanes? Check the *Packet Pals Directory* and chances are you'll find someone (maybe more than one person) who would like to swap mail with you on this topic.

The directory is available on diskette for IBM PCs and compatibles. To obtain an electronic copy, send a 3½- or 5¼-inch disk and a self-addressed disk mailer with three First Class stamps to: Ray Harkins, KB6LQV, 6114 East Shields St, Fresno, CA 93727-1130. There is no charge for the directory, but donations are appreciated. To learn more about how packet mail moves through the network, read "Where is My Mail?" by Dave Patterson, WB8ISZ, in this issue.

DO YOU HAVE A QUESTION OR A PROBLEM? ASK THE DOCTOR! SEND YOUR QUESTIONS (NO TELEPHONE CALLS, PLEASE) TO: "THE DOCTOR," ARRL, 225 MAIN ST, NEWINGTON, CT 06111.

A *Cheap* Way to Hunt Transmitters

By Glen Rickerd, KC6TNF
221 S Catamaran Cir
Pittsburg, CA 94565-3613

Now that I have your attention (what ham can resist the word "cheap" in a headline?), here is a new twist to an old technique for hunting the wily hidden transmitter. Not only is it cheap, it works very well. This method has caught on with a number of us in the San Francisco Bay Area (Pacific Division, East Bay), and many are now using it to sniff out the "fox" once we are in close. It also works at substantial distances from the transmitter. Some hunters who use this method exclusively are turning in mileage scores as low as those using Doppler units or directional antennas.

The origin of this idea is a good example of serendipity. Don Pass and his son Brad, KD6ERV, were having trouble using *body-fade* techniques to home in on strong signals during local transmitter hunts. They built the device described below in an effort to find a better means of shielding their H-Ts. By shielding the transceiver, you reduce the received signal strength. This makes it possible to obtain an accurate fix, as you'll see in a moment.

The next time they went on a hunt with Frank Vervoort, WA6BZP, the device proved to be surprisingly effective. Frank looked it over and said, "I know why that works so well; what a great idea!"

This simple device gives precise directional readings when used with an H-T. You probably have the materials to build it right now—and it only takes a few minutes!

Construction

Start with a pasteboard mailing tube that has sufficient inside diameter to accommodate your H-T. Cover the tube completely with aluminum foil. Some of us seal the bottom end with foil, too. It doesn't seem to matter whether the end is sealed if the tube is long enough. The foil tends to be quite fragile if left unprotected, so for durability, most of us wrap the aluminum foil in packing tape. You will also need a short, stout cord attached to the H-T, like a wrist strap. That's all there is to it!

A Little Theory

Many have heard of using body fade for direction finding with a 2-meter H-T. The idea is simple. You stand, holding the H-T to your chest, and slowly turn around, looking for a fade in signal strength as your body intervenes between the *fox* transmitter and the H-T. Your body provides a shield that gives the H-T a *cardioid* sensitivity pattern, with a sharp decrease in sensitivity to the rear (otherwise known as a *null*) that indicates the direction of the transmitter.

The difficulty with body fade is that it has always been subject to variables that change that ideal cardioid pattern. Anything that affects signal strength—including transmitter power, distance, receiver sensitivity, or the size and shape of your body—can work to smear or obliterate the null. The body fade null, which is rather shallow to begin with, can be obscured by reflections.

This is where the tube comes in. At the frequencies commonly used in transmitter hunts, it functions as a so-called *wave guide beyond cutoff*. Don't let the terminology spook you. In microwave parlance, a signal that is too low in frequency to be propagated in a waveguide is attenuated at a predictable logarithmic rate.[1] In other words, the farther inside the tube, the weaker the signal gets. In-line devices that use this principle to reduce signal strength are commonly known as *air attenuators*. They are commercially available, and there are plans in the transmitter-hunting literature detailing how to build one.[2] In this body-fade application, we use the foil-wrapped tube to reduce the received signal level until the cardioid sensitivity pattern is reestablished.

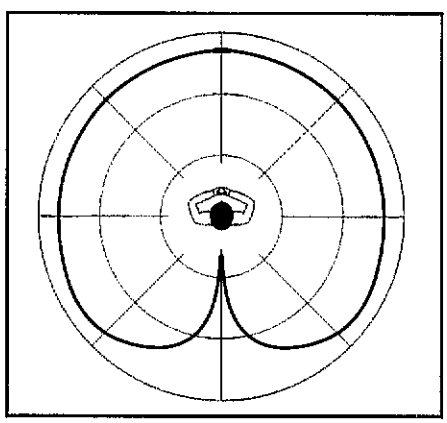


Fig 1—Hand-held receive sensitivity pattern when using body fade for direction finding.

On with the Hunt!

Hold the tube to your chest (vertically), and lower your H-T into it until the signal begins to weaken. Holding the H-T in place, turn around slowly and listen for a sudden decrease in signal strength. If you don't get a good null, vary the depth of the H-T in the tube and try again. Repeat until you get the null that you need to determine the direction. You do not need to watch the S meter; in fact it will likely be out of sight in the tube. Keep adjusting the depth until you get a sharp null.

This method of direction finding is highly dependent on your body's particular shielding characteristics. The depth of suspension that works for another person will not necessarily work for you. Experiment with it until you get a feel for what works best. It will take a little persistence to find your most effective technique.

A word of warning about reflections: they can and will obscure or shift the null in unpredictable ways. If you are hunting in a car, step well away from the vehicle before trying to get a bearing. Avoid large buildings, cyclone fences, metal signposts and the like. Hunting in a crowd of people is nearly useless because many of us are tall enough to be good reflectors at 146 MHz! Make sure that anyone standing nearby is at least 10 to 15 feet away when you are taking a bearing.

With this setup you can obtain an impressive amount of useful attenuation. I've been able to get a good null while standing less than five feet from a 30-watt transmitter. I simply extended the wrist strap with a shoelace to get sufficient depth in the tube. On another occasion, I nearly stumbled over a transmitter hidden in tall grass when I took a step backward in the

[1]Notes appear on page 66.

Fig 2—Using the attenuator tube. The H-T is suspended by the wrist strap inside the tube. For very strong signals, such as those encountered close to a hidden transmitter, remove the rubber duck antenna and suspend the H-T deeper within the tube, adjusting depth for optimum signal strength. (*photo by Don Pass*)

indicated direction. It's dynamite for close-in work!

The best thing about it is the cost: next to nothing if you scrounge the tube and scavenge some foil from the kitchen. Construction time is less than five minutes. This is an ideal group project, too. Think what it would mean if everyone in your club had one of these tubes in their car and knew how to use it, ready to help locate a jammer, a "stuck" transmitter, or a rescue beacon!

Notes

[1]E. Jordan, Ed., *Reference Data for Engineers: Radio, Electronics, Computer and Communications*, seventh edition. Howard W. Sams Inc, 1986. Page 30-3, "Propagation of Electromagnetic Waves in Hollow Waveguides." Page 30-8, "Attenuation in a Waveguide Beyond Cutoff."

[2]Joseph D. Moell, K0OV, and Thomas N. Curlee, WB6UZZ, *Transmitter Hunting: Radio Direction Finding Simplified* (TAB books, 1987), p 61, "The Waveguide Attenuator."

Glen, KC6TNF, is a technical writer with Systron Donner, Safety Systems Division in Concord, California. In his boyhood he accompanied his dad, W8BQD, on many transmitter hunts in Michigan. Licensed in March 1991, Glen's major interests are packet radio, satellite communications, and transmitter hunting.

Radio Tips:

Those Versatile Hand-Helds

Hams call them HTs, handie-talkies, walkie-talkies and bricks. And countless amateurs select pocket-sized hand-held VHF/UHF FM transceivers as their first rigs. Hand-held transceivers save money over buying separate mobile and base units, and they work fine for FM simplex, repeater or packet operation. That's a lot of versatility for such a small package!

In the US there are more than 6000 repeaters on 2 meters, 1600 on 220 MHz, 4100 on 440 MHz and 200 on 1.2 GHz. There are even FM repeaters that are linked to 10 meters, opening up the possibility of long-distance contacts (yes, codeless Technicians can legally use repeater links to the 10-meter FM subband).

It's great to keep your radio nearby, whether you're in the living room, in your backyard or out for a walk. Hand-held transceivers can be used to talk to the ground crew while you're working atop a 100-foot tower or to keep in touch with friends as you browse at a flea market.

To get the most from portable operating, be sure your battery's charged and keep a spare on hand. The "rubber duckie" antennas supplied with hand-held transceivers are adequate, but you can substitute a telescoping whip for increased performance.

A hand-held rig can become a mobile unit if you have a cigarette-lighter power adapter and a magnetic-mount or trunk-lip mount antenna. Using VHF/UHF FM, you can ask for directions, call for help (for yourself or another stranded motorist), exchange information on road conditions or enjoy a pleasant chat during your daily commute. A lonesome road through unfamiliar terrain is safer if you can contact other hams.

If you use a hand-held rig in your car, it's worthwhile to invest in a remote speaker/mike to avoid having to hold the transceiver up to your face when you transmit. In noisy vehicles, hand-held transceivers may not put out enough audio to be heard clearly. This can be remedied by connecting an extension speaker with a built-in 12-V audio amplifier to boost the sound level.

If you use your hand-held transceiver in your car, be sure both sides of the power cable are fused. The manufacturer may offer a power adapter with this feature or you can make the cable yourself. Secure the radio so it doesn't fly off the console during quick maneuvers or conk you in the head if you have to stop quickly. Keep it shielded from direct sunlight, but mount it near your line of sight. Better yet, get to know your rig well enough so you don't need to look at it to make adjustments while driving. Don't leave your rig inside your car on a hot summer day.

Do you enjoy traffic-handling? Do you like to chat with friends while burning dinner or watching *The Simpsons*? Bring your hand-held into the house, connect it to a 12-V power supply and you're all set. You can mount a good antenna on your roof, tower or inside the attic. In a pinch, plop a mobile mag-mount antenna on top of the refrigerator or a cookie sheet. In urban areas, almost anything will get you on the air!

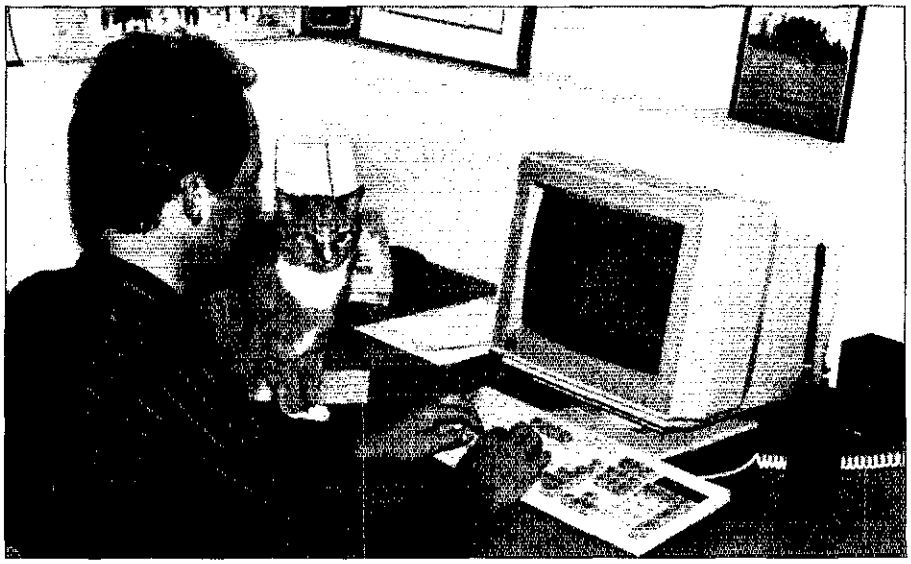
Standard AX.25 or TCP/IP packet radio operation on FM works fine with your hand-held transceiver. You can use it in the field or in your car with a laptop computer, or in your shack with a desktop PC or terminal. All you need is a source of power (a battery or a power supply) and a cable to connect your rig to your TNC. Almost every type of hand-held radio has been used for packet, so it shouldn't be difficult to get information on how to wire the mike and speaker connections.

You can invest between $75 and $600 in a hand-held VHF/UHF FM ham transceiver. It all depends on features, whether you buy new or used, single-band or multiband, and other variables. Older models cost less and are easy to find at hamfests and flea markets, but may be crystal-controlled, put out less power and lack fancier features. It's also difficult to find battery packs and accessories for older rigs.

Modern units are computer-controlled with dozens of features, put out plenty of power and may include more than one band. It will take you a while to learn how to use all their buttons and knobs!

The best strategy in selecting a rig is to talk to other hams, ask to try out their radios, browse through used-equipment classified ads and haunt local hamfests. Sooner or later, you'll locate the perfect all-purpose hand-held rig.—*NT0Z*

Where's My Mail?



Packet mail doesn't move by magic. When you send a message to a friend, it goes through many hands before finally reaching its destination.

By Dave Patterson, WB8ISZ
3834 Willow Creek Dr
Dayton, OH 45415

You know the pleasure of opening your mailbox and finding a letter from a distant friend. It really makes your day, doesn't it?

I get the same pleasure when I connect to my local *packet bulletin board system* (PBBS) and see the message: "You have mail waiting..." Most of the time the mail is from my life-long friend, Steve Ford, WB8IMY. Steve lives in Connecticut and is employed as an Assistant Technical Editor at the ARRL. We've been using packet radio to exchange messages ever since he left Dayton, Ohio, about six years ago.

Through packet radio we maintain a running dialog about the events in our lives. Of course, we could also write letters or simply pick up the telephone. And although we often *do* communicate by letter or telephone (or on 80-meter CW!), packet mail is...*different*.

There is a certain fascination to the process of sending mail via packet radio. We post our messages and away they go—meandering mysteriously across the 700-mile gap that separates us. Sometimes the messages arrive within a few hours. At other times the delays may be as long as two weeks or more. What causes one message to travel faster than another? And do they travel the same paths each time? Like most hams, I took the packet mail network for granted. It was time for a closer look.

Following the Road Map

A few months ago I began collecting WB8IMY's messages and saving them to disk—along with the complete *header* information contained in each message. I asked Steve to save my messages as well. The header held the key to my investigation. It's the part of a packet message that contains the route data. Think of it as a kind of written road map. By looking at the header, you can see the path the message traveled and the time it took to reach its destination.

Packet mail moves from station to station with packet bulletin boards acting as relays. Whenever a message is handled by a PBBS, that system adds its header information to the message (see next page). As your message travels, it literally grows along the way. The more systems handling your message, the larger your message becomes. Unlike the stone in the ancient proverb, your packet mail certainly does "gather moss" as it rolls!

In most cases, you won't see detailed header information in your packet mail unless you specifically ask for it. When mail arrives, most hams just send an "RM" (Read Mine) command to the PBBS to view the message. To see the complete header, however, you have to use a different command. On many systems it is "RH" (Read Header). The commands differ depending on the type of software your PBBS is using. If you're in doubt, ask the System Operator, or *SysOp*. That's the person in charge of the PBBS.

Unsung Heroes

When you consider that the amateur packet-radio network is an *all-volunteer* effort, it's amazing that the mail moves as well as it does. As your message travels across the country—or around the world—many unsung heroes are involved in the process. I'm talking about hams who've spent significant amounts of time and money to create bulletin board systems. Many of these systems are very elaborate, with HF or satellite capability in addition to their VHF/UHF links.

This volunteer network is at the mercy of several factors that can affect how fast your messages travel:

Station hardware problems: Radios fail, antennas blow down, computers bite the dust and so on.

Software crashes: The software packages that PBBSs use are as prone to failure as any other programs. When the software goes down, the PBBS is useless.

Link failures: A PBBS may rely on a *node* or *digipeater* to act as a relay to its neighboring system. If that relay goes off the air, the PBBS is effectively crippled.

Personal problems: What if a SysOp is ill, suffers a family crisis, or is laid off work? Maintaining the system becomes a low-priority task under such circumstances!

Propagation: Band conditions affect HF propagation. A solar storm could make it impossible to pass long-distance packet messages for hours.

And this just scratches the surface. The important point to remember is that the amateur packet network is not a common-carrier service like AT&T, Sprint or MCI. Don't rely on it if you're trying to pass critical information. (The exceptions are packet networks set up specifically to serve disaster areas. These are highly efficient and very reliable.) You can count on the SysOps to do their best, but if the message absolutely *must* reach the recipient, use your telephone or head down to your local post office!—*WB8IMY*

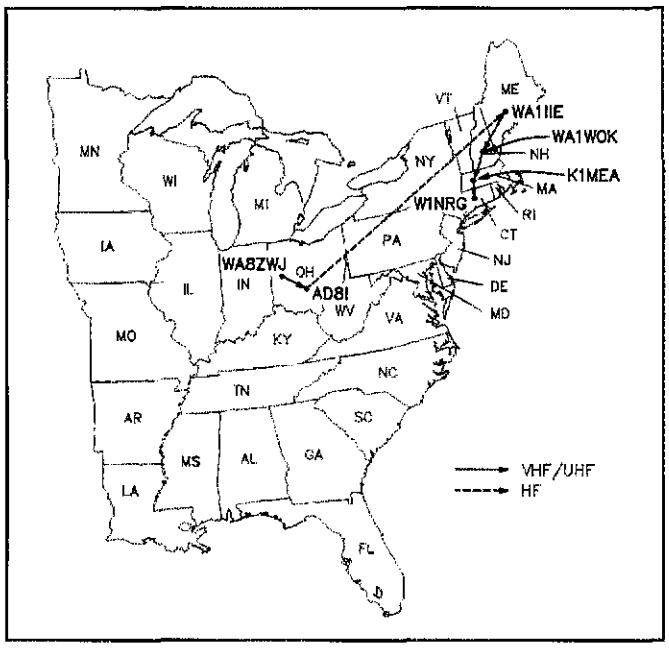


Fig 1—This is the route my messages usually take to reach the W1NRG system in Connecticut. The messages travel via VHF and UHF until they reach AD8I. At this point they jump to WA1IIE in Maine via an HF link before making their way through New England on VHF and UHF.

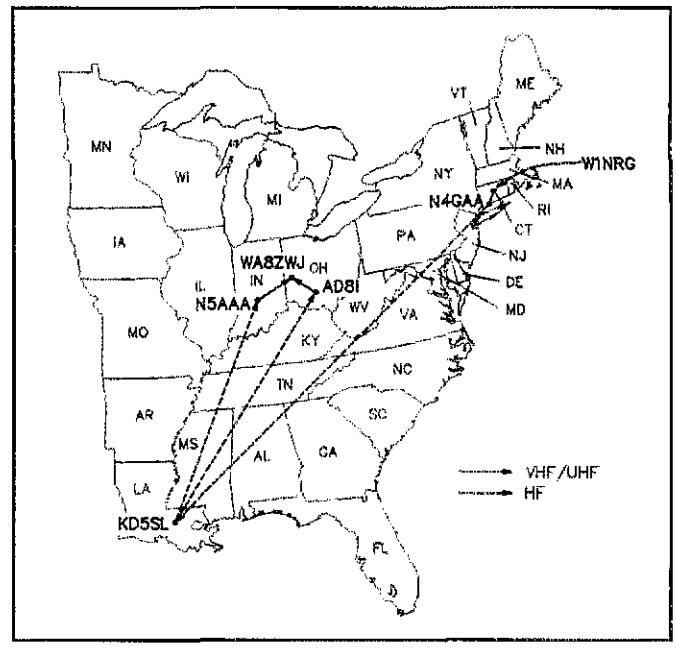


Fig 2—When WB8IMY sends his messages to me at WA8ZWJ, they usually make *two* hops on HF. N4GAA passes the messages to KD5SL in Lousiana, who then forwards them to AD8I in Ohio. On occasion, KD5SL will forward to N5AAA in Indiana instead.

Here is an actual header taken from a message that I sent to WB8IMY:

R:930824/1143z 36766
@W1NRG.CT.USA.NA
R:930824/1103z 21185
@W1EDH.CT.USA.NA
R:930824/0344z
@:K1MEA.#WMA.MA.USA.NA
Easthampton #:5505 Z:01109
R:930824/0228 @:WA1WOK.NH.
USA.NA Concord #:47610 Z:03301
R:930823/2222 @:WA1IIE.ME.
USA.NA Vassalboro
#:10233 Z:04989
R:930823/2202 @:AD8I.#CMH.
OH.USA.NA Ashville, OH #:29123
Z:43103
R:930823/2128 @:WA8ZWJ.#DAY.
OH.USA.NA Union #:44648
Z:45322

Start at the bottom, reading the "R:" lines from left to right. The first line tells you that I posted this message on August 23, 1993 (930823) at 2128 UTC. The message was posted to my local bulletin board, WA8ZWJ, in Union, Ohio. It became message number 44648 on WA8ZWJ's system. At the right-hand end of the line, you see the ZIP Code for WA8ZWJ's PBBS—45322.

Now move up to the next line. You can see that the message was handed off to AD8I in Ashville, Ohio, 34 minutes later. This relay took place on VHF or UHF frequencies. AD8I is a *hub* for messages traveling to and from Ohio.

The next station to receive my message was WA1IIE in Vassalboro, Maine. The message made a big jump from the Midwest to New England in only 20 minutes! In many cases, messages make these leaps by way of HF packet. If you have HF-packet capability, monitor the activity on 20 and 30 meters. You'll see many messages flying back and forth between various hub stations such as AD8I. (You'll find similar activity on other bands, too.)

Other digital modes play a significant role in long-distance message forwarding. AMTOR and PacTOR relay traffic throughout the world. CLOVER, a somewhat new digital mode, is becoming popular for its ability to pass large numbers of messages very quickly. Amateur satellites are getting into the act as well, especially for international traffic.

After the message reached WA1IIE, the path switched back to VHF/UHF again. As you continue upward, you see the message making its way to Connecticut. It takes several hours to meander from Concord, New Hampshire, to the W1NRG bulletin board in Wallingford, Connecticut, where WB8IMY finally picks it up. A total of 14 hours and 15 minutes passed between the time I posted the message on WA8ZWJ and its arrival at W1NRG.

Moving the Mail

I found that the mail between our stations traveled by similar routes each time. Fig 1 shows the typical route my messages took from Dayton, Ohio, to Connecticut. Fig 2 shows the routes taken most often by WB8IMY's messages to me. As you can see, the messages bounce around quite a bit.

What determines which route a message will take? It may surprise you to know that there is no overall routing plan. When you post a message to a PBBS, the system doesn't "know" the route all the way to the destination. All it knows is what it must do to pass the message to the next relay point. Each system along the line must evaluate the message and "decide" where to send it next. For a detailed explanation of this fascinating process, see the sidebar, "The SysOp Speaks."

It seemed sensible to assume that longer messages would travel slower than short messages. When I analyzed our collected data, I found this to be correct. Fig 3 is a chart comparing the length of messages and the time required to send them. Long messages are especially difficult to send over great distances. Interference and propagation problems on the HF bands cause loss of data between stations. When data is lost, it must be retransmitted over and over until it makes it through. This translates into lost time. As you can guess, the longer the messages, the more opportunities there are to lose bits of data.

Sending Your Own Mail

If you haven't tried packet mail yourself, you're missing one of Amateur Radio's little pleasures. To send a message, all you need to know is the call sign of the PBBS where the recipient picks up his or her mail. (If you're responding to a bulletin message, you can find the address in the header.) Simply connect to your nearest PBBS and you're ready to go.

On many packet systems, you begin by entering SP (for "Send Personal") followed by the person's call sign and their PBBS address all on one line. To send a message to me, for example, you'd enter:

SP WB8ISZ @ WA8ZWJ.#DAY.
OH.USA.NA

The SysOp Speaks

Rich Aubin, WA1TRY, is the system operator (SysOp) of the W1NRG packet bulletin board in Wallingford, Connecticut. Rich offers his perspective on packet mail forwarding:

If you're going to discuss packet mail forwarding, you have to begin by defining the type of messages in question. In this article, WB8ISZ describes his experiences sending—and receiving—*personal* packet messages. Personal messages are often erroneously referred to as *private* messages. But whether you call them personal or private, they are one in the same in the BBS hierarchy.

Personal messages are handled by *hierarchical addressing*. Don't let the terminology scare you away. The concept is simpler than you might think.

A hierarchical address consists of several *fields* tacked on to the PBBS call sign. Each field is separated by a period. For example:

WA8ZWJ.#DAY.OH.USA.NA

The field nearest to the call sign represents the "finest" distribution. As you go further to the right, the distribution becomes wider. Usually, any field preceded by a pound sign (#) is for local in-state distribution only. In this case, #DAY signifies the city of Dayton where this BBS is located. As you can guess, the in-state field doesn't come into play until a message gets to the state in question. The rest of the address is easy. OH is Ohio. USA means just what it says and NA stands for North America. (Some SysOps use *NOAM* instead of NA. NOAM is not the standard, however.) Hierarchical addressing is so simple and elegant that I'm amazed at how many SysOps do not understand how it works.

Let's say that we're going to send a message to the WA8ZWJ PBBS. Our PBBS computer looks at the left-most hierarchical field (#DAY) and doesn't recognize it. So it goes to the next field which is OH. If Ohio was a neighboring state, or if I had some sort of direct path to Ohio (on HF, for instance), the computer would automatically know how to send the message. Alas, our dumb computer doesn't have an inkling as to where Ohio is, so it skips to the next field which is USA.

Our computer *does* know what to do when it sees USA—it sends the message to N4GAA in southern Connecticut. His PBBS is a packet hub for mail going to and from Connecticut. After the message arrives at N4GAA, his system scans the address again. His computer doesn't recognize the #DAY field either, but the OH field is another matter. Like most hub stations, N4GAA may have an HF port for mail forwarding. When the computer reads the OH field, it routes the message to the HF port for transfer to Ohio.

Once the message gets to Ohio, the process is repeated. A PBBS in Ohio scans the fields and—surprise!—it recognizes the #DAY field. It knows the proper routing direction to get the message to the Dayton area as quickly as possible. Soon the message arrives at WA8ZWJ and sits waiting for pick up.—*WA1TRY*

You don't necessarily need to know the hierarchical address. (See the sidebar "The SysOp Speaks" for an explanation of hierarchical addresses.) Many bulletin boards automatically copy this information from all incoming messages and bulletins, gradually creating a large file of "known" PBBSs. If you simply enter SP WB8ISZ @ WA8ZWJ, the system may already have the rest of the address in its files. If not, the PBBS may warn you that the destination is an "unknown system." In that case, you'll need to manually enter the complete address.

After you type a short subject line, you're free to enter the text of your message. When you're finished, send /EXIT, CONTROL-Z or whatever your system requires to designate the end of a message. Within a short time, your message will be on its way!

Here are a few tips to help you become a more successful packet correspondent:

❑ Keep your messages short—500 characters or less. If you must send a long message, break it into several parts and send them separately. In the subject area of each message, use the label "Part 1 of 5" or something similar to reduce the confusion on the receiving end.

❑ Enter the address in the proper format and use the complete hierarchical address if necessary.

❑ Check your local PBBS for mail frequently. Some systems will hold your incoming mail for only a week before deleting it!

❑ Don't neglect the issue of privacy. Many hams will see and read your messages as they move through the system. When a message makes a jump via the HF packet network, for example, hams throughout the world can read the text. When you sit down to hammer out a message, use the politician's rule of thumb: Don't say anything you wouldn't want to see on the front page of tomorrow morning's newspaper!

❑ Enlist the help of your local SysOp if you become confused. Most SysOps are happy to assist. Thank your SysOp for the service he or she provides. Your appreciation is among your SysOp's few rewards.

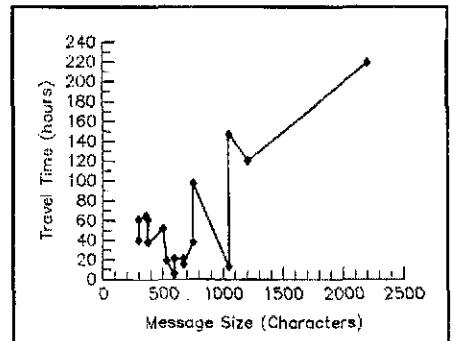


Fig 3—As this chart indicates, the larger the message, the longer it takes to reach its destination. There is one notable exception: a 1050-character message that traveled between us in only 12 hours.

And if you've read this far and you're not involved in packet radio at all, what's keeping you? All you need is a 2-meter FM transceiver (even an H-T), a terminal node controller (*TNC*) and a computer. I highly recommend that you pick up WB8IMY's book, *Your Packet Companion*. (Contact your favorite dealer or see the ARRL publications catalog in this issue.) It's written specifically for the new packet operator and it won't overwhelm you with technical jargon. This is strictly a hands-on, how-to book. Also see WB8IMY's article, "*QST* Compares: Packet TNCs," on page 80 of *QST* for December 1993.

Who knows? Maybe the next time you connect to a PBBS, the "Mail Waiting" message will be for *you*!

Radio Tips:

Packet Snooping

When you're new to packet radio, it's often difficult to figure out what's going on in your area. How many packeteers are within range of your station? What are their call signs? What are they doing with their sytems?

Why not let your packet TNC do the snooping for you? Check your TNC manual and look for a command called **MCOM**. By sending the command **MCOM ON** from your keyboard, you're instructing your system to display every packet it hears on a particular frequency—even packets you wouldn't see normally. (Some TNCs do not use MCOM. Instead, the same function is performed through a variation of the **MONITOR** command.) You'll see connect requests when one station calls another. You'll also see text data (messages) being passed back and forth. By watching this activity, you can determine the call signs of bulletin boards, personal mailboxes, nodes and digipeaters. Take notes while you're watching and then try connecting to some of these stations. Soon you'll know who you can reach, and who is out of range.—*WB8IMY*

Do You Need an Antenna Tuner?

Maybe yes, maybe no. It all depends on the type of antenna and feed line you're using.

By Steve Ford, WB8IMY
Assistant Technical Editor

There is a great cloud of mythology surrounding antenna tuners, particularly when the conversation turns to what they can and cannot do. Make no mistake, they are useful devices in the right applications. The trick is deciding whether you need one!

When Rigs and Antenna Systems Disagree

Every antenna has an *impedance* expressed in *ohms*. The same is true of the feed line you use to connect your transceiver to the antenna. Impedance sounds like a complicated beast and, to a certain extent, it is. In simplest terms, it is a combination of *inductive reactance*, *capacitive reactance* and garden-variety *resistance*.

It's probably best to avoid a long discussion about the meaning of reactance. This is "New Ham Companion," not the *Proceedings of the IEEE*. If I had several more pages to devote to this article, I'd be more than happy to bore you to tears with reactance theory. For our purposes, think of reactance as opposition to the flow of an ac signal in a circuit. In this case, the ac is the RF generated by your transceiver and the circuit is your antenna system. File this idea away for the moment. We'll come back to it later.

Meanwhile, back at the radio ranch....

The impedance of the antenna depends on a number of factors, including the length, operating frequency, height above ground, proximity of metal objects and even weather conditions (such as ice on the antenna). The impedance of the feed line depends on how the cable is constructed.

Your feed line does more than simply connect your radio to your antenna. It acts as an impedance *transformer*. That is, the impedance of your antenna is transformed by the feed line into the value your radio "sees" when you connect it to the cable. This *system impedance* acts as a *load* for the energy created by your radio—just like a light bulb is a load for the energy supplied by a battery.

Most amateur transceivers are designed to work with a load impedance of 50 ohms. When your radio sees an impedance of 50 ohms, or something close to it, you're on easy street. You press the mike switch, close the CW key or type on your keyboard and all is right with the world.

But what happens when the impedance *isn't* 50 ohms? Now you have a situation known as a *mismatch*.

When a mismatch exists, a certain portion of the power generated by your radio is *reflected*—like light is reflected by a mirror. This reflected power comes shooting back down the cable to your radio. When it reaches the radio, it is reflected back toward the antenna. The reflected power combines with the *forward* power being generated at the radio to create *standing waves* in the feed line.

By using a *standing-wave-ratio* (SWR) meter, you can measure both the forward and reflected power. A 1:1 SWR reading indicates that no power is being reflected back to your radio. This is good. On the other hand, an SWR of 3:1 or more means that a substantial amount of power is being reflected. This is usually bad. (Don't you love these simple concepts?)

A high SWR can cause considerable RF voltages to develop in the feed line and in the output circuits of your radio. This is a dangerous condition for your rig—especially if it is a modern solid-state transceiver. To prevent this, many radios manufactured within the past 10 years include SWR protection circuits. When the SWR gets too high, these circuits automatically reduce the output power or, in some cases, shut down the transceiver altogether (see Fig 1). Older tube radios are much more forgiving, but even they can be damaged when operated under high SWR conditions.

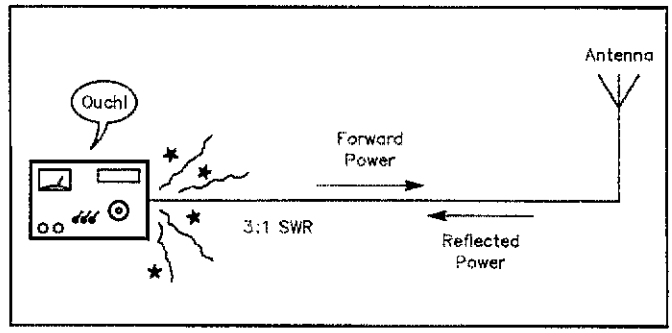


Fig 1—Most transceivers are designed to expect an antenna system impedance of 50 ohms. When the antenna impedance is something other than 50 ohms, a transmission line mismatch occurs and a portion of the RF power is reflected back to the radio. *Standing waves* are created in the feed line and high RF voltages can develop. When the *standing-wave ratio* becomes higher than 3:1, your transceiver may be damaged.

If your antenna system presents a serious mismatch to your radio, what can you do? If you connect your transceiver directly, the protection circuitry will drop your output like a rock. Worse yet, you may find yourself on the receiving end of an expensive repair bill. You need to provide a 50-ohm load for your transceiver—regardless of what is really present. One way to accomplish this is by using an antenna tuner.

How Does an Antenna Tuner Work?

In its most basic form, an antenna tuner is simply a network of variable inductors (coils) and capacitors. By adjusting the coils and capacitors, you counterbalance and cancel the effects of the inductive and capacitive reactance at the *transceiver* end of the feed line. (*Now* you know why I bothered bringing up the subject of reactance in the first place!) As the reactances are canceled, the impedance at the transceiver is transformed to 50 ohms (see Fig 2).

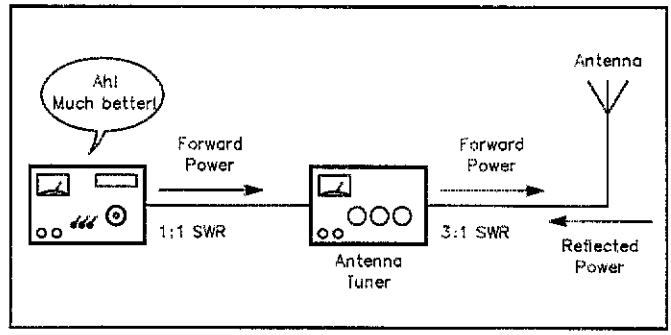


Fig 2—By using an antenna tuner, you can adjust the impedance your transceiver "sees" to a hospitable 50 ohms. The antenna mismatch to the line still exists, but the tuner protects your radio from the RF voltages while allowing it to develop its maximum output.

As far as your transceiver is concerned, the load impedance is matched and it's free to dump all of its power into the antenna system.

I bet a number of you are saying to yourselves, "*Wait a minute!* The impedance at the transceiver side of the tuner is 50 ohms, but it's still some other value at the antenna side. All you've done is shift the mismatch problem from the transceiver to the tuner!"

You're right. The mismatch still exists, but now it's at the output of the antenna tuner instead of the transceiver. By using the tuner, we're protecting the radio while still allowing it to develop maximum output. If the tuner is well designed, it should be able to handle the RF voltages and currents caused by the high SWR.

Of course, the reflected power is still bouncing back and forth between the antenna tuner and the antenna. Some of this power is lost in the feed line. If you're using low-loss feed line, however, most of it is radiated at your antenna. In the meantime, your transceiver is happy and you're happy. Who could ask for more?

Use an Antenna Tuner if...

...you want to feed your antenna with open-wire line.

Open-wire line (or *ladder line*) offers extremely low loss at HF frequencies (much better than coaxial cable). One problem is that open-wire line is *balanced* while your transceiver output is *unbalanced*. You need to use an antenna tuner with a built-in *balun* to form a bridge between the balanced line and the unbalanced output of your radio. A balun is a type of transformer that converts balanced feed lines to unbalanced, or vice versa. (***BAL***anced to ***UN***balanced. Get it?) Most antenna tuners use 4:1 baluns that also convert the impedance of open-wire feed lines to a value that the tuner can handle.

...you want to operate your antenna on bands other than those it was designed for.

When you attempt to use, say, a 40-meter dipole on 10 meters, a big mismatch will develop, along with a high SWR. By using an antenna tuner, you may be able to create a 1:1 SWR at your transceiver. (I say "may" because the mismatch can sometimes be so great that it is beyond the capability of your tuner to handle.) The high SWR may cause substantial loss in a coaxial feed line, but at least you'll radiate *some* power at the antenna.

...your antenna has a narrow *SWR bandwidth* on some bands.

Some types of multiband antennas do not offer low SWRs from one end of each band to the other. There is usually a range—expressed in kilohertz—where an SWR below 2:1 can be achieved. For example, a multiband trap dipole may offer an SWR of 2:1 or less from 3600 to 3800 kHz. That's an SWR bandwidth of 200 kHz. If you try to operate above 3800 kHz or below 3600 kHz, you'll encounter an SWR higher than 2:1 and your radio may become displeased. With an antenna tuner, you can operate outside the SWR bandwidth and still load the full output of your radio into the antenna system.

Don't Bother with an Antenna Tuner if...

...your SWR is 1.5:1 or less at the frequencies you operate most often.

An SWR of 1.5:1 or less is not serious and does not require the assistance of an antenna tuner. Most modern rigs will tolerate a 1.5:1 SWR just fine. In fact, many will be happy at an SWR of 2:1. If you are using a good-quality feed line, the loss caused by an SWR of 1.5:1 or even 2:1 isn't enough to worry about at HF frequencies. Many hams are obsessed with providing an absolute 1:1 SWR for their radios at all times. Apparently they also have money to burn!

...you have a high SWR at VHF or UHF frequencies.

VHF/UHF antenna tuners are available, but my advice is to save your money. Remember that an antenna tuner massages the antenna system impedance *at the transceiver*. The mismatch still exists and the SWR is still high at the antenna side of the tuner. Even the best coaxial cables have significant losses at VHF and UHF when the SWR is high. A VHF/UHF antenna tuner will make your radio happy, but most of its power will never make it to the antenna. The best approach is to correct the mismatch at the antenna by adjusting whatever tuning mechanism it provides. If the antenna cannot be tuned, check the cable for defects and make sure you've installed the antenna properly.

...you're interfering with TVs, telephones and other appliances in your neighborhood.

Despite what you may have heard, an antenna tuner will not necessarily cure your interference problems. It's true that most antenna tuners will reduce the level of *harmonic radiation* (signals your radio generates in addition to the ones you want), and if the interference is being caused by harmonics, a tuner may help. Most interference, however, is caused by RF energy that's picked up indirectly by cables or wires, or directly by the device itself. By using an antenna tuner, you'll probably radiate more energy at the antenna than you did before. That may make your interference problem worse!

Looking for Mr Goodtuner

So, you've decided that you need an antenna tuner after all. Antenna tuners come in all shapes and sizes. What features should you consider?

❑ **A built-in SWR meter**—An SWR meter of some type is a must if you want to use an antenna tuner. When adjusting your tuner, you need to keep your eye on the *reflected power* indicator. Your goal is to reduce the reflected power to zero—or at least as close as you can get. When the reflected power is zero, the SWR is 1:1 at your transceiver.

Many tuners feature built-in meters. If not, you can purchase one separately. Your radio may even have its own SWR meter.

❑ **A roller or tapped inductor**—More expensive tuners feature a variable coil called a *roller inductor*. As you turn the front-panel inductor knob, the coil inside the tuner rotates. A metal wheel rolls along the coil like a train on a railroad track. As the wheel moves along the coil, the inductance increases or decreases.

Less expensive tuners do not use roller inductors. Instead, there is a coil with wires attached at various points. On the front panel, a rotary switch selects the wires. According to how the inductor is wired in the circuit, selecting one *tap* or another

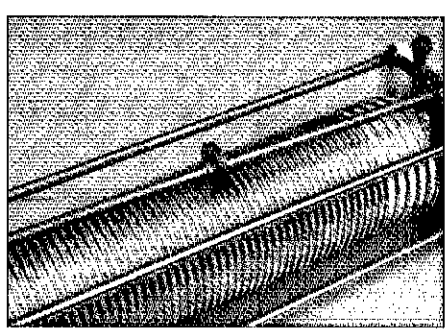


Fig 3—This is a typical roller inductor. Notice the wheel that rolls along the coil windings. As the wheel moves, the inductance changes.

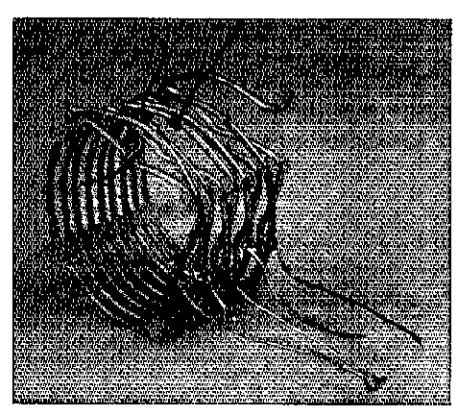


Fig 4—Tapped inductors have wires attached at various points. By selecting a particular wire, you get a fixed amount of inductance.

varies the inductance. This is known as a *tapped inductor*.

There are advantages and disadvantages to both approaches. Roller inductors offer the best tuning performance, but they are subject to the woes of mechanical wear and tear. For example, if corrosion builds up on the wheel or the coil windings, the electrical quality of the connection will deteriorate. Roller inductors are also cumbersome to use. You may have to twist the control many times when moving from one band to another.

Tapped inductors are easy to use and free of mechanical problems (unless the switches get dirty). However, you may find that they restrict the operating range of your tuner. When you turn the switch, you select a *fixed* amount of inductance. You can't easily change it to tune a particularly difficult mismatch situation.

❑ **A built-in balun**—If you intend to use an open-wire feed line, buy a tuner with a built-in 4:1 balun. These baluns often dissipate quite a bit of heat, so always choose a large balun over a small one.

❑ **Multiple antenna capability and dummy loads**—Some tuners offer the ability to connect more than one antenna. This is handy in all sorts of applications. Let's say you have a vertical antenna for 40-10 meters and a wire dipole for 80 meters. You can connect both feed lines to your tuner and easily switch between them.

Built-in dummy loads are convenient, but not necessary. A dummy load is a resistor (or group of resistors) that absorbs the output of your transceiver while allowing very little energy to radiate. It's used for making transmitter adjustments and other tests. If your tuner lacks a dummy load, you can purchase one separately.

❑ **Automatic operation**—Most transceiver manufacturers offer *automatic* antenna tuners. These tuners are usually built in the radio itself, or they're offered separately. Automatic tuners are convenient when you need to change bands or frequencies quickly. You simply push a button and your tuner adjusts its coils and capacitors to achieve the lowest SWR. Some automatic tuners sense when you've changed frequency and will readjust immediately! (You don't have to lift a finger.)

Automatic antenna tuners are expensive and their tuning range is limited. If your operating style requires you to jump from band to band rapidly (contesting is one scenario), consider an automatic tuner. Otherwise, conserve your cash and invest in a manual tuner.

A Word About Power Ratings

If your transceiver produces only 50 or 100 watts of power, a 200- or 300-watt tuner should do the trick, right? Well...yes and no. Remember what we said about mismatches causing high RF voltages in the tuner? If you're trying to use your tuner in a high-SWR situation, the RF voltages at the tuner may cause an unpleasant phenomenon known as *arcing*. That's when the RF energy literally jumps the gaps between the capacitor plates or coil windings. When your tuner arcs, you'll usually hear a snapping or buzzing noise. The reflected power meter will fluctuate wildly. Interference to your TV and other devices will increase dramatically. You may even see brilliant flashes of light inside your tuner!

Arcing is obviously bad news for your tuner. It's your tuner's way of saying, "Stop! I can't handle this mismatch!" There are two cures for arcing: reduce your output until it stops, or get a tuner with a higher power rating.

High-power tuners use large capacitors and coils. The gaps between the plates and windings are greater, making it more difficult for an arc to occur. If you can afford it, you're always better off buying a tuner with a 1.5 kW rating or better. (The exception is QRP operating where you're running low power levels.) A hefty tuner costs more, but it will serve you well in the long run.

Buy or Build?

As you comb through the advertising pages of *QST*, you'll see many new antenna tuners for sale. The prices are often reasonable and the quality is usually good. Keep your eyes open for used tuners, too. If an old tuner is in decent condition, it's every bit as usable as a new one.

If you like to build things, however, consider an antenna tuner as your next project. Antenna tuners are relatively easy to construct. You can find capacitors and coils at hamfest flea markets at low prices. Even roller inductors—the most expensive part of a roller-inductor tuner—can be found for less than $40 if you look carefully.

Your chances of success with an antenna tuner project are excellent. You have to try pretty hard to build one poorly! Best of all, you'll have the satisfaction of using a piece of equipment that you've put together yourself. The *ARRL Handbook* offers several tuner designs you can try. Heat up your soldering iron and go to it! QST

Radio Tips:

Log it or Lose it

Back in the old days (not all *that* long ago!), the FCC required every amateur to keep a detailed station log. (In addition to regular QSOs, hams even had to log unfruitful CQ calls.) And although we're not required to keep a log nowadays, an accurate station log is useful not only today, but tomorrow, too.

We all have things we like to keep track of: states and countries worked and confirmed; information for awards; or the names and addresses of our on-the-air friends. A well-kept station log is invaluable in your quest for the Worked All States or the DX Century Club (DXCC) awards. In addition to keeping a running list of states and countries, your logbook is the perfect place to keep detailed information on a wide range of subjects.

Your logbook is also a good place to keep notes on modifications to your equipment. Not only will the information be easy to find for future reference, it will be easier to note the effects of such changes by referencing contacts before and after.

How does your new loop antenna compare with your old trap vertical? Check out the signal reports in your logbook and you'll have a good idea!

DXers often refer to their logs when trying to work into specific parts of the world. When is the best time to work Africa in the winter? A quick check of last year's log entries will probably turn up the required information.

While you're at it, why not keep other changes in your log? When you upgrade, note it in your log. When you get a new rig or put up that long-awaited tribander, write it down. Ten years down the road, your log entries will bring back a flood of memories!

Speaking of memories, poring through your old logbooks can be a lot of fun. You'll come across your first QSO and remember how nervous you were, or you'll come across rare DX stations you've worked, pileups you've busted or the first time you worked someone special. Reliving those events is almost as much fun as it was when it happened!

Computers have become quite popular in ham shacks across the country—especially those belonging to contesters and DXers. If you have a PC in your shack, you might want to consider keeping your station log on your computer. A number of suitable programs are available. Check the ads in *QST*. Logging programs may also be available through your local club or computer user's group. If you're into programming, consider writing your own logging software.

If you do go the computer route, remember to keep regular backups and a hard copy of your log information—otherwise, the benefits of having instant access may be lost if your data disks are lost or damaged.

If computerized logging isn't your thing, *The ARRL Logbook* is just what you've been looking for. Used by thousands (millions?) of hams over the years, the latest version is available from the ARRL for $3.50. It has room for nearly 1000 QSOs and includes useful information such as Q signals, a time-conversion chart, the ITU phonetic alphabet, an RST chart, international call sign prefixes and more.—*NT0Z*

Conducted By Mark Wilson, AA2Z
Editor, *QST*

The Yaesu FRG-100 General-Coverage Receiver

Reviewed by David Newkirk, WJ1Z

I suppose that the days of *separates*—matching, transceive-compatible transmitters and receivers—are understandably long-gone and never to return. It's just too logical and cost-effective to build transmit and receive functions into a single box labeled *transceiver*. Some Amateur Radio equipment manufacturers nonetheless continue to build general-coverage receivers—receivers that hams and market-conscious non-ham shortwave listeners, seeking to evaluate the unknown in terms of the known, stretch to characterize as "the receiver part of transceiver *X*." Potential buyers of such boxes then pore over reviews of these radios' supposed transceiver progenitors, trying to imagine how receive-only versions might compare.

I'm already on public record as being a receiver enthusiast, so I probably won't surprise you when I admit that Yaesu's FRG-100, a general-coverage AM, CW, SSB and (optionally) FM receiver that tunes from 50 kHz to 30 MHz, revved up *my* guessing machine in a big way. Keeping my ears open, I found that other hams were also wondering if the FRG-100 is, in this case, "the receiver section of an FT-890." (I can almost hear the *QST*s rustling open to my FT-890 Product Review.) Hmm, maybe I could qualify for a career in writing cheap detective novels if I could engagingly keep you guessing about the answer to that question until the end of this review. (*There's* that FT-890 write-up—in September 1992.) Let's see . . . I imagine that the first thing you'd do after locating the FT-890 write-up would be to compare the FT-890's receiver-test numbers (Table 1 on page 81 of September 1992 *QST*—hmm) with the numbers in *this* review's Table 1 (page 74). Then, if your interests are anything like mine, you'd go right to the dynamic-testing numbers for minimum discernible signal, dynamic range . . .

Nahhh! The FRG-100 is *not* an FT-890 spinoff. Among other differences, the FT-890 includes a switchable front-end preamp and the FRG-100 has no preamp; the FT-890's first mixer (the circuit block that can make or break a radio's strong-signal-handling performance) uses four JFETs and the FRG-100's uses two; the FT-890 uses a first intermediate frequency (IF) of 70.455 MHz and the FRG-100 uses 47.21 MHz; the FT-890 includes front-panel IF shift and the FRG-100 doesn't; the FT-890 includes an IF notch filter and the FRG-100 has no notch filter; the FT-890 allows the installation of optional filters for SSB and CW, while the FRG-100 allows the installation of an optional CW filter only. So that's that (platoons of September 1992 *QST*s snap shut), and so much for the FRG-100, right?

Nope. The FRG-100 stands on its own as a serious, lower-priced communication receiver that has already drawn critical acclaim in shortwave-listening circles (the *World Radio TV Handbook*'s 1993 Industry Awards named it "Best Communications Receiver 1992"). The SWL community has largely evaluated the FRG-100 in terms of how it receives one-way communication—mainly, AM radiotelephone as embodied by shortwave broadcasts. *This* review evaluates the FRG-100's performance from an Amateur Radio *and* SWL perspective. To this end, we equipped our FRG-100 with a 500-Hz CW filter, but choose not to install the optional FM Unit-100 narrow-band FM module. The receiver package included the PA-11B ac adapter, which puts out 12 V dc at 1.5 A.

The Basics of the Box

Frequency Agility. A satisfyingly weighted tuning knob dominates the FRG-100's front-panel controls, tuning the receiver in 10-Hz steps in LSB, USB and CW and 100-Hz steps in AM and FM (**FAST** mode not selected) or 100-Hz steps in LSB, USB and CW and 1-kHz steps in AM and FM (**FAST** mode selected). **UP** and **DOWN** push buttons tune the receiver in 100-kHz or 1-MHz steps.

Citing "a private survey of American world-band listeners . . . undertaken by a private institute" as rating the importance of keypad tuning as 83.5 on a scale of 100, *Passport to World Band Radio* 1994 slams the FRG-100 for its "incredible omission" of this feature, saying that the radio "can't be tuned properly" without it. Well! Keypad frequency entry is certainly a convenience, but with 25 years of shortwave and amateur listening behind me, I can't ascribe it such importance. Ham-equipment manufacturers apparently can't, either: *None* of the low-end MF/HF transceivers offered by the major players—ICOM, Kenwood, Ten-Tec, Yaesu—include keypad tuning. Considering what else the FRG-100 brings to the communication-receiver market for its price, I think the omission of keypad tuning is defensible.

Memories. The FRG-100's 52 memories—01 through 50, Lo and Hi—store frequency and mode. Lo, Hi and 01 contain default information—necessary as jumping-off points when the radio's microprocessor is reset, for instance—but can be reprogrammed at will. Lo and Hi also serve to hold limits for the FRG-100's scanning functions. The memories are tunable—that

The Bottom Line

Of special interest to listeners for whom innovatively flexible CW and SSB reception come before hi-fi AM as receiver-performance musts, the compact FRG-100 packs a surprising performance wallop at a price that should make its competition worry.

Table 1
Yaesu FRG-100 General-Coverage Receiver, Serial No. 3D040176

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency range: 50 kHz to 30 MHz.	As specified.
Modes of operation: USB, LSB, CW, AM, FM (optional).	As specified; FM not tested.
Power consumption: 1.2 A max, 11-14 V.	0.76 A at 13.8 V.
Sensitivity ("for 10 dB S/N, FM 12 dB SINAD"): SSB/CW (2.4-kHz BW), <4 μV from 100-250 kHz, <1 μV from 250-500 kHz, <2 μV from 0.5-1.8 MHz, 0.25 μV from 1.8-30 MHz.	*Minimum discernible signal (noise floor) with 500-Hz filter:* / *Signal level for 10 dB (S+N)/N, 2.4-kHz BW* 1.02 MHz: −130 dBm / −116 dBm (0.35 μV) 3.52 MHz: −139 dBm / −124 dBm (0.14 μV) 14.02 MHz: −138 dBm / −124 dBm (0.15 μV)
AM (6-kHz BW), FM (28-30 MHz, 15-kHz BW): 100-250 kHz, <2 μV; 250-500 kHz, <4 μV 0.5-1.8 MHz, <1 μV, 1.8-30 MHz.	Test signal modulated 30% with a 1-kHz tone, AM Wide: 1.02 MHz: −101 dBm (2 μV) 3.80 MHz: −110 dBm (0.7 μV)
FM (28-30 MHz, 15-kHz BW): <0.5 μV	Not tested.
Dynamic range: Not specified.	Blocking dynamic range:* 1.02 MHz: 111 dB** 3.52 MHz: 117 dB** 14.02 MHz: 113 dB**
	Two-tone, third-order intermodulation distortion dynamic range:* 1.02 MHz: 98 dB 3.52 MHz: 93 dB 14.02 MHz: 93 dB
	Third-order input intercept: 1.02 MHz: + 17 dBm 3.52 MHz: +0.5 dBm 14.02 MHz: +1.5 dBm
Image rejection: 60 dB or better from 1.8-30 MHz.	Second-IF image rejection: 87 dB at 14.02 MHz (test signal at 14.93 MHz).
Squelch sensitivity: 1.8-30 MHz (CW, SSB, AM): <2.0 μV; 28-30 MHz (FM): <0.32 μV.	14.2 MHz, USB mode: −105 dBm (1.3 μV) at threshold, −12.5 dBm (53 mV) at maximum; FM not tested.
S-meter calibration (μV for S9 reading): Not specified.	CW narrow 70 μV at 14.02 MHz; 120 μV at 1.02 MHz.
Receiver IF/audio response: Not specified.	Bandwidths at −6 dB, measured at external speaker with SSB carrier offsets and CW pitch at factory defaults: CW narrow, 329-863 Hz (534 Hz) CW wide, 216-1719 Hz (1503 Hz) USB, 215-1707 Hz (1492 Hz) LSB, 108-1821 Hz (1713 Hz) AM wide and AM narrow, 72-2100 Hz (2028 Hz)
Receiver audio output: at least 1.5 W at <10% distortion with 4-Ω load.	2.7 W at 10% total harmonic distortion with 4-Ω load.
Color: Black and dark gray.	
Size (height, width, depth): 3.7 × 9.4 × 9.6 inches.	
Weight: 6.6 lb.	

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

**Measurement was noise-limited at the value shown.

is, they act like individual VFOs—and selectable by means of a detented, bidirectional **MEM** knob. The usual VFO/memory-button cluster controls memory storage and retrieval, and VFO/memory toggling.

Display. The FRG-100's yellow-backlit liquid-crystal display shows memory-channel number, frequency to the nearest 10 Hz, and annunciators for mode, clock, squelch, computer-control and other functions. The signal meter, also warmly backlit in yellow, spans S1 to 60 dB over S9.

Mode/filter agility. Four push buttons switch the FRG-100 between USB and LSB (**SSB**), CW wide and CW narrow (**CWN/N**), AM wide and AM narrow (**AM/N**) and **FM**. The FRG-100 comes with IF selectivities of 2.4, 4 and 6 kHz as standard. Function keys let you change, on the fly, the IF selectivities assigned to the AM/N and SSB modes—quite useful, for instance, in tuning in AM as SSB: Achieving carrier zero-beat is easy with double-sideband signals if you momentarily switch in the 4- or 6-kHz filter and tune for the slowest possible inter-sideband beat.

Clock/timer. The FRG-100 has two 12/24-hour clocks, one of which can be set to act as a one-event or sleep timer capable of turning the receiver (and a device connected to relay contacts accessible via the radio's rear-panel **REMOTE** jack) on and off. Both clocks must be set to 12- or 24-hour operation simultaneously; one can't be set to 12-hour operation with the other set to 24.

Scanning. MF/HF scanning is a major yawn for yours truly, but for the record, the FRG-100 can do memory, band (that is, frequency), priority and channel-group scanning. The radio's scanning can be set to resume 2 seconds after a signal vanishes

(carrier-delay mode) or 5 seconds after acquiring a signal (time-delay) mode. You can lock channels out of memory scanning as necessary.

Rear-panel connections. The FRG-100 connects to the outside world via **ANT**enna connectors (switchable LO-Z [50 Ω, coaxial] and **HI-Z/GND** [450 Ω, spring terminals]), **REC**order, **REM**ote, **MUTE**, **DC12V IN** and **C**omputer-**A**ided **T**ransceiver jacks, and the ever-faithful **GROUND** post.

RF input attenuators are present—6- and 12-dB jobs selectable separately or together by means of front-panel buttons. The obligatory squawky, top-mounted speaker is present, too.

Programmable functions. The SWL-oriented reviews I've seen give next to no space to FRG-100 features that I think *every* synthesized, microcontroller-commanded MF/HF radio should include. The FT-890, for instance, glaringly omits user-programmable CW-receive offset and sidetone pitch—you're stuck with 700 Hz, period. Not so with the FRG-100: It allows you to select a CW-receive pitch of 400, 500, 600 (the default) or 700 Hz.

Some operators prefer to listen to their CW in "USB" or "LSB." You have no choice in the FT-890, but the FRG-100 lets you adjust two related settings: You can move the radio's BFO above or below its 455 kHz IF, *and* you can adjust the FRG-100 to jump between LSB and CW (or USB and CW) without changing the pitch of received signals.

Want to tweak your FRG-100's frequency calibration so it's spot-on with WWV? No problem: The radio lets you set its PLL Offset value—*to a different value for each mode* (USB, LSB, CW, CW narrow, AM, AM narrow, FM)—within ±3 kHz of its default value. This feature, in conjunction with the radio's button-press beeper (which, adjustable as it is from 270 to 3520 Hz, can be set equal to the radio's CW-receive pitch for use as a transfer oscillator), can allow you to accurately measure carrier frequencies to the nearest 10 or 20 Hz with the FRG-100.

In even the most expensive Amateur Radio transceivers, circuit alignment and IF-filter asymmetry generally cause received band noise, and the audio of identical and opposite sidebands, to sound different in USB and LSB. The FRG-100's SSB Carrier Offset features lets you minimize this effect and tailor the radio's SSB audio response by setting the BFO-to-IF offset independently in LSB and USB. In both modes, you can swing the BFO, *on the fly*, from 452 to 458 kHz in 10-Hz steps—just what you need, for instance, to tailor the FRG-100's audio response for best operation with a digital modem. (Despite what the *Operating Manual* says, you can do this without affecting the pitch of received signals—so this feature can successfully serve as a precise IF-shift control in SSB.)

Additional user-programmable features, some executable on the fly and some only at power up, include microprocessor reset, scanning defaults, memory-channel lockout and more. The radio's computer-control command/response suite includes something of possible use to those interested in doing automated bandscans: access to digitized S-meter data.

Documentation. The FRG-100 *Operating Manual* continues Yaesu's tradition of excellent instruction books. As if the manual wasn't enough, the FRG-100 comes with a plastic command-summary/time-chart card that slips neatly into a holder on the receiver's bottom cover. Smooth!

The FRG-100 in Action

As Table 1 shows, ARRL Lab testing found that our FRG-100 meets or exceeds all of its specifications. Even though the radio doesn't include an RF preamp, its sensitivity is more than adequate. I was disappointed (but not surprised) to see the FRG-100 radio's blocking-dynamic-range numbers come up *noise-limited*. This indicates that the radio's frequency synthesizer is significantly phase noisy, which can cause a superimposed-hiss effect that's most noticeable when you try to receive weak signals adjacent to very strong ones. Considering the FRG-100's price class, though, this is forgivable. The radio's two-tone, third-order intermodulation distortion dynamic range numbers—in the low 90s—are good for its price class.

On the air, the FRG-100's behaves as our lab findings suggest it should. Its AGC-attack response is acceptably good, even when set to **FAST** while receiving my transmitter through transmit-receive-switch leakage. (The FRG-100's **SLOW** AGC response sounds like other radios' **SLOW** AGC, but **FAST** behaves more like **MEDIUM** in radios that give you that choice.)

As with every noise blanker I've ever used, the FRG-100's blanker knocked down some impulse noises and didn't touch others.

The FRG-100's S meter is there, looks nice and moves when signals come in, change strength or go away. (Sorry; I just can't take MF/HF signal meters seriously unless they're calibrated in dBμV or some other meaningful unit.)

If there's one FRG-100 trait worth crabbing about, it's what I call Heavy-Handed AF Rolloff. And the FRG-100 does it with a vengeance. Look at Table 1's AF/IF audio bandwidth numbers. The radio's upper -6-dB audio-bandwidth limits in AM wide (6-kHz IF filter) and AM narrow (4-kHz IF filter)—2100 Hz in both instances—are so low that the audio sounds muffled and boomy. You can barely tell whether you've chosen AM narrow or quality AM wide! Although rolloff this severe can work to enhance weak-signal CW copy, it's too much for AM and even somewhat muffles SSB audio.

Tuning away from strong signals during CW reception, I can hear high-pitched *filter blowby* with the narrow filter in line. Okay, this is something that audio rolloff can legitimately mask. But then I read the FRG-100 review in *Passport to World Band Radio* 1994: "The '100 sounds good to the ear, too, and our lab tests confirm better-than-average audio." This, after taking the radio to task for its overwide 4- and 6-kHz filtering, through which "heterodynes from adjacent stations, like werewolves baying at the moon, sneak in to spoil the listening experience"! Eh? Can we be talking about the same radio? *Our* FRG-100 sounds like it's smothering under a blanket during AM reception! (According to Yaesu, the 4-kHz filter performance has been improved in the latest production models.)

Despite *Passport* 1994's remarks predicting inaction, Yaesu apparently *did* modify the FRG-100's IF/AF response in answer to complaints like *Passport*'s. The fix seems to have been—sigh—heavy-handed AF rolloff. Oh, well. Somewhat higher-fi audio is available at the radio's **REC** jack. If you know your stuff, you could even—gasp—modify the FRG-100's circuitry for better sound by changing a capacitor or two.

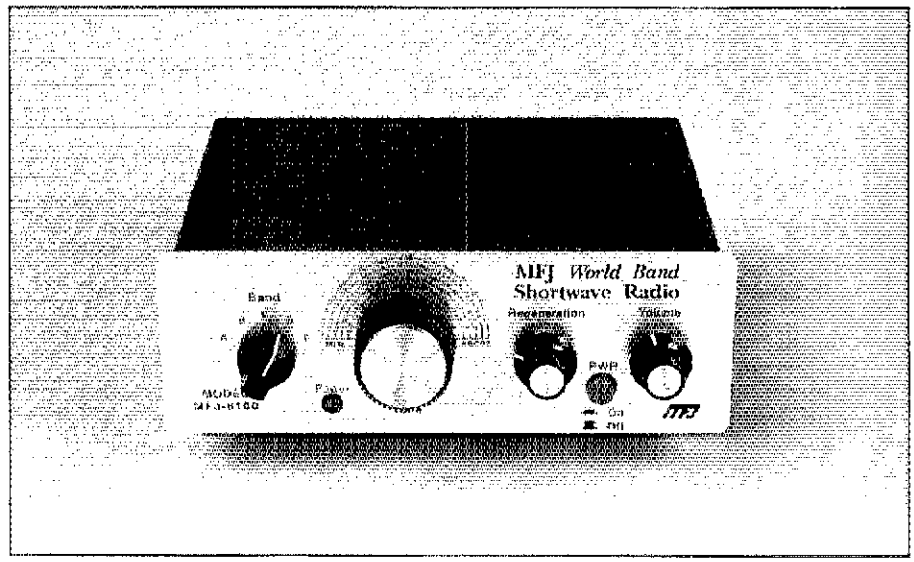
My bleatings on audio response aside, what you should know about the FRG-100 is this: It receives CW and SSB signals very well—with none of the weak-CW-signal graininess exhibited even by some mid-priced MF/HF receivers and transceivers of the previous equipment generation—and AM passably well. Within the constraints imposed by heavy-handed AF rolloff, its excellent reception of AM as SSB confirms that its AGC response and SSB-width IF filtering are above reproach for a receiver in its price class. The FRG-100 brings 10-Hz-step tuning *and 10-Hz frequency display* to the consumer-communications-receiver market at an industry-low price. It's lightweight, quite frequency-stable, and well-laid out mechanically and ergonomically. I want one!

But now my guessing machine is revving: What about a transceiver spin-off of the FRG-100?

Manufacturer: Yaesu USA, Inc, 17210 Edwards Rd, Cerritos, CA 90701, tel 310-404-2700. Suggested retail prices: FRG-100, $669; FM Unit-100, $47; XF-E 500-Hz filter, $149; XF-F 250-Hz filter, $159; TCXO-4 high-stability crystal, $102.

The MFJ-8100 Shortwave Regenerative Receiver Kit

Reviewed by David Newkirk, WJ1Z

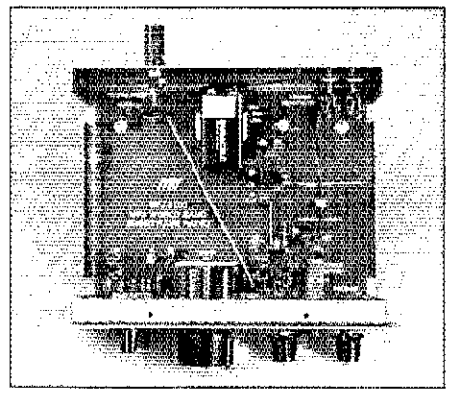


The feeling comes without warning: You're in a five-star restaurant and you have carte-blanche ability to pay. The menu bewitches, the wine list beckons, the sky's the limit . . . and suddenly you realize that the food you *need* is a sweet string bean snapped straight off the vine.

The radio-hobby equivalent to that feeling—which, for the sake of discussion, I'll refer to as Finally Getting The Joke—is the sudden suspicion that using the feature-studded, kilobuck-plus, RS-232-compatible electrobox in front of you may sometimes be an elaborate exercise in Almost, But Not Entirely, Missing the Point.

In the restaurant example, the appropriate response is to find that fresh string bean and eat it. In radio hobbyism, the best way to reset your microprocessor is to spend a little time *failing* to miss the point—to get a little R&R by reconnecting with and enjoying radio with a minimum of hardware between you and radio itself.

That's where MFJ's MFJ-8100 Shortwave Regenerative Receiver kit comes in. Until I built and used the MFJ-8100, I'd yet to hear a solid-state regen that did any justice at all to what a regenerative receiver can do. *Sure* you can equip any oscillator, tube or solid-state, with an antenna jack, ac-couple its output to an audio amplifier and hear signals, but unless you do it right, your lash-up will work about as poorly as today's Very Serious Hams *think* regens worked. Such is not the case with the MFJ-8100K.



What you get in the MFJ-8100K box is a set of parts, an enclosure, a circuit board and a lively, literate Heathkit-like manual that treats you and the job at hand with respect. (You supply a 9-V battery, antenna wire and low-impedance headphones separately.) *Of course* you should end up with a receiver that works the first time if you follow the manual's check-the-boxes instructions; so enjoyable is the manual that you end up with more: a radio and a source of this-way-to-the-fun inspiration. I estimate that unhurried constructors will tend to finish the job in two to three hours, including normal domestic interruptions.

The MFJ-8100's active devices comprise three J310 JFETs (one as an untuned, grounded-gate RF amplifier, two as a Butler-oscillator regenerative detector) and an LM386 audio-power-amplifier IC. Amazingly (to me), MFJ's choice of encapsulated RF chokes do a more-than-reasonable job as three out of the four coils in the detector's tuned circuit (for its highest band, you wind a toroidal inductor yourself). A wide-spaced capacitor with built-in reduction drive (ratio, about 6:1) tunes the receiver well—from about 3.5 to 22 MHz. Final tweaks involve adjusting set-and-forget regeneration and tuning trimmers after you install the circuit board in the enclosure, and then you're ready to cruise the bands. With all of its screws in place, the enclosure makes a solid package, indeed.

I almost dropped my teeth when ARRL Lab Supervisor Ed Hare, KA1CV, said he wanted to do sensitivity and dynamic-range testing on the 8100K. The radio really isn't optimized for 50-Ω input, the impedance level at which all of our test equipment operates. (Nor does the 8100K need much of an antenna, such as whatever might be connected to the non-station end of a coaxial feed line, to haul in the world entertainingly—10 to 20 feet of wire is sufficient.) For the record, though:

- The MFJ-8100K's RF sensitivity (in this case, what we term *minimum discernible signal*—a 3-dB signal-plus-noise to noise ratio) is, just above critical regeneration, –105 dBm at 4 MHz and 10 MHz. At 20 MHz, Ed had to turn down the set's **RF GAIN** control, a variable resistor in series with its antenna-input line, to a point at which test-equipment loading didn't make the 8100K's detector stop oscillating. At that point, the radio's MDS was –90 dBm.
- The MFJ-8100K was not stable enough for us to measure its blocking dynamic range. With 100-kHz tone spacing, however, increasing the test signal to a level 85 dB above MDS made the received signal abruptly disappear.
- The MFJ-8100K's two-tone, third-order dynamic range measured as 70 dB with 100-kHz tone spacing.
- With an 8-Ω load, the MFJ-8100K's audio amplifier operated at 45 milliwatts with 20% total harmonic distortion. That's plenty of headphone audio.

Pretty crummy numbers compared to a "real radio," eh? But statements like that lead directly to Missing the Point, which (I opine) a radio like the MFJ-8100K can keep you from doing. The point of radio is getting the message across, and the fact is that hams and pros alike did just that for decades with receivers that worked as well as the MFJ-8100K. Speaking from experience, I can tell you that the MFJ-8100K needs no apologies as ham-built regens go. Made just a bit more capable of dealing with variable signal levels through the addition of an external 5-kΩ antenna-input pot (one terminal to chassis, one terminal to the 8100K's **ANTENNA** post, wiper to the antenna), the MFJ-8100K comes as close to equaling a good ham-built regen of yesteryear as a few transistors and an LM386 are likely to come.

The next time your nine-band, full-break-in, kilobuck-plus marvel starts to feel like overkill, the antidote just might be an evening spent building an MFJ-8100K.

Manufacturer: MFJ Enterprises, Box 494, Mississippi State, MS 39762, tel 601-323-5869, fax 601-323-6551. MFJ-8100K regenerative receiver kit, $59.95; MFJ-8100W wired and tested regenerative receiver, $79.95.

Heil Pro-Set Headset

Reviewed by Mark J. Wilson, AA2Z

The previous two reviews were written by a self-proclaimed receiver snob [er...enthusiast—sorry, Dave]. Before you read this review, you should know that I'm a *headphone* snob. I've gone through *a lot* of headphones—either they're too tight, or too loose, or they hurt my ears, or they sound muffled, or... Maybe I was dropped on my head as a baby or something, but I've always had a problem finding headphones that are comfortable after extended wear.

About 10 years ago, Clarke Greene, K1JX, introduced me to Beyer DT-550 stereo headphones that sound great and are comfortable to wear for a full weekend of contesting. What they don't have is a boom microphone, so I gravitated toward a Heil BM-10 headset for phone operation after reviewing one for February 1992 *QST*. In that review I praised the BM-10's audio quality and comfort, but voiced some reservations about the headset's durability. The review also noted that the BM-10's personal-stereo-type on-ear headphones did little to block external noise.

Apparently others felt the same way, because a common question among the contest crowd at the 1993 Dayton HamVention was "did you see the new Heil headset?" Indeed, Heil had introduced a new headset—the Pro-Set—that maintained the traits we liked in the BM-10 but addressed the concerns about the physical package.

The Pro-Set combines a set of conventional stereo over-the-ear headphones with a boom mike attached to one side. Its simple-but-elegant design easily adapts to heads of all shapes and sizes without a lot of fuss, making it extremely comfortable to wear for extended periods. I knew at once that the Pro-Set felt "right" but didn't give it much thought until I read a review of this product by Bob Wilson, N6TV, in the November/December *National Contest Journal*. As Bob explains, "The removable cushions are supported by a lightweight plastic dish which attaches to the overhead support with a unique ball joint attachment. This ingenious arrangement allows each headphone to pivot independently several degrees in any direction, letting the phones conform to the shape of your head instead of the other way around." Bob goes on to note that the padded headband has detents on each side so that you can adjust the headphones independently over a range of about 1.5 inches. Oh, *that's* why...

The microphone boom swivels up and down, and when it's up for storage, you don't even know it's there. The boom is extremely flexible, and you can adjust the microphone position in three dimensions so that it's just right. According to our postal scale, the headset weighs 10.3 ounces (including cable and connectors).

The Pro-Set's cabling is an improvement over the BM-10. The BM-10 had

separate mike and headphone cables, which often ended up a tangled mess. In the Pro-Set, the lines for the headphone and microphone connections are bundled together in a single 90-inch-long cord with strain reliefs at each end. The headphone cable terminates in a standard ¼-inch stereo phone plug.

The mike cable terminates in a standard two-conductor ⅛-inch phone plug. *A ⅛-inch phone plug?* Yes. One of life's little frustrations is that the 8-pin mike connectors on today's transceivers all look the same, but they're wired differently. Heil gets around this problem by offering adapter cables to connect the Pro-Set to a variety of transceivers. The adapter cables are about 12 inches long. On one end is a ⅛-inch phone jack to match the Pro-Set's mike plug and a ¼-inch phone jack for an external PTT switch (Heil sells optional foot switches and hand-held PTT switches.) On the other end is an 8-pin mike connector wired correctly for the transceiver of your choice. The adapters are even color coded (blue for ICOM, yellow for Yaesu, and so on). You get one adapter—your choice—with the headset, and you can buy additional adapters separately.

Like the BM-10, Heil offers the Pro-Set with a choice of microphone elements. Both elements are proven designs that have been in the Heil lineup for some time. The HC-5 element, designed to provide good audio for everyday operating, is rated at 350-4000 Hz with a 6-dB rise at 2400 Hz. The HC-4, designed for more "punch" for contest and DX work, rolls off the low end sooner—at 500 Hz—and has a 10-dB peak at 2100 Hz. The review unit had an HC-4 element. On-the-air reports with the Pro-Set were similar to reports I've gotten with other mikes using the HC-4 element. Listeners liked and commented on the clean, crisp and punchy audio—no surprises here!

The Pro-Set headphones are a big improvement over the BM-10. We loved the way the BM-10 headphones sounded, but didn't like the fact that they did little to block external noise. The Pro-Set headphones sound great, too, and their over-the-ear design is a lot more effective at muting fan noise, people talking in the background, and so on.

Heil's latest headset offers the impeccable audio of the popular BM-10 and adds a number of worthwhile improvements to the physical design. Finally, I can return my trusty Beyers to the stereo cabinet.

Manufacturer: Heil Sound Ltd, 2 Heil Dr, Marissa, IL 62257; tel 618-295-3000, fax 618-295-3030. Manufacturer's suggested retail price: Pro-Set headset, $135; AD-1 adapter cables, $13.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

AEA DSP-2232 multimode data controller (see Product Review, April 1993 *QST*). Minimum bid: $600.

Hal Communications PCI-4000 CLOVER II data controller, s/n 0148 (see Product Review, April 1993 *QST*). Minimum bid: $550.

Hal Communications PCI-4000 CLOVER II data controller, s/n 0149 (see Product Review, April 1993 *QST*). Minimum bid: $550.

MFJ-207 SWR Analyzer (see Product Review, November 1993 *QST*). Minimum bid: $53.

MFJ-249 SWR Analyzer (see Product Review, November 1993 *QST*). Minimum bid: $132.

SGC-230 Smartuner automatic antenna tuner (see Product Review, November 1993 *QST*). Minimum bid: $324.

Tejas Technology Backpacker II 40-meter CW QRP transceiver (see Product Review, November 1993 *QST*). Minimum bid: $132.

Sealed bids must be submitted by mail and must be postmarked on or before January 27, 1994. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494. QST

Hints and Kinks

Conducted By David Newkirk, WJ1Z
Senior Assistant Technical Editor

FERRITE SHIELD-CURRENT CHOKES CURE STRAY RF ON VERTICAL-ANTENNA TRANSMISSION LINES

◊ A vertical antenna can induce current on the shield of its coax feeder. The antenna induces current on the shield in the same manner that it induces current in the ground-system radials.

Since the shield is connected to station ground, RF current flowing on the feeder shield also flows on the outer surfaces of the equipment when the transmitter operates. This current can induce undesirable voltages in interconnecting cables, causing erratic operation of computer keyboards and power supplies. RF feedback also can occur through the transmitter microphone circuit.

These problems occurred when I operated my kilowatt power amplifier and Kenwood TS-940S transceiver. (RF feedback in the TS-940 microphone preamplifier has been recognized by others and can be solved with bypass capacitors and RF chokes.) A better solution—one that will address all station problems caused by coax-shield RF currents—is to prevent the RF from getting into the station from the coax shield. Gary Peterson, KØCX, suggested that I do this by putting a ferrite-bead shield-current choke in my antenna feed line where it enters my station.

A good source of the required components is The Wireman, Inc, Landrum, SC (see *QST* ads). The required components are a package of 50 type FB73-2401 ferrite beads (Wireman part #912B), 15 inches of RG-303 coax, and two coax connectors (UHF connectors [PL-259s; the Wireman's #702] with inserts [UG-175s; the Wireman's #704] for installation on RG-58 coax, or N connectors intended for installation on RG-58 [UG-536B/Us, available as the Wireman's #737). Although the Wireman sells these parts bundled as part of a W2DU Balun kit [#833], the coax in the kit is too short to accommodate the connectors, so I recommend ordering the parts individually instead of buying them as The Wireman's W2DU Balun kit.

To assemble the choke, install one connector on the cable. Because the UG-536B/U connector is made for RG-58 (which has a larger diameter than RG-303), you must heat-shrink a piece of 1-inch-long, 7/16-inch-diameter plastic tubing on the end of the coax before you install the connector. This will make the connector fit the cable tightly.

Next, put a 1/2-inch-long piece of heat-shrink tubing on the cable about 1 inch from the connector to hold the beads in place. Then place the 50 beads on the cable. Put on another 1/2-inch piece of tubing to anchor the other end of the beads, and then shrink a piece of 3/8-inch-diameter tubing over the beads. Install the other connector on the cable. Install the choke on the transmission line where it leaves your station.

This should largely do away with problems related to stray RF traveling into your station on your feed line's coax shield. An idea for clubs: Build one or more chokes that members can borrow to test this fix's effectiveness before building their own chokes.

If your station is not in the immediate vicinity of your antenna and you have problems with stray RF with a dipole or inverted V, the problem may be due to lack of a balun or use of an ineffective balun. If this is the case, install the choke at the antenna feed point as discussed in *Reflections* rather than using the choke at the station end of your feed line.—*Bruce R. Palmer, KØWM, Edmond, Oklahoma*

ANOTHER SIMPLE INTERFACE FOR TRANSCEIVERS WITH RS-232-C PORTS

◊ In January 1992 Hints and Kinks, Danny Stone, WB4ETY, described a simple level converter for connecting transceivers with transistor-transistor-logic-level (TTL-level) RS-232-C ports to personal computers. This conversion is necessary because TTL levels are 0 and +5 V, while RS-232-C levels are bipolar, with a higher allowable magnitude range. The converter described here takes advantage of the fact that some computer RS-232-C interfaces will work with TTL levels. Thus, no level conversion is needed with signals from the transceiver to the computer, and the standard RS-232-C levels from the computer must be "clipped" to avoid damaging the transceiver.

See Fig 1. I used a single 74LS08 quad AND gate, one gate each for data transmit, data receive, clear to send (CTS) and ready to send (RTS). In some cases, only the two data lines will be needed. The input diodes clip the RS-232-C levels from the computer, and the gates seem to be necessary to establish cleaner voltage transitions or more compatible thresholds.

This circuit is not as simple as the one presented by WB4ETY, but it's more likely that a 74LS08 or suitable substitute is available from the junk box than the Maxim MAX232 IC he used.—*Mark Shelhamer, WA3YNO, Baltimore, Maryland*

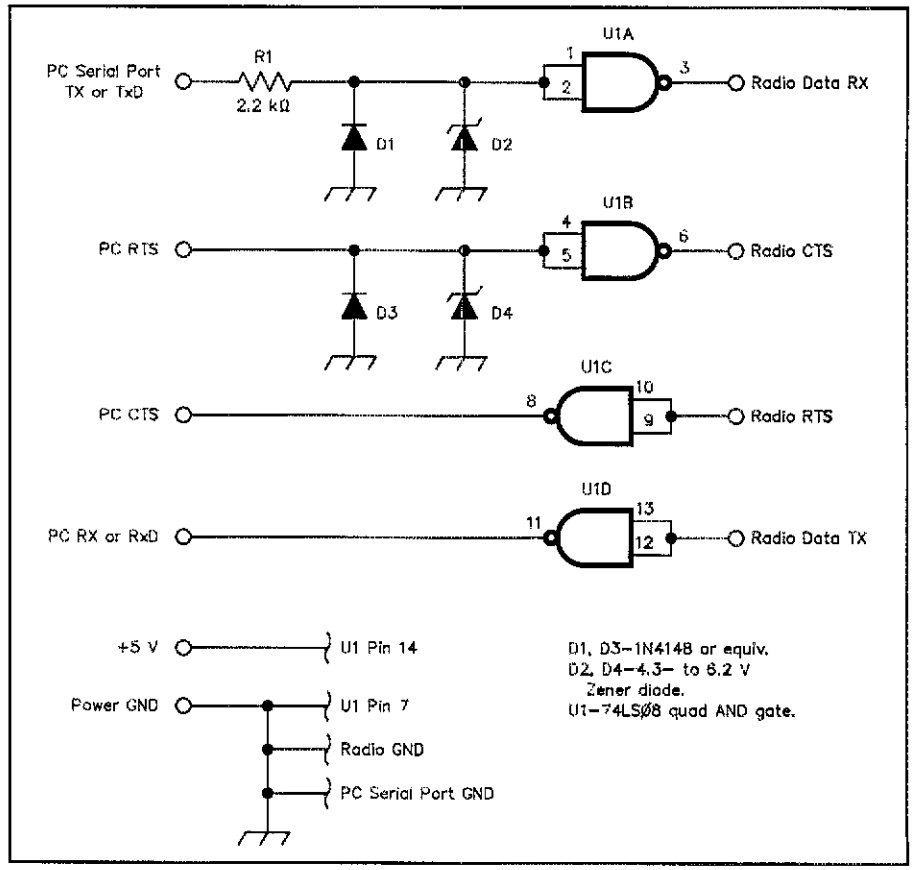


Fig 1—Mark Shelhamer uses this simple RS-232-C interface with a transceiver that requires only TTL-level (0 to +5-V) serial data for proper control. The *LS* in *74LS08* stands for low-power Schottky, a variant of the long-established 7400-series TTL family. 74LS parts are available from Mouser, Digi-Key and other suppliers.

CUTTING PRINTED CIRCUIT BOARD

◊ Comments in November 1991 H&K's "Making Boxes from PC Board" on using a sheet-metal or PC-board shear brought to mind my use of an office-type paper cutter for this purpose. The one I use has a blade about 2 feet long, and does a clean job on PC board and thin brass or aluminum. Caution: Glass-epoxy circuit board dulls a paper cutter blade quickly, making it almost useless for paper. A paper cutter once used for PC board would best be dedicated to PC-board use from then on.—*Roger Gibson, K4KLK, Raleigh, North Carolina*

ADDING UNSQUELCHED AUDIO OUTPUT TO THE ICOM IC-228A TRANSCEIVER

◊ I use my ICOM IC-228A 2-m rig for packet and voice applications. Opening a radio's squelch can take a few milliseconds, so for best network throughput, I operate my 228A with its squelch open. This "open-squelch" operation is annoying, though, when I'm monitoring channel activity by ear. I solved this problem by adding an unsquelched audio output line that does not compromise normal squelch operation.

I decided that the best way to add a line out of the IC-228A would be to use one pin of its eight-pin mike connector (Fig 2). (High-level audio is available at this connector [at pin 8] for driving a speaker or similar load, but adjusting the radio's AF gain control varies this line's level. I needed a *fixed*-level, unsquelched audio output line.)

All of the connector's pins are used, but one, pin 4 (**T.SQueLch BUSY**) carries a signal I haven't yet used for any of my applications. (If you haven't installed the IC-228's optional UF-40 tone squelch decoder, or you've installed one and have disabled it, you won't use this line at all.) So, I disconnected the wire connected to that pin and added the circuitry shown in Fig 3. It provides fixed-level, unsquelched audio

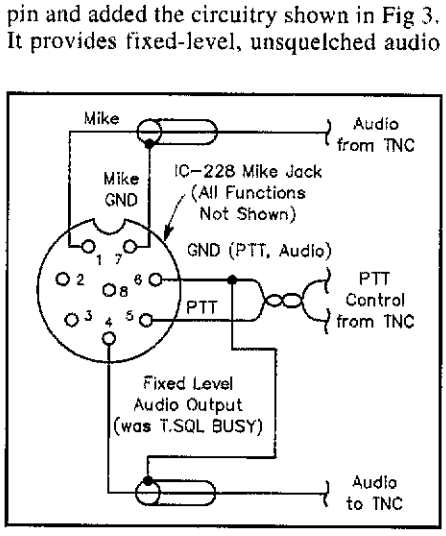


Fig 2—Scott McLellan modified his IC-228A's mike jack to provide unsquelched, fixed-level audio output at Pin 4. On a stock IC-228A, Pin 4 carries the **T.SQL BUSY** line.

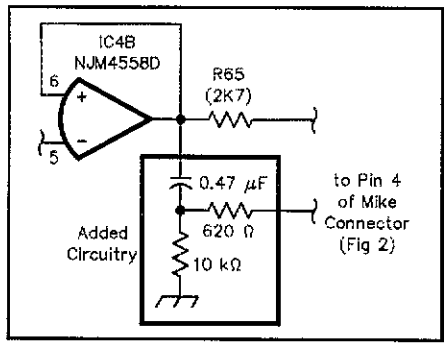


Fig 3—Three components and a wire couple the new audio line to the mike jack while adding low-end audio rolloff. See text.

output from the IC-228A's receiver.

The Fig 3 circuitry taps into the 228A's audio chain prior to the squelch switch and the audio level control. The added circuitry includes a single pole of audio filtering to provide a flat response above about 300 Hz when loaded with approximately 600 Ω, such as a TNC input. The actual load resistance is not particularly critical as long as it's not less than 100 Ω.—*Scott W. McLellan, ND3P, Kempton, Pennsylvania*

MINIMIZING TVI FROM THE YAESU FT-757GX TRANSCEIVER

◊ My FT-757GX generated TVI even when operating into a dummy antenna. Investigation revealed that harmonics were leaking out of the rig via its 12-V power cord. I solved this problem in three steps; a fourth may be necessary in stubborn cases.

Step 1: Isolate the 757's final-amplifier dc connections. Remove the radio's top cover (cavities in this casting contain the radio's final amplifier and output filters), and remove its internal aluminum cover. Two heavy-gauge, Teflon-insulated wires carry dc power from the radio's four-pin Jones plug (power connector) to the final-amplifier board. Unsolder these wires at the Jones plug and slip on as many ferrite and powdered-iron toroids and sleeves as possible. Small (T-37 and smaller) toroids and sleeves, just large enough to slide on, are best. Mix 12 powdered-iron and Mix 43 ferrite are best. Put as many on as room within the cavity allows (remember that the aluminum cover must clear the parts you add).

Step 2: While the dc wires are still disconnected, add bypass capacitors (0.01-µF, 25- or 50-V disc ceramics, between the dc lines and chassis) at the Jones plug. There's a circuit-board mounting screw close to the Jones plug; use this screw as a ground. Keep the capacitor leads as short as possible. Reconnect the dc wires to the Jones plug. Replace the aluminum cover and put the radio back together.

Step 3: Do a quick dummy-antenna TVI check. You should see a dramatic improvement. If the TVI is not completely eliminated, go to Step 4.

Step 4: Shield the power cable. Large (¾- to 1-inch-diameter) braid makes the job easy. Cut a piece of braid a bit longer than the cable. Flare one end and push it over the end of a broom handle. Push the entire braid over the broom handle, and push the braid together lengthwise to shorten its length and widen its diameter. Tape the open end of the power cable to the broom handle. Push the braid off the broom and onto the cable. Disconnect the broom, stretch the braid out to cover the length of the cable. Solder a short jumper or heavy wire to the transceiver end of the braid, and solder a banana plug to the jumper. This plugs into the adjacent ground lug. With the braid in place and grounded to the transceiver chassis, all traces of TVI should be gone.

A related note: The FT-757GX includes a rear-panel key jack, the common lead of which is *not* connected to chassis ground. RF feedback into the keyer wires can cause various problems, including the rig locking up in transmit mode and transmitting at full power regardless of its drive-control setting. Use shielded, twisted-pair cable between the FT-757GX and paddle, and ground it with a short wire between your key cable's plug and the 757's ground lug. Failure to do so can result in destruction of the keyer board, and switching circuitry on the Local board. Contact Yaesu for information on factory modifications that include chokes and bypass capacitors to keep RF from entering the rig. Unshielded keying wires do not seem to contribute to TVI.—*Mitchell Lee, KB6FPW, San Jose, California*

LAUNDRY-DETERGENT BOXES STORE *QST*

◊ An empty 9-lb, 13-oz All detergent box can hold 15 to 16 *QST* copies upright, saving room in the shack. (Boxes from other detergent brands might work well if they are wide enough to hold the magazine.) It also holds *The ARRL Handbook* and other ARRL technical publications nicely.

Start cutting horizontally about 4 to 5 inches deep up the spout side, diagonally across the front, then horizontally across the side about ¾ inch from the top, and then again diagonally down to meet the first cut. The result is a great "poor man's" magazine holder.—*Ted Steinhorst, KA2BIG/7, Murray, Utah*

KEEP YOUR *QST* BINDERS IN SHAPE II

◊ *WJ1Z*: Argh, an uncorrected version of Louis D'Antuono's *QST* storage hint found its way into print in November 1993 Hints and Kinks—we even misspelled his name! Here, with apologies, is WA2CBZ's hint as it should have appeared:

When a *QST* binder fills up at the end of the year, the magazines' weight may cause them to put the binder out of shape. A solution to this problem is to put a paperback book (about ½ inch thick) underneath the *QST*s (between the binder covers). This helps the binder keep its shape and look better on the shelf as well.—*Louis D'Antuono, WA2CBZ, Brooklyn, New York*

Technical Correspondence

Conducted By Paul Pagel, N1FB
Associate Technical Editor

LARGE ANTENNA COILS

◊ PVC dielectric loss generally exceeds copper (and aluminum) resistance loss at HF in inductors of the type described by Bob Johns.[1] From work carried out over the past decade using design concepts similar to those of Johns, I've concluded it is essential that the drilled-hole diameter be much smaller (eg, roughly one-half) than that of the conductor OD to minimize conductor-insulator contact, with resulting minimization of interturn capacitance and associated loss. Two of the techniques I've used are shown in Fig 1A.

While different coil geometries and conductor diameters yield slightly different results, the general conclusion appears to remain: Maximum Q for a given coil volume is achieved with minimum electric field in the PVC. This is realized by minimizing parallel circuit impedance and/or reducing PVC-conductor contact.

The significant advantages of the PVC mounting scheme are its structural rigidity for given cost and its ease of fabrication. Specifically, by extending the slitted PVC supports well beyond the coil ends, and using solvent-welded Ls and Ts to interconnect them, a rugged, microphony-resistant structure is realized. These "plumber's-delight"[2] structures are then readily mounted on larger-diameter PVC pipe or aluminum tubing as shown in Fig 1B. But care must be taken to avoid significant RF currents from flowing in the PVC, which, in transmit applications, can result in heating with consequent softening. —*F. N. Eddy, 366 Winter St, Weston, MA 02193*

Bob Johns replies:

I think the basic point (PVC losses can be reduced by using smaller holes in the rib and reduced metal-to-PVC contact) is good. I haven't verified or experimented with Mr Eddy's suggestions.

The construction method of Fig 2B seems appropriate for the larger, heavier coils Eddy made, but overkill for the lightweight aluminum-wire coils.—*Bob Johns, W3JIP, Urban Antennas, Inc, Box 662, Bryn Athyn, PA 19009*

[1]B. Johns, "Home-Brewing Large Antenna Coils," *QST*, Oct 1992, pp 45-49.

[2]With plastic pipe used extensively for plumbing these days, the term "plumber's delight construction," commonly used to refer to almost any sort of *all-metal* construction, takes on a new meaning.—*Ed.*

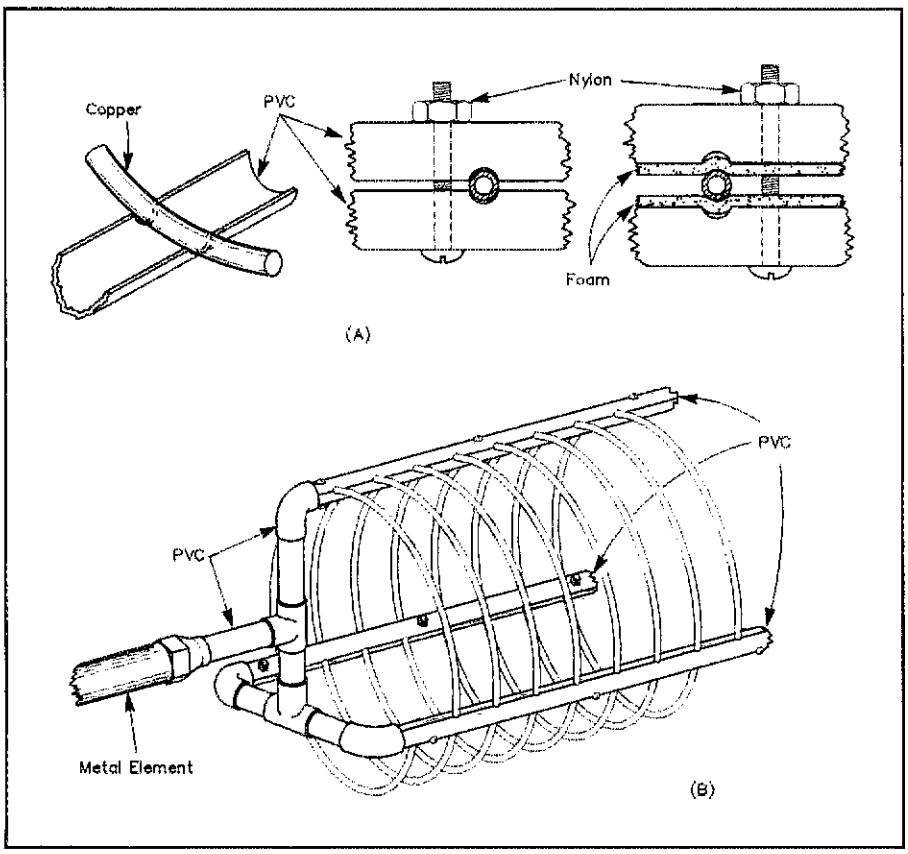


Fig 1—At A, two construction techniques for minimizing PVC dielectric loss when assembling large antenna coils. A smaller drilled-hole diameter results in decreased wire-to-PVC contact. At B, a "plumber's delight" mounting scheme for the antenna coils using PVC pipe, Ts and elbows.

MORE ON ELECTRICAL PROTECTION DEVICES

◊ I thought Michael Covington's *QST* piece[3] quite good, but he left out my favorite circuit-protection techniques. I use only simple diode protection when cost (or expediency) is the only criterion. Otherwise:

• Schottky diodes have half the drop of ordinary silicon diodes. For example, 0.55 V maximum for a 1N5818 versus 1.1 V maximum for a 1N4001 (both passing 1 A). Drawbacks? The Schottky diodes are slightly more expensive and their PIV ratings are limited to between 20 and 40 V.

• Germanium diodes have an even lower drop than Schottkys and are available with PIV ratings up to 200 V. The 1N270 (0.25 V at 100 mA) and 1N92 (0.5 V at 500 mA) are fairly common. To handle higher currents, use a PNP germanium power transistor (such as the ECG330 or ECG27). Tie the base to the collector to act as the diode cathode and use the emitter as the anode. You'll wind up with a 0.25-V drop, 5- to 15-A, 30-PIV power diode. (But there's a better way to use a transistor; I'll get to that.)

• Wire a bipolar transistor (an ECG153 for currents under 2 A; an ECG180 for currents up to 30 A) as shown in Fig 2. Choose the resistor so the transistor's base current is about 1/10 to 1/50 of the peak collector load current. If battery polarity is correct, the transistor turns on. A transistor's V_{CE} saturation voltage is much lower than a diode drop, so the input/output drop is very low: 0.25 to 2.5 V for silicon, 0.1 V for germanium. If the battery is connected backwards, the base-emitter junction is reverse-biased, the transistor is cut off and the output voltage is zero.

The maximum reverse base-emitter voltage for silicon transistors is only 6 to 7. If

[3]M. Covington, "Reverse-Polarity Protection for Your Gear," *QST*, Jul 1993, pp 40-41.

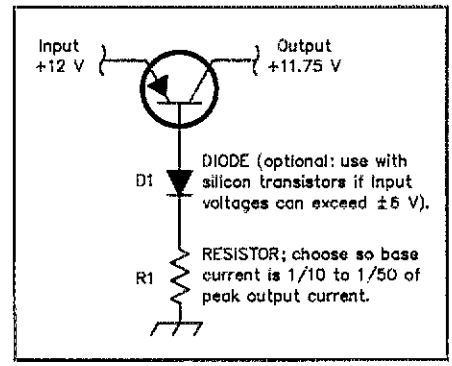


Fig 2—D1 is optional; use it with silicon transistor if the input voltage exceeds ±6 V. Choose R1 to provide a base current equal to a value of 1/10 to 1/50 of the peak output current.

you expect the peak reverse input voltage to exceed these ratings, add a blocking diode as shown. A germanium transistor's maximum reverse base-emitter voltage is 30 to 60 V.

The circuit of Fig 2 also current limits the output. If the output is shorted, the current limits at about 100 times the base current. The transistor will get hot, but if it has adequate heat-sinking, no damage will be done—no blown fuses, melted insulation, etc.

• LEDs work as diodes, too (that's what the D stands for). Although their reverse breakdown voltage is not usually specified, it's generally at least 10 to 20 V. The forward drop is high (1.2 to 2.5 V) and the current rating is low (100 mA maximum), but they provide a visual indication if things are working. I like using them for solar-cell blocking diodes and for battery chargers, so I can see the changing current.

• A bridge rectifier connected between the input and output not only protects against reversed polarity, but corrects for it, too. The ac terminals go to the input supply, and the + and – terminals are tied to the load. This only works if the equipment being powered has no independent grounds or connections to other equipment.

• Relays: Put a blocking diode in series with the relay coil, so it pulls in only when the voltage polarity is correct. The normally open contact then connects power to the load. Input/output voltage drop is negligible, and reverse input/output breakdown can be darn near infinite. This is the only way to go for high-current loads.

The load also won't connect unless the input voltage is high enough to fully energize the relay coil. This is useful if the load device could be damaged by attempted operation with too low an input voltage; for instance, mistakenly connecting a 12-V rig to a 6-V battery. The minimum voltage necessary to operate the relay contacts can be adjusted by adding power-rectifier diodes or Zener diodes in series with the coil.

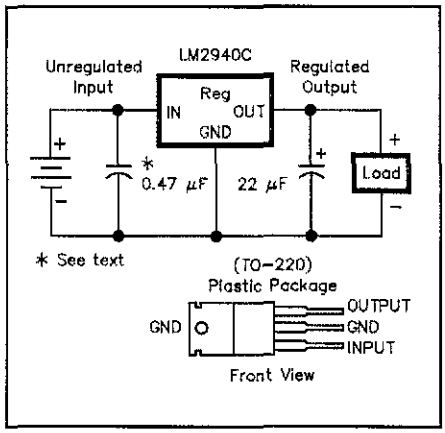


Fig 3—The capacitor at the regulator's input should be nonpolarized; a monolithic ceramic is a good choice. (This is also Fig 4 of the referenced July 1993 article; see Note 3.)

• Latching relays provide the ultimate in reverse-voltage protection. They exhibit infinite input/output impedance for reverse voltages, zero input/output voltage loss and zero current drain: 100% efficient.

• IC regulators look easy to use, but they are not particularly cheap or reliable when exposed to excessive voltages or reversed potentials. The regulators require bypass capacitors on their inputs and outputs to be stable. These capacitors must be nonpolarized. If the 0.47-µF capacitor in Fig 3 is the usual polarized tantalum or aluminum electrolytic, it will go out with a *bang!* if the input voltage polarity is reversed. So use a monolithic ceramic instead.

• A final note on reverse-polarity protection: Lots of equipment often has one or more high-capacitance electrolytic filter capacitors at its input. These capacitors look like a dead short at turn-on, and the surge current can easily destroy semiconductor devices. Power sources can deliver amazingly high voltage surges. Little ac power adapters (wall transformers) can deliver double or triple their rated voltages under no-load conditions, and the dreaded load dump in a car can exceed 200 volts.

The more compact the device, the more easily it can be damaged. ICs are the most susceptible, and MOSFETs aren't nearly as good as their proponents claim. Unless you are going to do extensive worst-case testing, employing "antique" technologies, or an "idiotically" overrated device is cheap insurance.—*Lee A. Hart, N8DUA, 323 West 19th St, Holland, MI 49423*

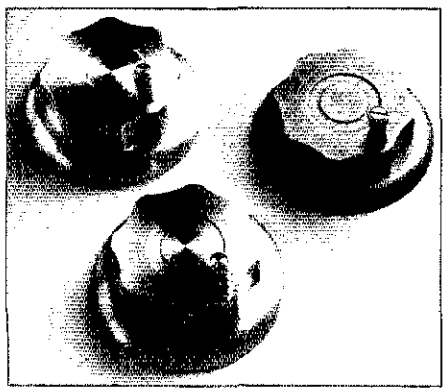
Note: All correspondence addressed to the Technical Correspondence column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you can be reached if necessary.

Keep the author(s) in the communications loop. Whether praising or criticizing a work, copy the author(s) on comments sent to Technical Correspondence. QST

New Products

JUPITER SUPERKNOB

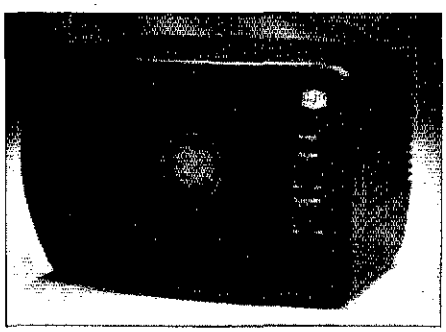
◊ Whether the knob on your Collins 75A-4 is cracked, broken or intact, the Jupiter Superknob will certainly pique your interest. Machined from solid brass or bronze, these replacement knobs are six times heavier than the fragile Collins stock knobs, they have serial numbers for collectability and add a smooth, flywheel feel to the 75A-4's tuning.



Price: $99 plus $5 shipping (30-day money-back guarantee) from Joel Thurtell, K8PSV, 11803 Priscilla, Plymouth, MI 48170; tel 313-453-8303.

BOOSTER SPEAKER

◊ Not satisfied with the your rig's puny audio output? Pump up the volume from your base, mobile or hand-held transceiver or scanner with a five-watt amplified speaker. You'll copy weak signals better and quiet stations will be easier to hear above the road or other background noise. The SA-1 uses a wide-range four-inch speaker in a ported-cavity enclosure, with controls for volume and equalization, and draws 600 mA at 12 V dc. The SA-1 comes with an audio-input cable, dc input power plug and hook-up sheet. Suggested price $89.95. Heil Sound Ltd, Heil Dr, Marissa, IL; tel 618-295-3000, fax 618-295-3030.



NEW CATALOG, ADDRESS

◊ Tejas RF Technology has moved and has a new eight-page catalog filled with interesting radio equipment in kit and assembled form, such as the Backpacker II low-power, single-band CW transceiver kit ($159.95, extra band kits $10 each); the deluxe 8044ABM Minikeyer (pc board, complete kit, mounting kit to install it inside the backpacker QRP rig); Mini Signal Strength Meter; Remote Inline RF Sensor; Bidirectional SWR/Wattmeter Sensor and Calibrator; Variable Peaking Bandpass CW Filter; Mini Dipole Single-Band Antenna, automatic Gel Cell Charger; Dick Smith's Fun Way Shortwave Receiver kit; Doubly Tuned Bandpass Filter PC board and more. The new addresses and telephone numbers are (mail) PO Box 720331, Houston, TX 77272-0331; (shipping) 10535 Rockley Rd, Suite 103, Houston, TX 77099; tel 713-879-9300, fax 713-879-9494. QST

Conducted By James D. Cain, K1TN
Senior Editor

ARRL Members Pick New Board Representatives

Three ARRL Divisions will each have a new pair of representatives beginning January 1, 1994, as the result of elections concluded November 19. New Directors and Vice Directors were chosen in the Dakota, Midwest and Pacific Divisions. This was election year for seven ARRL Divisions (the other eight Divisions are up for election in even-numbered years). Two years ago, in elections in these same Divisions, all seven Directors were returned to office (but four new Vice Directors were elected, including three who opposed incumbents). This year, the results were as follows (in alphabetical order):

In the Atlantic Division, Director Hugh Turnbull, W3ABC, and Vice Director Kay Craigie, WT3P, were unopposed. Two years ago, both turned back challengers.

In the Dakota Division, earlier in the year, Vice Director Rick Whiting, WØTN, became Director when incumbent Howard Mark, WØOZC, resigned because he moved out of the Division. Rick chose not to seek election to the office of Director, and former Director and former International Affairs Vice President Tod Olson, KØTO, ran unopposed. Meanwhile, Rick ran for a second term as Vice Director, but was defeated by challenger Hans Brakob, KØHB, 726 to 585 votes. Hans, 53, is a member of the ARRL Contest Advisory Committee.

In the Delta Division, Director Joel Harrison, WB5IGF, withstood a challenge from Jack Hill, W4PPT, 1618 to 1244. Hill told voters "You know what the incumbent has brought you for six years. Now it's time for us to move forward." Joel, who at age 35 is the youngest ARRL Director, reminded voters that he has served as chairman of the Administration and Finance Committee and is a member of the League's Executive Committee.

In the Great Lakes Division, Director Allan Severson, AB8P, and Vice Director George Race, WB8BGY, were unopposed.

Well-known contest operator and DXer Lew Gordon, K4VX, was victorious in the Midwest Division over incumbent Bill McGrannahan, KØORB, 1674 to 1609. Two years ago, Bill joined the Board family as Midwest Division Vice Director by beating incumbent Chuck Miller, WAØKUH, and last summer became Director following the death of Paul Grauer, WØFIR. Lew, who is 64, noted in his campaign statement that his wife, Terry, NSØZ, is an Extra Class licensee and daughter Sharon is licensed as NØHVY. (A bit of trivia: Lew will be the first ARRL Director to serve with a call sign issued in a call area that doesn't "match" his ARRL Division. Others have run, but Lew is the first to be elected under this seeming handicap.)

When McGrannahan assumed the Directorship of the Midwest Division, ARRL President George Wilson, W4OYI, named Larry Staples, WØAIB, to serve as Vice Director for the remainder of Bill's term. Larry ran this year to retain the post to which he had been appointed, but was defeated by Bruce Frahm, KØBJ, 1813 to 1387 votes. In a somewhat unusual turn, Staples and Frahm noted their ages in their campaign statements (Frahm is 41, Staples 62). Frahm told Midwest Division voters he has "been involved with the family farm all my life."

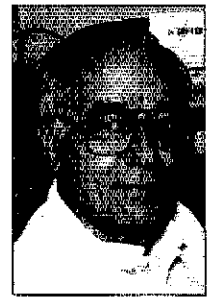
Two years ago, Charles McConnell, W6DPD, retained his seat as Pacific Division Director by defeating his opponent, Glenn Zumwalt, KJ6EN, by a 2:1 margin. This year, McConnell faced a challenge from his Vice Director, Brad Wyatt, K6WR, elected two years ago. Brad more than doubled Chuck's vote total, 2714 to 1354. Brad told voters he had taken early retirement from IBM and that his "experience and demonstrated willingness and ability to travel year-round to meet with you are *yours* when you vote 'K6WR.'"

With Brad's Vice Director slot up for grabs in the Pacific Division, a race developed between three long-time amateurs and ARRL Life Members. Former Vice Director Jettie Hill, W6RFF, sought the position again, running against Jim Maxwell, W6CF, and Jerry Boyd, KG6LF. All three cited extensive experience and qualifications in their campaign statements; Jim ran away with the election, with 2372 votes to 849 for Jettie and 844 for Jerry. Jim, a former ARRL Santa Clara Valley Section Manager, holds a PhD in aeronautical engineering/biomechanics.

In the Southeastern Division, long-time Director Frank Butler, W4RH, overcame opposition by three opponents: his vote total of 2807 was greater than that of the three other candidates combined. In his campaign statement, Frank cited his Executive Committee membership and his role in international (IARU) affairs. Running against Frank were Northern Florida Section Manager and former Section Emergency Coordinator Rudy Hubbard, WA4PUP; Alan Page, KE4WO, the only candidate to appear on ballots this year *without* a photo; and David Shiplett, AC4MU, who said "New Blood Needed...the incumbent has been a League official since 1957...How many years is that?" (Frank was a Florida Section Manager from 1957-1980, but an ARRL Director only since 1980). Southeastern

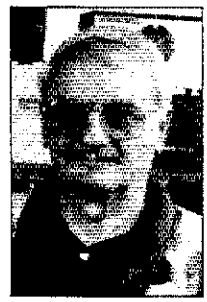
Dakota Division

Tod Olson, KØTO

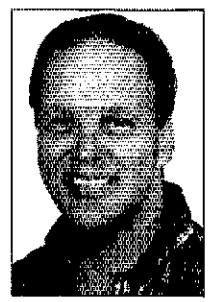


Hans Brakob, KØHB

Midwest Division

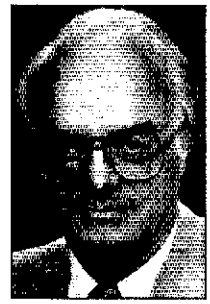


Lew Gordon, K4VX



Bruce Frahm, KØBJ

Pacific Division



Brad Wyatt, K6WR

Jim Maxwell, W6CF

Division voters also returned Vice Director Evelyn Gauzens, W4WYR, to office. Her opponent, "Mitch" Mitchell, WA4OSR, ran a strong campaign, however, earning 44% of the votes cast. Mitch introduced his campaign statement by saying, "I am excited about the opportunities and challenges facing ham radio and the ARRL. *I am not running because I am upset or mad at anyone or anything*" (his emphasis).

The terms of office for all new and incumbent Directors and Vice Directors are for two years, beginning at noon January 1, 1994.

Here are the official results for the contested offices:

Dakota Division

Vice Director:
Hans Brakob, KØHB, 726.
Rick Whiting, WØTN, 585.

Delta Division

Director:
Joel Harrison, WB5IGF, 1618.
Jack Hill, W4PPT, 1244.

Midwest Division

Director:
Lew Gordon, K4VX, 1674.
Bill McGrannahan, KØORB, 1609.

Vice Director:
Bruce Frahm, KØBJ, 1813.
Larry Staples, WØAIB, 1387.

Pacific Division

Director:
Brad Wyatt, K6WR, 2714.
Charles McConnell, W6DPD, 1354.

Vice Director:
Jim Maxwell, W6CF, 2372.
Jettie Hill, W6RFF, 849.
Jerry Boyd, KG6LF, 844.

Southeastern Division

Director:
Frank Butler, W4RH, 2807.
David Shiplett, AC4MU, 1837.
Rudy Hubbard, WA4PUP, 731.
Alan Page, KE4WO, 186.

Vice Director:
Evelyn Gauzens, W4WYR, 3094.
S. Felton Mitchell, WA4OSR, 2436.

222 MHz: Novices Get More; Weak-Signal Band Okayed

The FCC has acted to expand privileges for Novice class licensees on the 222-MHz band as well as to create a subband for "weak signal" work on that band. The changes approved by the FCC in a Report and Order released December 2, 1993, were first proposed in an FCC Notice of Proposed Rule Making in November 1992 (PR Docket 92-289) in response to petitions for rule making from the ARRL. The effective date for the new rules is February 1, 1994.

Expanded Novice Privileges

The new rules authorize Novice operation in the entire 222-225 MHz (1.25-meter) band. Novices currently have access to 222.10-223.91 MHz, an allocation created in the 1987 "Novice Enhancement" proceeding. At that time, the League sought full access for Novices to the (then) 220-225 MHz band. The FCC's 1987 Report and Order, however, limited Novices to 222.10-223.91 MHz.

In support of its latest proposal to the FCC, the League said expanding Novice frequency privileges to include the entire 1.25-meter band made sense since Novices already are permitted to use SSB and CW on portions of the HF bands, and there was no reason why they should not be permitted to use those same modes in the entirety of the 222-225 MHz band, where other licensees use those modes.

The FCC agreed with the ARRL that allowing Novices privileges on the entire 222 MHz band was a good idea, saying that the changes would allow Novices "to become proficient in a wider variety of amateur service operations" and give them "more flexibility in selecting the mode of transmission."

"Choosing the appropriate mode would result in a more efficient use of available spectrum," the FCC said.

But Not Control Operators

In PR Docket 92-289, the FCC also proposed that Novices be authorized to be licensees and control operators of repeaters on the 222 and 1240 MHz bands. The ARRL opposed this idea, as it had during the Novice Enhancement proceeding in 1987. The FCC in its final ruling agreed, saying Novices lack knowledge about repeater operation. The Commission also noted that allowing Novices to be control operators would diminish the distinction between the Novice and Technician Classes.

Experimentation Encouraged

The League also proposed that a "weak signal" segment be established at the bottom end of the 222 MHz band, at 222.0 to 222.15 MHz, similar to what previously existed at 220.0 to 220.5 MHz. Repeater and auxiliary operation are now prohibited from 222 to 222.15-MHz.

The League said its proposal was in response to loss in August 1991 of 220-222 MHz to the land mobile service and that a weak-signal subband, which could not be enforced through voluntary agreements or formalized band-planning by amateurs, was necessary to allow amateurs to carry on experiments in propagation and operating techniques.

Some repeater operators, nearly all in southern California, said that severe crowding in the 222-225 MHz band there would make a 150-kHz subband untenable. On the other hand, weak-signal operators said that the loss of 220-222 MHz most severely affected them, rather than repeater users, and that repeater owners and users in the 222-225 MHz band had been unwilling to accommodate other spectrum users.

The ARRL told the FCC that it "remains persuaded that the issue reflects not any one group of amateurs refusing to accommodate another, but rather of the difficulty of reaccommodating amateur users displaced from the 220-222 MHz segment."

The League noted that weak signal operators are entitled to pursue a variety of weak signal operations in some segment of the 222 MHz band, and such operations are incompatible with repeater and auxiliary link operations on the same frequencies.

The League said that while it has always

Delays Predicted in Club Call Sign Plan

An FCC proposal to use volunteer administrators in the issuance of call signs to clubs and military recreation stations, discussed on page 85 of November 1993 *QST*, is apparently in jeopardy. Last July, the FCC began accepting applications for "Club and Military Recreation Station Call Sign Administrators," after a change in Commission rules allowed it to use qualified volunteer organizations as administrators of the new program. Several groups applied, including the ARRL. Meanwhile, the FCC's Order, enabling the acceptance of applications and the program itself, was questioned in a petition for reconsideration filed by David Popkin, W2CC. Popkin argued that the Commission erred in not providing an opportunity for public comment before amending its rules. The issue now has been further complicated by the possibility that the FCC may soon be able to institute a "vanity call sign" program, where the Commission could charge a fee for the issuance of specific call signs–which could include clubs and military stations. ARRL General Counsel Chris Imlay, N3AKD, says that the club call sign program thus appears to be on indefinite hold.

supported local, voluntary band-planning as a means to accommodate the interests of diverse groups of amateurs, such simply could not work in this case, and that current FCC staffing does not permit it to referee amateur-to-amateur disputes. Thus, a statutory subband seemed the only solution.

FCC RELEASES DETAILS OF "INSTANT LICENSE" PLAN

On November 4, the FCC issued a Notice of Proposed Rule Making (NPRM, PR Docket 93-267) on its plan to grant temporary operating authority to unlicensed persons who pass the examination for a new amateur operator license. The temporary authorization would begin when the exam is passed and an application for a license is filed, and last until a full-term license is received from the FCC, with some restrictions (see December 1993 *QST*, page 92). The Commission said it believes this system would reduce the approximately 11,000 inquiries it receives each year from amateur license applicants about the status of their applications. The ARRL is on record as preferring to see Commission resources devoted to the implementation of electronic filing and other measures to minimize the turnaround time for the processing of applications. The comment deadline for this NPRM is January 10, 1994; reply comment deadline is February 10, 1994.

For the full text of this NPRM, send a self-addressed, stamped envelope (SASE) to the Regulatory Information Branch at ARRL Headquarters and ask for PR Docket 93-267. ARRL Members are encouraged to express their views on this proposal.

LICENSES WITHDRAWN IN PROBE OF VE EXAM IRREGULARITIES

The FCC has invalidated the licenses and license upgrades of 27 people after an investigation of irregularities at four Volunteer Examiner (VE) test sessions in southern California in June and August 1993. The sessions involved the ARRL and W5YI VECs, and a number of volunteer examiners have had their accreditations suspended as a result. The ARRL/VEC has suspended the accreditation of four volunteer examiners at the FCC's request, and that of three additional VEs involved in one of the test sessions, after finding irregularities in the records from one of the suspect test sessions. The FCC thanked the ARRL/VEC for its help in the investigation, and lauded VEs for their hard work and dedication.

John B. Johnston, chief of the FCC's Personal Radio Branch, said: "I'd like to commend the ARRL-VEC for working together with the W5YI-VEC to uncover irregularities at several recent sessions in the Los Angeles area and suspend the VEs involved. Your action will prevent future occurrences and assure that amateur

Behind the Diamond: W1AW Chief Op Jeff Bauer, WA1MBK

If Jeff Bauer comes to visit, keep him away from your tower. Before you know it, if it's up, the Human Gin Pole will take it down, and if it's on the ground he'll put it up.

At 42, an age when most of us at least start to think about cutting back on tower work, Jeff seems to have accelerated his need to climb. This month we present the third in what's becoming a series of visits with HQ staff "retreads"; Jeff Bauer was a W1AW evening shift operator in 1973-74, returning to HQ and W1AW in 1984, taking over as head honcho at W1AW a couple of years ago (two other licensed ops complete the W1AW contingent). Between tours of duty here, he was a sound engineer for local rock and roll bands and repaired consumer electronics equipment, for a while running his own small business.

Sometimes these Behind the Diamonds begin to sound like a broken record, but facts is facts: Jeff started with a crystal set as a boy, listening to local stations when he wasn't burning up electric train transformers or building cranes with his Erector Set. His long fascination with radio culminated in WN1MBK in 1969, when Jeff was a senior at Farmington High School (he also graduated from Ward Technical College in Hartford with a major in communications technology).

Jeff says that ARRL Washington Area Coordinator Perry Williams, W1UED, was his "Outdoorsman" at Boy Scout camp. "For three summers Perry tried to get me to learn Morse code for my First Class badge. For some reason I just couldn't do it," Jeff admits. But later, as a Novice ham, Jeff got his 20-WPM sticker from W1AW. Go figure.

The first Jeff Bauer aerial was a barbed wire fence, which he tapped into for his crystal set (and you thought there wasn't any farmland in Connecticut). Not counting the prefix switch from WN to WA, Jeff has always had the same call sign, a rarity for our generation (some of us being barely able to remember the *last* call sign we had). Back in 1990, when W1AW was being completely redesigned, Jeff worked full time on the project for six months, implementing many of his own ideas for improvements. Today his work–including the installation of more than a mile of Heliax cable–is evident all over the new W1AW. Check it out when you come to visit.

As Chief Operator, Jeff handles the administration of the station; if ARRL Headquarters is Mecca for visiting hams, W1AW is its shrine. Every year, several thousand visitors tour the station and many operate from one of three visitor operating consoles. W1AW is on the air more than 3500 hours a year, transmitting code practice and bulletins, and taking part in occasional special projects.

As for two-way contacts, Jeff says his staff answers more than 5000 QSL cards a year. At home, Jeff is on the local *PacketCluster*, TCP/IP and dabbles in HF DXing, contests and QRP. Like most of us who live in the country around here, he spends a lot of time "rearranging rocks" (which in these parts, have a way of growing right up out of the ground, explaining why Connecticut Yankees in the 18th century gave up farming and turned to manufacturing). Jeff's also interested in computers, likes to hike and plays several musical instruments. When he's not high on a tower, of course.

—James D. Cain, K1TN

W1AW Chief Operator Jeff Bauer, WA1MBK, "The Human Gin Pole." *(K1TN photo)*

FCC-ISSUED CALL SIGN UPDATE

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

District	Group "A" Extra Class	Group "B" Advanced	Group "C" Tech/Gen	Group "D" Novice
0	AAØPJ	KGØJP	NØZFP	KBØLMN
1	AA1HU	KD1SC	N1QOL	KB1BEI
2	AA2QI	KF2SM	N2XAA	KB2QPY
3	AA3GK	KE3KS	N3QVP	KB3AZG
4	AD4MR	KR4HF	++	KE4HJE
5	AB5QJ	KJ5SC	++	KC5DZT
6	AB6YI	KN6US	++	KE6DDA
7	AA7ZR	KI7TD	++	KB7ZJM
8	AA8NC	KG8EZ	++	KB8QHH
9	AA9JF	KF9SE	N9VKZ	KB9IVZ
Hawaii	++	AH6NE	WH6QJ	WH6CQZ
Alaska	++	AL7PJ	WL7NY	WL7CHI
Virgin Is	WP2C	KP2CC	NP2GT	WP2AHU
Puerto Rico	++	KP4VW	++	WP4MLM

++All call signs in this group have been issued in this area.

licenses are granted only to those who are truly qualified. You've sent a strong signal that the ARRL-VEC is vigilant in its oversight to keep the volunteer testing system at the highest level of integrity."

"I know," Johnston said, "it takes time and effort to scrutinize test materials and contact applicants and VEs concerning a suspect session, but it's occasionally necessary for the good of amateur radio. The volunteer testing system is a great success. Your oversight validates and supports the hard work of the many dedicated VEs who participate in testing–and the hams who passed their tests and are now making the contributions to society for which Amateur Radio is so justly renowned."

REPEATER TRUSTEE FINED; AWAITS OUTCOME OF APPEAL

The FCC has issued a Notice of Apparent Liability (NAL) to William Krause, WA2HDE, the trustee of a 222-MHz repeater in New York City. The repeater was found to be transmitting for several days in August on 243 MHz, a Federal Aviation Administration (FAA) frequency used for emergency locator transmitters.

The FCC's NAL called the violation "willful and repeated." Krause, an engineer, said that the repeater, a 10-year-old commercial unit, developed a malfunction that caused it to emit a weak signal on 243 MHz when its transmitter was unkeyed. He said the repeater was checked out on a regular basis.

The FCC said that the violation was "minimally occurring" on three days, August 30-September 1, and that the FAA had said the "unauthorized signal" had also occurred on August 26-29.

In late October, Krause responded to the NAL, saying "I at no time willfully transmitted on any frequency I am not authorized for. I was shocked to hear that there was any problem at all, much less one of such a nature."

Krause told the FCC, "I have always made measurements of the transmitter in the transmitting mode and would never have found this problem unless pointed out" (the spurious signals were present only when the repeater was in *receive* mode–*Ed*).

Krause pointed out that this was his first offense and asked the FCC not to impose the fine.

SECTION ELECTION RESULTS

Ballots were counted November 23 in ARRL Section Manager elections for Alabama, Delaware, Kansas, Tennessee and Western Massachusetts. Terms of office begin January 1, 1994. The results are as follows:

Alabama:

Ken McGlaughn, KM4JD, 428 (elected)
Joe Smith, WA4RNP, 228

Delaware:

Randall Carlson, WBØJJX, 172 (elected)
Carl Dennis, NX3A, 64

Kansas:

John Seals, WRØR, 358
Robert Summers, KØBXF, 386 (elected)

Tennessee:

O. D. Keaton, WA4GLS, 696 (elected)
Dana Stine WI3B, 382

Western Massachusetts:

Dan Senie, N1JEB, 196 (elected)
Bill Voedisch, W1UD, 181

Four Sections were not contested and the following were declared elected:

East Bay:
Bob Vallio, W6RGG

Michigan:
Dale Williams, WA8EFK

New Mexico:
Joe Knight, W5PDY

Santa Barbara:
Marc Holzer, N6UNX

SECTION ELECTION NOTICE

To all ARRL Members in Illinois, Indiana, Maine, Northern Florida, Oregon, Santa Clara Valley, Vermont and Wisconsin Sections: You're hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 8 of this issue. A petition, to be valid, must contain the signatures of five or more ARRL Full Members residing in the Section concerned. Photocopied signatures aren't acceptable. No petition is valid without at least five signatures on that petition. It's advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters, but aren't 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 SM must be a resident of the Section, a licensed amateur of Technician class or higher and a Full Member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination. Petitions must be received at Headquarters on or before 4 PM Eastern Time March 4, 1994. Whenever more than one Member is nominated in a single Section, ballots will be mailed to Full Members of record as of the nominations closing date (March 4, 1994) from Headquarters on or before April 1, 1994. Returns will be counted May 24, 1994. SMs elected as a result of the above procedure will take office July 1, 1994. If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning July 1, 1994. If no petitions are received for a Section by the specified closing date, such Section will be resolicited in the July 1994 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager office between elections are filled by the Field Services Manager. You are urged to take the initiative and file a nomination petition immediately.–*Richard Palm, K1CE, Field Services Manager*

REPEAT NOMINATING SOLICITATION

Because no petitions were received for the Alaska SM election by the deadline of September 10, 1993, nominating petitions are herewith resolicited. See the above for details on how to nominate. QST

Moved & Seconded

MINUTES OF THE EXECUTIVE COMMITTEE
Number 444
Memphis, Tennessee
October 30, 1993

Agenda

1) Approval of minutes of May 8, 1993, meeting
2) FCC matters
3) Legislative matters
4) Antenna and RF interference cases
5) Other legal matters
6) International matters
7) Organizational matters
8) Recognition of new Life Members
9) Affiliation of clubs
10) Approval of conventions
11) Other business

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at 8:30 AM Eastern Daylight Time, Saturday, October 30, 1993, at the Memphis Marriott Hotel, Memphis, Tennessee. Present were President George S. Wilson, III, W4OYI, in the Chair; First Vice President Rod Stafford, KB6ZV; Executive Vice President David Sumner, K1ZZ; and Directors Frank M. Butler, Jr., W4RH, Joel Harrison, WB5IGF, Stephen A. Mendelsohn, WA2DHF, and Marshall Quiat, AG0X. Also present were Directors John C. Kanode, N4MM, Edmond A. Metzger, W9PRN, Allan L. Severson, AB8P, and Hugh A. Turnbull, W3ABC; International Affairs Vice President Larry E. Price, W4RA; General Counsel Christopher D. Imlay, N3AKD; and Chief Financial Officer Barry J. Shelley.

Mr. Sumner presented pins and certificates to Mr. Kanode and Mr. Price in recognition of more than 40 years of ARRL membership, and to Mr. Wilson for more than 25 years of ARRL membership (applause).

1) On motion of Mr. Mendelsohn, the minutes of the May 8, 1993, meeting of the Executive Committee were approved as printed in July 1993 *QST*.

2) FCC matters

2.1) Mr. Imlay reported on the status of ET Docket 93-59, a Notice of Proposed Rule Making to allocate 449 MHz for non-government wind profiler radar systems and Notice of Inquiry seeking comment as to whether such systems should be accommodated at 915 MHz. The ARRL has filed comments and reply comments, questioning the need for non-government wind profilers and challenging the process by which 449 MHz was selected. The public record shows an absence of support for non-government wind profilers, particularly at 449 MHz. The ARRL continues to seek recognition of ongoing amateur requirements in any implementation of wind profiler radar systems.

2.2) Mr. Imlay reported on the status of ET Docket 93-40, the FCC proposal to allocate the 219-220 MHz band for limited amateur operations on a secondary basis, made in response to an ARRL petition. According to the FCC unified agenda, action on this proposal is expected around March 1994. Mr. Wilson asked whether the Executive Committee would support an effort to plan a high-speed, nationwide digital communications network that would use this band where it is available, and other connections where it is not (eg, in the area of the Mississippi River and its tributaries). If so, planning would have to begin immediately. After discussion it was agreed that a mechanism for such planning would be considered later in the meeting.

2.3) Mr. Imlay noted that the FCC proposal in PR Docket 93-61 to expand Automatic Vehicle Monitoring (AVM) systems into a new Location and Monitoring Service (LMS) had encountered opposition from a number of other sources in addition to the ARRL. The League had managed to thwart an effort by AVM proponents to get language favorable to their cause adopted by Congress. An ARRL petition seeking a primary allocation for the Amateur Service in a portion of the 902-MHz band is in preparation for filing, as previously authorized by the Board.

2.4) The ARRL participated in the FCC Notice of Inquiry proceeding, ET Docket 93-198, to help develop U.S. proposals for the 1993 World Radiocommunication Conference (WRC-93). ARRL Technical Relations Manager Paul Rinaldo, W4RI, has been named a member of the U.S. WRC-93 delegation. Mr. Price also will be attending WRC-93, on behalf of the International Amateur Radio Union.

2.5) There has been no further action in PR Docket 93-85, a Notice of Proposed Rule Making concerning control operator responsibility, since the August 1 deadline for reply comments.

2.6) Similarly, there has been no FCC action with regard to petitions concerning automatic control on HF, RM-8218 and RM-8280. Existing Special Temporary Authority for a limited network of HF digital stations to operate under automatic control will remain in effect until RM-8218 is dealt with by the Commission.

2.7) At Minute 50 of its July Meeting, the Board directed the filing of a petition to FCC seeking relief from regulatory restrictions on the use of digital codes. As a first step, ARRL and FCC staff have discussed regularizing certain codes that are now in common use by documenting their characteristics and referencing them in the regulations. A petition is to be a second step, building on the first, toward a more wide-ranging relaxation of Sections 97.307(f) and 97.309(a) of the Rules.

2.8) It has been reported that the FCC plans to grant a petition for reconsideration of its Order implementing the provisions of Public Law 102-538, which authorized the Commission to use qualified volunteer organizations for the purpose of providing club and military recreation station call signs. The reconsideration petition, filed by David Popkin, W2CC, claimed that the Commission erred in not providing an opportunity for public comment before amending its rules. If this occurs, there will be an indeterminate delay before this program can be implemented. More information should be available shortly.

2.9) In connection with the resumption of issuance of club station call signs, the League has been seeking a more meaningful definition of "club" so as to reduce the number of frivolous applications that might otherwise be filed. After discussion, it was agreed that further pursuit of this objective should await clarification of where the club call sign issue is heading.

2.10) Mr. Imlay reported on the status of a petition, RM-8165, filed by Cornell University, which seeks the creation of a "quiet zone" around the Arecibo radioastronomy facility in Puerto Rico. After discussion, it was agreed that no further action by the League is required at this time.

2.11) On motion of Mr. Harrison, the General Counsel was authorized to file comments in ET Docket 93-62, a Notice of Proposed Rule Making to implement guidelines for evaluating the environmental effects of RF energy, along the lines proposed in his report. The comments will (1) question the legitimacy of an NPRM which does not, in fact, include specific text of proposed rules; (2) point out that the guidelines on which comments are sought are not available to the public, except upon payment of an exorbitant fee to a private entity; (3) give specific examples to show that the new guidelines are arbitrary; (4) support the League's policy of prudent avoidance of prolonged exposure to unnecessarily high levels of RF energy; (5) argue for categorical exemption of amateur stations; and (6) demonstrate that while the subject is deserving of serious attention, the public interest is ill served by the adoption, on the basis of mere suspicion, of measures that could have drastic economic consequences.

2.12) The Commission's proposal for the temporary licensing of foreign radio amateurs on the basis of an examination of their qualifications by Volunteer Examiners, PR Docket 92-167, is still pending but is expected to be dismissed without action.

2.13) Mr. Price reported briefly on more promising efforts than Docket 92-167 to streamline operating for amateurs visiting other countries, the "International Amateur Radio Permit." An initiative drafted for the IARU by ARRL staff is working its way through CITEL, the organization of telecommunications administrations in the western hemisphere: once adopted by CITEL it could be placed on the agenda of a future World Radiocommunication Conference. The Executive Committee expressed its appreciation for the support of this initiative that has been provided by the United States, on the basis of the IARU-submitted paper. On the other hand, there has been no recent progress toward the United States' joining the CEPT common license arrangements in Europe.

2.14) A petition has been submitted to the FCC by the General Motors Research Corporation, seeking access to 76-77 GHz (a band where the Amateur and Amateur-Satellite Services are secondary to Radiolocation) for a low-power vehicular radar to operate under Part 15 of the FCC Rules. In the petition, the extent of advance coordination with the ARRL was overstated. Should the Commission issue a Notice of Proposed Rule Making in this matter, there will be an opportunity for public comment on the technical compatibility issues.

2.15) The FCC has adopted, but not yet released, a Notice of Proposed Rule Making (PR Docket 93-267) based on a petition (RM-8288) by the Western Carolina Amateur Radio Society/VEC to create an "instant licensing" system. Under the proposal, temporary operating authority for up to 120 days would be granted to most applicants for new amateur licenses. Because the NPRM has not been released, it is not known how the Commission proposes to minimize the obvious opportunities for abuse of such a system. The League is on record as preferring to see Commission resources devoted to the implementation of electronic filing and other measures to minimize the turnaround time for the processing of applications.

2.16) No further FCC action has been taken on RM-8301, a petition submitted in the name of the National Conference of VECs to require that a single individual be named as "contact VE" for each examination session. The ARRL's comments opposing the concept were submitted on August 30.

2.17) The High Altitude Auroral Research Program (HAARP) is an Air Force project involving very high transmitter powers in the frequency range 2-10 MHz. While the amateur bands reportedly are on the list of frequencies to be protected from interference, because of the high powers involved there appears to be a basis for concern about its possible effects. The League will continue to monitor developments, and to ensure that the legitimate concerns of the Amateur Radio community are heard appropriately.

2.18) Mr. Imlay reviewed alternative strategies identified in the course of his study of how best to pursue an expansion and clarification of the PRB-1 limited preemption order. On motion of Mr. Butler, the President was requested to appoint a committee to examine the issue, and to develop a recommendation for consideration by the Board or the Executive Committee. Mr. Wilson appointed Messrs. Stafford and Quiat to work with General Counsel Imlay on the issue.

2.19) Mr. Imlay reported that a petition seeking a lifetime operator's license for radio amateurs is in preparation for early filing, as directed by the Board at Minute 73 of the July Meeting.

2.20) In ET Docket 93-235, the FCC has proposed to provide additional frequencies for the operation of cordless telephones between 43 and 50 MHz. The deadline for comments is November 8. On motion of Mr. Mendelsohn, the General Counsel was authorized to file comments expressing concern about the interference susceptibility of such devices.

2.21) Mr. Imlay noted our continuing frustration with the apparent lack of effective follow-through by the FCC on enforcement cases referred to the Commission for action by the Amateur Auxiliary. The morale of the active volunteers is suffering as a result. He will meet with FCC staff in an effort to convey the depth of our concern, and the necessity for corrective action.

2.22) The ARRL has received an FCC request for financial details of our VEC program. A response is due by January 31, 1994, but audited statements will not be ready by that time and it may be necessary to request an extension. Mr. Sumner confirmed that the cost of administration of the ARRL VEC program significantly exceeds the amount of examination fees collected, and would still exceed the fees collected even if fees were charged for examination Elements 1(A) and 2.

2.23) The ARRL filed in response to an FCC public notice seeking comments on a request from Hughes Network Systems for a declaratory ruling in support of small satellite antennas in commercial and industrial zones. Noting that this was another

example of abusive zoning practices of the kind to which amateurs are frequently subject, we used the opportunity to call the Commission's attention to the need for an administrative review process to address such abuses.

2.24) Earlier in the month, Mr. Sumner had circulated to the Executive Committee and to affected Directors a proposal to request that the FCC alleviate the shortage, in Puerto Rico, Alaska, and Hawaii, of call signs in the more desirable formats. On motion of Mr. Butler, the General Counsel was instructed to write to the FCC requesting that the public notice that defines the call sign assignment system be amended accordingly.

The Executive Committee was in recess for lunch from 11:50 AM until 1:12 PM, reconvening with all present.

3) A written report on legislative affairs, prepared by Washington Area Coordinator Perry Williams, W1UED, was next to be taken up. Mr. Williams reported that as of October 22, there were 106 House cosponsors of the Amateur Radio Service Joint Resolution, H.J. Res. 199, and 17 co-sponsors of the Senate version, S.J. Res. 90. There are 18 cosponsors of the Amateur Radio Volunteer Service Act, H.R. 2623.

4) Mr. Imlay reported on the status of litigation over several amateur antenna installations, or proposed installations. He noted that amateurs did not always understand or appreciate the extent of the assistance being provided by the League when it files a Brief Amicus Curiae in such a case.

5) The General Counsel reported briefly on the status of other legal matters involving the League.

6) International matters

6.1) Mr. Stafford reported on his consultation with the IARU Administrative Council, at its September 26-27 meeting in Brussels, concerning nominations for IARU President and Vice President for the 1994-1999 term. The nominations of Richard L. Baldwin, W1RU, as President, and Michael J. Owen, VK3KI, as Vice President, are being submitted to the IARU member-societies for ratification.

6.2) Mr. Price reported on his attendance, and that of Mr. Butler who is a member of the IARU Region 2 Executive Committee, at an August meeting of that body in Guayaquil, Ecuador. He also reported on his attendance as IARU Secretary at the IARU Region 1 Conference in De Haan, Belgium, in September. An ARRL delegation consisting of Messrs. Stafford, Sumner, and Rinaldo also attended the six-day Region 1 meeting, which has been reported on in November *QST*.

6.3) Mr. Price also reported on a five-week series of ITU meetings now underway in Geneva. Mr. Rinaldo is attending the meetings as a member of the U.S. delegations. IARU representation is being handled by several people, including Mr. Butler (who had just returned from Geneva) and Mr. Price (who will spend two weeks there, in November). The first World Telecommunication Development Conference will be held in Buenos Aires in March 1994; Mr. Price will head the IARU team.

6.4) On motion of Mr. Butler, the Secretary was directed to cast affirmative votes on behalf of the ARRL on the admission to the IARU of the Association of Radio Amateurs of Bosnia and Herzegovina, and the Qatar Amateur Radio Society.

7) Organizational matters

7.1) A report by Mr. Shelley on policies with regard to the management and financial oversight of ARRL-sanctioned conventions was considered. After discussion, it was agreed that the report would be referred to the January Meeting of the Board for further consideration.

7.2) Mr. Metzger, as its chairman, reported on behalf of the Election Committee. The three committee members will serve as the Tellers for the counting of ballots for Director and Vice Director on November 19. As soon as the results are certified, they will be communicated to the President who in turn will notify the candidates. A question concerning the counting of words in candidates' statements appears to have been answered satisfactorily.

7.3) Mr. Kanode, as its chairman, reported briefly for the Membership Services Committee, which will meet November 13 in Denver. The Volunteer Resources Committee will also meet at the same place and time.

7.4) Mr. Sumner reported that approximately 7300 ARRL members so far have contributed $189,000 to the special fund drive for the Phase 3D satellite that was authorized by the Executive Committee.

7.5) New England Division Director Bill Burden, WB1BRE, had requested that consideration be given to the adoption of a policy regarding messages sent to Headquarters via Amateur Radio that order commercial products. On motion of Mr. Harrison, it was voted that the ARRL will not sell commercial products ordered by Amateur Radio.

7.6) Mr. Sumner reported that the revision of the Directors' Workbook ordered at Minute 45 of the July 1992 Board Meeting is still underway. There were no questions regarding the status of other pending action items arising from previous Board and Executive Committee meetings.

8) On motion of Mr. Harrison, the names of 60 newly elected Life Members were recognized, and the Executive Vice President was instructed to list their names in *QST*.

9) On motion of Mr. Butler, the following clubs were declared affiliated:

CATEGORY 1
Boundary Waters Amateur Radio Club, Grand Marais, MN
Denver Radio League, Denver, CO.
Elk County Amateur Radio Association, St. Marys, PA
Snowbelt Amateur Group, Arcade, NY
South Central Radio Club, Anchorage, AK
Washington/Holmes Amateur Radio Club, Chipley, FL

CATEGORY 2
North East Weak Signal Group, Bristol, CT
Oklahoma DX Association, Claremore, OK

CATEGORY 3
New Lisbon Developmental Center Amateur Radio Club, Manahawkin, NJ
U.S. Naval Academy Amateur Radio Club, Annapolis, MD

Clubs affiliated by mail vote since the May 8, 1993, meeting:

CATEGORY 1
Amateur Radio Fellowship, Kent, OH
Castle Amateur Radio Club, Merced, CA
County Line ARA of Northwest New Jersey, Hackettstown, NJ
Dallas/Fort Worth Amateur Radio Club, Coppel, TX
Delaware Repeater Association, Rockland, DE
Five County Amateur Radio Club, Fonda, NY
Geers Ferry Amateur Radio Club, Quitman, AR
General Motors Amateur Radio Club, Warren, MI
Kern River Valley Amateur Radio Club, Lake Isabella, CA
Omar H Mung Amateur Radio Society, Cuyahoga Falls, OH
Peconic Amateur Radio Club, Peconic, NY
Willits Amateur Radio Society, Willits, CA
Wyoming DX Contest Club, Cheyenne, WY

CATEGORY 2
International Police Association Radio Club, Sanbornville, NH

CATEGORY 3
Boles Junior High School Amateur Radio Club, Arlington, TX
California State University—Sacramento Student Amateur Radio Club, Sacramento, CA
Carleton College Amateur Radio Club, Northfield, MN
Kings Park Schools Amateur Radio Club, Kings Park, NY
Sachem High School Amateur Radio Club, Farmingville, NY
Woonsocket High School Amateur Radio Club, Woonsocket, RI

ARRL now has the following number of active affiliated clubs: Category 1, 1724; Category 2, 19; Category 3, 191; Category 4, 7; total, 1941.

10) On motion of Mr. Harrison, the holding of the following ARRL conventions was approved:
International DX, April 15-17, 1994, Visalia, CA
Alabama State, May 15-16, 1994, Birmingham, AL
Atlantic Division/New York State, May 20-22, 1994, Rochester, NY
Northwestern Division, June 3-5, 1994, Seaside, OR
Montana State, July 15-17, 1994, East Glacier, MT
New Mexico State, August 20, 1994, Albuquerque, NM
Roanoke Division, September 17-18, 1994, Virginia Beach, VA
Indiana State, November 19-20, 1994, Ft. Wayne, IN

Conventions approved by mail vote since the May 8, 1993, meeting:
Eastern New York Section, August 8, 1993, White Plains, NY
Michigan State, August 29, 1993, Owosso, MI
W9 DXCC Convention, September 11,1993, Glen Ellyn, IL
Eastern Washington Section, September 17-19, 1993, Milton-Freewater, OR
Kansas State September, 25-26, 1993, Wichita, KS

11) Other business

11.1) On motion of Mr. Mendelsohn, the proposal of the TwinsLAN Packet Radio Club to host the 1994 ARRL Digital Conference, in the autumn of that year in the vicinity of Minneapolis-St. Paul was accepted.

11.2) A request for the back-dating of the renewal of an expired membership had been received; however, the Committee noted it had no authority under the Bylaws to grant such a request.

11.3) Mr. Butler moved to grant an additional $250 to the Northern Florida Section for expenses incurred during 1993, but there was no second.

Returning to agenda item 2.2, on motion of Mr. Mendelsohn the following resolution was adopted:

Whereas, the FCC, in response to an ARRL request, has proposed to allocate the 219-220 MHz band for certain amateur operations on a secondary basis, and

Whereas, nothing in the record of this proceeding provides a basis for the FCC to withdraw or to significantly modify its proposal, and

Whereas, the FCC unified agenda schedules action on this pending issue around March 1994, and

Whereas, it is in the best interests of the Amateur Service for amateur operations to be introduced into this band in an orderly and efficient manner that will maximize the usefulness of the band, within the limitations to which it is subject, and

Whereas, radio amateurs have requirements for digital communications links that have not been satisfied since the loss of the 220-222 MHz band, it is

RESOLVED that the president is instructed to appoint an ad hoc committee to develop and recommend a plan for the implementation of the 219-220 MHz allocation. In appointing this committee, he is requested to use the services of members of the Spectrum Committee, augmented as necessary. The committee is requested to provide an interim report to the January Board Meeting, and a final report to the first meeting of the Executive Committee in 1994.

There followed, without formal action, a discussion of the format of candidates' statements in Director and Vice Director elections.

There being no further business, the meeting was adjourned at 5:16 PM.

Respectfully submitted,

David Sumner, K1ZZ
Secretary

Life Members Elected October 30, 1993

Cynthia S. Antonelli, KA9VKL; Nick Antonello, WB9QML; Jeanine L. Ashwell, N0XKL; Kenneth R. Barnes, N8COQ; Bindy Boylin, KB6UJR; Philip A. Buras Jr, WD5DWP; John Burmingham, WB8PUF; Thomas C. Chang, N1MXW; John Colacci, AB2Z; David C. Crocker, W1TMD; Angelia Y. Cuccio, KD4WSP; William D. Cutlip II, WB8AVQ; Brad L. Dassonville, AA7YG; Brends S. Diamond Rose, KB3ATI; Hugh F. Dowell Jr, W9WNH; Robert L. Emory, KD1CT; Dagmar Fisher, KB7BZY; Richard J. Furlong III, N5RST; Edward T. J. Graboski, AJ3N; Mark J. Harl, KA2MTX; Bill Harlow, K5RPX; Charles S. Hartley, KM3V; Scott W. Herres, N7JQQ; James M. Hill, N4MOC; Dominic A. Isabella, WW3J; Andrew O. Isar, NN7L; William H. Jolly, N0RTI; Gary Kliczinski, KB8FV; David J. Klippel, N2MHI; Shirley M. Klippel, N2PHP; Lois O. Knight, KC5CXO; Elizabeth A LeMond, KB9ICL; Marcus C. Leatham, KR5N; Timothy C. Mathews, AB5OA; Mark McCasland, KB5LJQ; Eugene McGlaughn, KC4TFF; Scott Mickelbank, N1IOK; John Mielnik, N9LVD; Robert Morrow, WB6GTM; Erin J. Murphy, KB5ZKE; Loren C. Nichols, AA7MT; Walter F. Ordway, K1DFO; Thomas D. Owen, WA2OOS; Andrew A. Parker, WV1B; Wilburn E. Petree, KG5BG; David L. Purltov Jr, WD4PDZ; Henry T. Rand Jr, AA2U; Brandin Rockwealth; Robert L. Rose, KA2JUQ; Robert Rowen, N5XUS; Margaret A. B. Shaw, KE4CXI; J. Scott Taylor, KO4LO; Christy Trembly, KJ6BX; Anthony W. Tucker, N2VCT; Michael H. Volckmann, KB7DJE; Randall P. Wagaman III, AA6WJ; Jesse M. Wall Jr, KA8YYZ; Arthur K. Warlow, W12A; Barbara R. Weirich, AA2CX; Kenneth R. Wells, AH9C; Steven Whited, KE9YH. QST

How's DX?

Conducted By Bill Kennamer, K5FUV
DXCC Specialist

Peter I Island

Number One on every DXer's Most-Needed list, Peter I Øy (Island) lies at 68° 50'S latitude, 90° 35'W longitude. It's a forbidding place, described as entirely covered with snow and ice, except for areas of bare rock where the slopes are precipitous. It's often surrounded by pack ice, and lies 240 miles off the coast of Antarctica. The highest point is Lars Christensen Peak, a volcanic mountain of 5750 feet elevation. The west coast has precipitous cliffs. The east side is less high and contains a Piedmont platform of a great height in the central regions.

The island is 11½ miles long, lying in a north-south direction and about 5½ miles wide. Framnes Head, on Sandefjord Bay, is a rugged platform of lava thought to measure 250 × 130 feet. Above here, rock rises to the snow line, 200 feet higher. A provision depot was built on this point in 1929.

The island's history "begins" on January 10, 1821, when the Russian Antarctic explorer Cpt von Bellingshausen first saw the island from a distance of 15 miles. Although he was unable to reach it, he named the island for the czar. For more than 100 years, no one reported seeing or landing on the island. Then the Norwegian whaling ship *Odd I*, under Cpt Anderssen, reached Peter I on January 17, 1927. Unable to land because of rough seas, *Odd I* circumnavigated the island and took soundings near the shores.

On February 1, 1929, the *Norvegia* reached the island. The first recorded landing was made on February 2, when the island was claimed for Norway and a provision depot was established on Framnes Head. The *Norvegia* stayed near the island for a week, engaged in sounding and charting operations. In February 1931, the *Norvegia* returned, but was unable to get within 36 miles of the island because of pack ice.

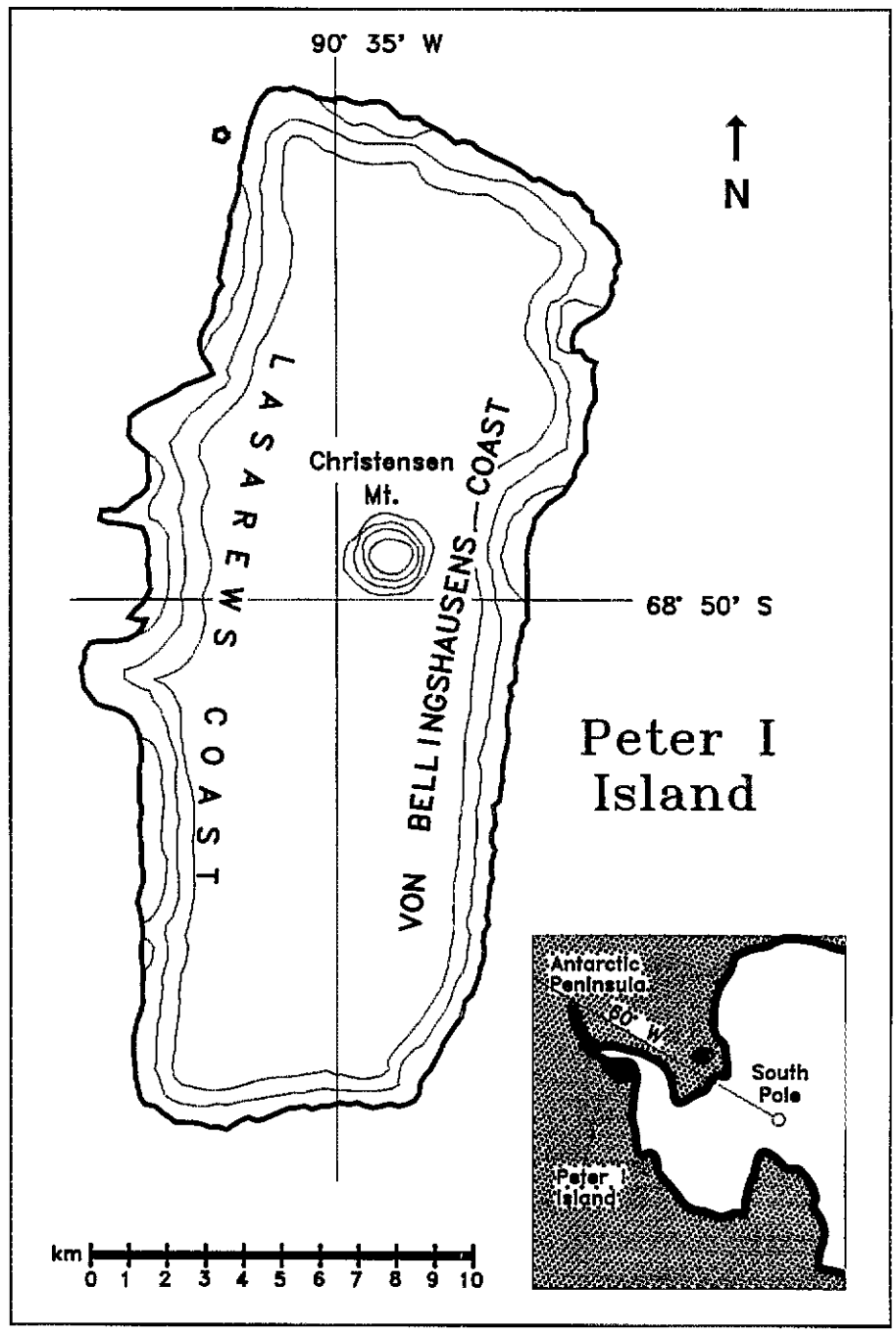
On May 1, 1931, the island was placed under Norwegian sovereignty by Parliament, and on March 24, 1933, it was incorporated in Norway as a dependency.

Other visitors found difficulty over the years. *Discovery II* visited the area in 1931, but couldn't approach closer than 20 miles because of pack ice. The *Bear* reached the island in February 1941 and circumnavigated it at a distance of four miles.

Finally, the Brategg Expedition, a Norwegian group, landed on the island in February 1948.

Josephine Clark, WB6ZUC, was fortunate to witness the third known landing in January 1982. Hard to believe as it may be, cruise ships sometimes venture into the Antarctic regions. One of these was the MV *World Discoverer*, under Cpt Heinz Aye. Josephine's description:

"Last year, on the Society's first circumnavigation, Cpt Aye, in one Zodiac, did attempt to land; the surf was too high, however. So this year he was more than ever primed to conquer the island. It is an impressive mass of basalt lava rock, about 11½ × 6 miles, and with three peaks (which we could not see because of low clouds) up to 5750 feet high. The top is permanently covered with glacial ice. It was late and getting dark, with a low ribbon of eerie mist across the black face of what little cliff was not snow- or ice-covered. To the right of the chosen landing site was a huge, narrow, flat piece of volcanic rock jutting partly into the sea, its sides sheer and its top jagged and turreted. The overall impression was of a prehistoric movie set—dark, foreboding, mysterious. Into the choppy waters two Zodiacs were lowered, and into each of these climbed five men. Soon they disappeared from view among the small bergs and stones along the shore. At 1101, the captain fired a flare, the signal that they had landed. Hurriedly, they took photos, collected small rocks and observed birds (Frank, Dietland and George were along, as well as Cpt Aye, Hank the photographer, and Werner, representing Society Expeditions). They all returned safely, wet but euphoric. The island had been reconquered after 54 years!" [Apparently, the captain hadn't heard of any other landing, thus Josephine's reference to the 54-year time span.—*Ed.*]



The ham radio part of the story actually picks up before this time. The first recorded entry in the ARRL DX Century Club (DXCC) files is from 1970, when Dick Tesar, WA4WIP, wrote to Bob White, W1CW, regarding the possible status of Peter I Island "if a ham operator could operate from there." Bob's reply, dated July 28, 1970, says, "No problem on Peter I Island being considered as a separate listing on our Countries List."

Dick apparently made investigation into the feasibility of an operation, but nothing happened at that time.

The next mention we find is a request for a determination of country status in 1978 from Harry Beardsell, VE7ZQ. Harry was writing on behalf of Belgian author/explorer Willy de Roos, who held the call sign VK9XR, which he used on his yacht *Williwaw*. Willy had obtained permission to land and use the call sign 3Y0BZ during 1979. His plan was to winter on Peter I and write a book about his experience.

On the basis of the request, the ARRL DXCC Advisory Committee (DXAC) studied the matter of Peter I. The discussion became complex because of the existence of the Antarctic Treaty of 1961. This treaty provided for the peaceful use of the Antarctic region. It also defined the area to be covered by the treaty as all areas below 60° S. Peter I fell into the area covered by the Antarctic Treaty. (We'll come back to this issue later.)

Peter I is roughly 248 miles from the coast of Antarctica. "Roughly" is used because it's hard to tell where the coast ends and the ice begins. Many Antarctic bases are located over ice, not land. Also, the rules stipulated, "Separated by a minimum of 225 miles of open water." After deliberation, in 1979 the DXAC recommended that Peter I be added to the countries list under Criteria 2 (a), deemed to be the least controversial of the criteria.

The Awards Committee then looked at the case. After its examination, the motion was essentially tabled. This had a lot to do with the question of "open water" because there was discussion of whether the pack ice actually extended to the point that there wasn't 225 miles of open water. Because the proposed operation was canceled, at that time it became a moot point.

In 1981, an inquiry as to its status was made by Willi Nietman, DJ8CR. It was followed in 1982 by a second inquiry from Stein Barlaug, LA4ND. So the Peter I case was back before the DXAC.

This time, the DXAC debated the case on the merits of the Norwegian sovereignty. The DXAC found that under article Iv, 1.a, the 1931 claim preceded the treaty. Under this treaty, article 1.(a) states that "Nothing contained in the present Treaty shall be interpreted as a renunciation by any Contracting Party of previously asserted rights of or claims to territorial sovereignty in Antarctica." It then presented the case of separation from Norway under rule 2(b). The Awards Committee accepted this proposal by a 5-2 vote, and on July 12, 1983, Peter I was approved to be added to the DXCC Countries List whenever the first valid operation occurred.

An unusual precedent was set in this case, in that Peter I was brought before the DXAC, and approved, before an operation was made. This marks the first time that this was done. Prior to Peter I, it was usually a case of operate first, then check to see if it would be accepted. This was a matter of great debate, as many felt that without the incentive of a guaranteed place on the countries list, no operation would have ever taken place because of the massive expense and danger involved.

Although two expeditions were talked about in 1982-83, neither was able to put together all the necessary pieces to make a DXpedition work. Geir Stokkeland, LA5VAA, tried to organize a group for operation in 1985-86, but there was no operation. Finally, in 1986, Einar Enderud, LA1EE, contacted the ARRL to be sure that the status of Peter I hadn't changed. It seemed that a DXpedition could come together on short notice if Peter I could be secure in its place on the DXCC Countries List after the operation. With assurances returned, the DXpedition to activate a new one was underway.

Einar was assigned 3Y1EE, and Kare Pedersen was assigned 3Y2GV for the operation. They accompanied the Norwegian Polar Institute as paying members, filling the available transportation capacity. They were able to use the MV *Aurora*, a former seal hunter fitted for research, which had a helicopter landing area. A helicopter was needed for landing, as several past attempts by others to land by water had been turned back by heavy seas. This would also allow operation up on the island, and not down on the rocks.

The landing was made on January 22, 1987, with the temperature –2° C and gale-force winds blowing. Igloo tents were set up and the group quickly went to work. Einar's first contact was with N3II, and the pileups began. With only two operators to satisfy the demand, the bedlam on the bands became heavy. On SSB, a new technique of working the pileup appeared: they set the memories in their transceiver at 10-kHz intervals within their listening frequencies. When the pileup became too heavy on one frequency, they merely punched the button and went to the next one. During the operation, which lasted from January 23-February 2, the pair made more than 17,000 QSOs. This has been the only operation from Peter I.

In February 1994, a team headed by Ralph Fedor, KØIR, plans to arrive at Peter I. It intends to sail from Port Stanley in the Falkland Islands on January 23, 1994, aboard the Russian ship *Kaptain Khiebnikov*, a 434-foot icebreaker fitted to carry 100 passengers. It has two seven-passenger helicopters fitted with cargo nets. Veterans of the VP8SSI South Sandwich Island operation, the group will use its experience there to help in the preparations for Peter I. Ralph reports that improved tents are high on the list for this trip. They have monoband antennas for 15-40 meters, and tribanders, too. The group plans a two-week stay on the island. While their history is yet to be written, we can anticipate that Peter I will shortly be off the top of "needed" lists all over the world.

YOUNGEST DXCC MEMBER?

Who's the youngest member of the DXCC? Certainly Laura Sobon, KD4OZC of Raleigh, North Carolina, is a candidate. Laura's goal was to reach DXCC before her 10th birthday in October, and she got all the confirmations together in time to do it.

Laura earned her Novice license when she was eight years old and upgraded to Technician when she turned nine. She passed her General in July 1993, and her 20-WPM code test in August. She just got her Extra Class license around Halloween.

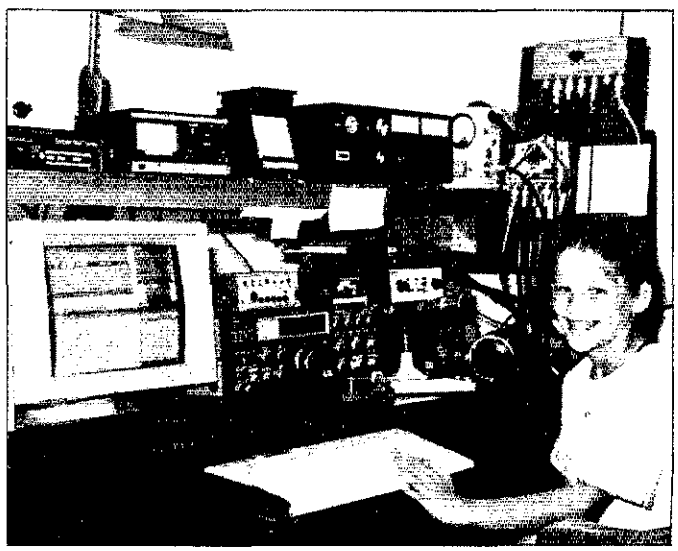
Laura's interest has been spurred by her dad, Paul, NØØT, a DXer himself. Laura participates with him in ARES exercises and helped provide communications from a Red Cross vehicle after a tornado hit Hillsborough, North Carolina, in 1992.

In addition to DXing, Laura runs the Raleigh ARS 2-meter net Friday nights on 146.64. She's been working the net since she received her Technician license in 1992. She's in the fourth grade at Our Lady of Lourdes school in Raleigh, where her favorite subjects are math and science. She and her dad are involved with the Y-Indian Princess program and the Y-Indian Trailmate program.

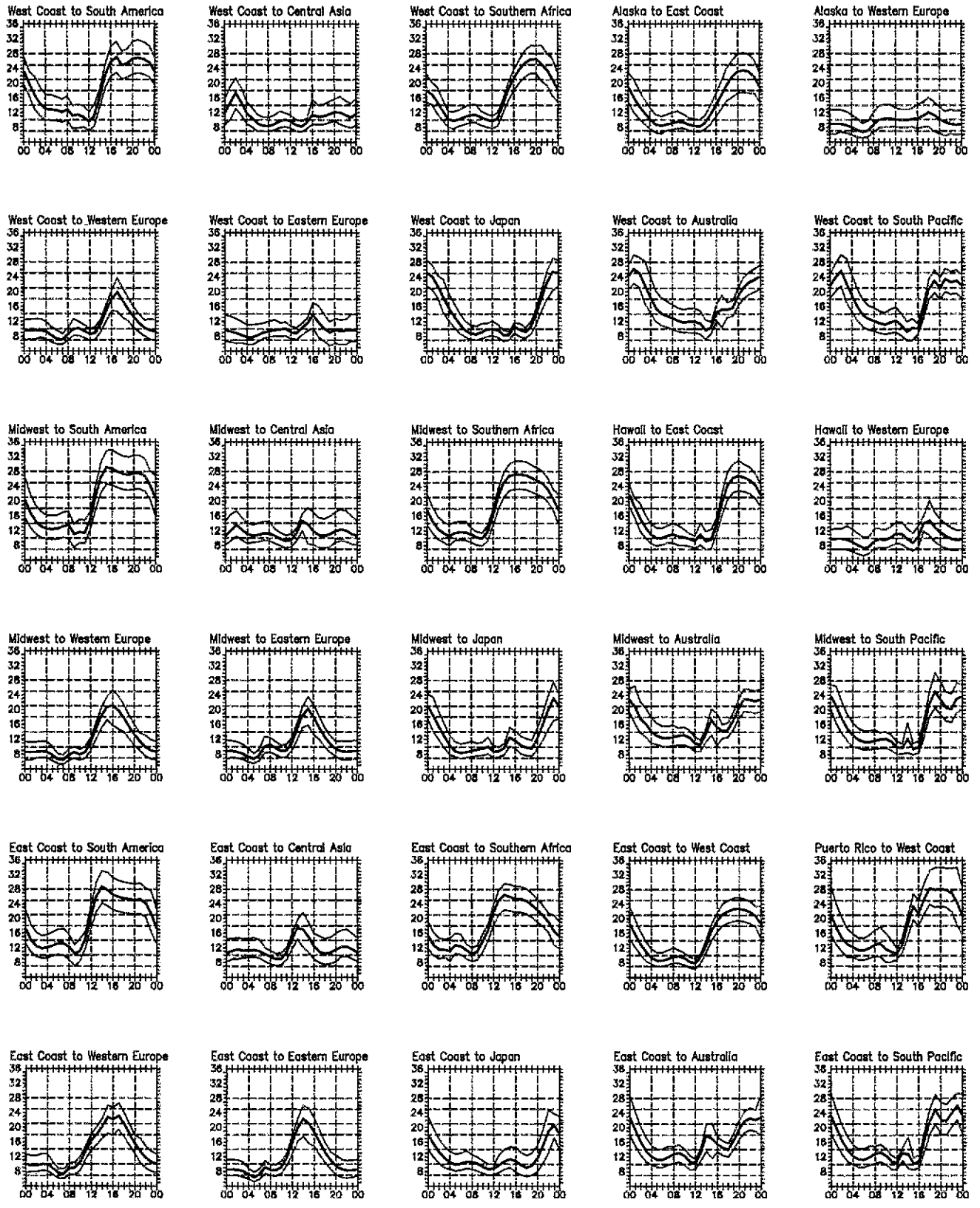
Laura enjoys getting QSL cards, especially the pretty pictures people send. Some even send extra postcards when they find out her age. She likes working CW in the pileups, and has taken a liking to RTTY, so you might meet her on the keyboard, working DX on 20 meters.

Does anyone know any younger holder of a DXCC? I know that Bill Tippett, WØZV, achieved his first DXCC as a 75-watt, crystal-controlled Novice while a boy in North Carolina at age 13.

While we're at it, how long does it take to make the ARRL DXCC Honor Roll? Let us hear from you.



Extra Class operator Laura Sobon, KD4OZC, at the station she shares with her dad, Paul, NØØT. Laura achieved her DXCC before her 10th birthday. Not to be outdone, younger sister Erin, age 7, is working on her Novice ticket. Paul's planning on his own multiop contest team! *(NØØT photo)*



When are the bands open? These charts predict average propagation for the period January 16 through February 15, 1994, for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10% of the days of the period, the highest frequency propagated will be at least as high as the uppermost curve. On 50% of the days it will be at least as high as the middle curve, and on 90% of the days it will be at least as high as the lowest curve. 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. Curves are generated using *IONCAP*. The predictions for this period assume a smoothed 2800-MHz observed solar flux value of 107, which, after adjustment for earth distance, is equivalent to a sunspot number of 52.

DXCC

Conducted By Bill Kennamer, K5FUV

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official DXCC Countries List. The totals shown below are exact credits given to DXCC members from September 1 through September 30, 1993. There were 327 current countries at that time. The DXCC rules and application forms are contained in *The ARRL DXCC Countries List*, which is available for $2.

TOP OF THE HONOR ROLL

Mixed

327

DL8AN/336
F6BLP/334
G4EDG/331
I2MQP/337
I6KK/331
JA1BLC/353
JA1OND/341
JA6BEE/351
JF1HOH/337
LA9HC/346
OK1KRS/337
ON5FU/338
VE1BLX/334
VE1XT/332
VE3BX/356
ZL1ARY/357
AD1S/334
K1JO/348
K1LHT/348
NQ1K/333
W1PNR/345
KD2SY/330
K2BXG/337
NK2H/330
NY2E/330
N2JD/338
WB2DND/339
W2JGR/339
W2SSC/373
K3BEQ/338
KE4VU/330
K4CEB/352
WB4RUA/338
W4WJ/337
K4JAG/335
K6GA/365
K6PU/359
N6AHV/333
WG6P/330
AB8K/341
K8KJN/346
N8AA/352
W8OK/368
K9ECE/366
W9DMH/337
W9KQD/355
WØJLC/335

Phone

327

EA5AD/331
I6KK/331
JA6BEE/346
OHØNJ/341
ON5FU/338
VE3BX/346
XE1L/335
ZL1ARY/351
W1ENE/348
W1PNR/345
KD2SY/330
KK2I/334
KM2P/348
NK2H/330
NY2E/330
W2YTO/337
K6GA/350
K6PU/349
WG6P/330
W8ILC/351
K9ECE/365
W9DMH/337
W9KQD/342
KØKTP/339

CW

327

DL8AN/336
G4EDG/331
KK2I/331
K4FJ/333
W4WJ/334
W8BKP/330
W9KQD/333

NEW MEMBERS

Mixed

AH6LV/101
DF5UL/286
DL3ECK/138
DL3NAZ/309
DL8HCO/236
DL9SDD/101
EA1KK/311
F5RXL/169
JA1FYS/252
JA1PAP/153
JA5GG/175
JG1JTZ/109
JH1QAE/126
JH3GRO/296
JI1HWV/316
JJ1XPJ/165
JL1PNQ/108
JR3ADB/108
JR8SVM/110
LA1KHA/108
LA9GY/200
OE3OLW/313
OZ1LUM/119
SM3JLA/245
SMØIHR/116
S53ZZ/108
UV9FM/309
VE3FF/300
VE3ZTH/133
VE6JAV/217
VE6SLV/172
VP8SSI/132
ZP6CW/101
ZS2DL/166
ZS2LR/190
5X1A/112
AA1AL/127
AA1BQ/103
KD1KR/104
N1IFM/251
WA1MPB/156
WS1A/166
AA2HM/107
KA2NJE/164
KB2LSI/102
KF2BH/298
KF2MM/106
N2LVI/132
N2MWX/113
WA2BGE/318
WA2HNO/194
W2CN/101
W2MPK/349
KA3WED/132
KD3HN/100
N3NCW/171
WJ3A/300
WR3Y/154
AC4ZB/101
KC4CVJ/103
KC4GHM/151
KD4OZC/106
KF4EZ/104
KJ4WH/104
N4USG/111
WA4MCZ/295
WA4QDM/104
WB4KLI/117
WB4RUO/101
WD4IFI/198
W4BQF/181
W4PKU/151
AA5YU/286
AB5MG/101
KI5PY/114
WR5I/110
*W5YCX/100
KC6QHA/111
KD6DFX/110
KM6CB/228
KM6UR/105
NI6P/137
N6PEQ/174
WA6PJR/329
WA6RFJ/208
WD6DXH/119
WD6EYD/183
W6UPI/211
AA7WP/153
NG7S/180
WA7GMY/250
W7FNI/162
K8JLF/192
K8SL/315
K8UNV/331
WB8G/292
WD8AHR/113
W8TN/331
KB9CRY/107
KF9KZ/103
N19Q/295
N9BBE/119
N9CKC/162
WA9QNU/199
WV9Y/136
WY9V/191
W9ILY/223
AJØI/252
KBØIHM/132
KWGS/206
KØHOA/144
KØJUZ/130
NJØU/239
WBØCJB/105
WØML/267

Phone

F5RXL/143
GØLJH/160
HK6ISX/300
HL1IHU/120
IT9JWV/215
JA1PAP/153
JA1UKK/152
JA8TFO/317
JH3GRO/294
JL2HUJ/110
JM1MNW/110
OE3KPC/109
SMØEBP/142
UA9FAR/267
UV9FM/299
VE3FF/276
VE6JAV/217
VE6SLV/172
YC8EMH/109
5X1A/112
AA1AL/127
KM1A/190
KX1T/150
K1DPB/256
N1IFM/251
WA1EHK/151
WS1A/165
WS1L/127
W1ER/240
W1YIF/180
AA2HM/107
KA2NJE/164
KF2BH/289
KF2MM/106
N2DUW/100
N2JE/190
N2LVI/132
N2MWX/113
WA2CKP/176
WA2HNO/192
WA2JBD/122
WB2KSQ/285
WB2LOS/111
WO2Q/268
KD3HN/100
KE3GA/129
KC4CVJ/103
KC4GHM/150
KD4FLU/102
KD4FTY/137
KD4HYT/101
KD4OZC/104
KK4DK/116
N4GCK/130
N4TO/122
WA4MCZ/283
WA4QDM/104
WB4YPY/112
WD4IFI/197
W4ZYT/200
AA5YU/166
KB5MRU/103
KG5EG/139
KX5V/164
K5VIP/196
W5/XE1XYY/102
AA6BR/208
KC6QHA/111
KF6A/199
KK6KR/105
KM6CB/228
N6PEQ/167
N6VB/217
N6YNI/107
WA6GIN/243
WA6RFJ/208
W6GPM/107
W6TUI/322
W6UPI/211
W6UZ/197
AA7WP/133
KA7ETG/166
K7NPN/119
WA7GMY/249
WY7K/127
K8BCK/279
K8SL/311
K8TDJ/107
NJ8X/102
N8LAS/106
W8CXO/109
AB9W/106
K9KU/313
NT9O/246
N9BBE/117
WB9CPQ/121
WB9TOW/113
WY9V/191
KFØZJ/111
KØHOA/144
KØJUZ/126
NIØG/319
NØNYG/108
WBØMGS/233
WØRWS/104

CW

DF5UL/279
F6FXW/119
GØOOO/104
JA9KYZ/158
JA3LDH/118
JA6WLG/107
JH1BAM/192
JJ1XPJ/165
ON4ACG/277
RA4HW/247
SMØIHR/108
S53ZZ/108
UV9FM/221
VE1AZN/133
VE2ABO/101
AA1AC/152
AK1N/122
K1DPB/234
NV1C/164
N1CWR/115
W1YIF/204
KB2KLK/107
KF2BH/135
KF2X/253
KS2M/127
K2IJ/321
WA2UUK/279
AA3BK/147
K3NW/302
KN4Q/106
N4TO/217
WB4FHF/166
W4BQF/181
AA5YU/271
KF5QR/115
N5NA/113
N5OGP/169
AA6BR/194
KF6A/158
NI6P/133
N6VB/199
WD6L/103
NG7S/177
N7YQR/107
WY7K/146
K8BCK/256
K8JLF/172
K8TDJ/160
K8UNP/250
NJ8X/106
WT8S/242
W8KZM/138
KA9DFN/104
KE9YR/145
NT9O/260
NZ9Z/112
N9CKC/113
W9ILY/191
AJØI/241
KBØIHM/117
KDØZR/281
NJØU/214
NØAX/261
WGØO/144

RTTY

G4GED/103
IØKKY/141
WA1MPB/156
NK2H/130
WA4MCZ/204
WV7Y/113
K8UNP/114
WA9CVK/117
KØBX/131
WØML/230

Satellite

AHØU/100
IW5AB/103
Z21HJ/104
AA6PI/103
WD6EPV/105
W9EXR/105

160 Meters

N4CC/101

80 Meters

LA6MP/107
SM3JLA/107
UA9FAR/117
UV9FM/165
WW1N/105
W1ER/128
AA2DU/100
NZ2L/136
WO2Q/102
N4TO/119
W4CVX/114
KF6A/102
WB7B/106
KC8FS/102
K8UNP/141
WB8IZM/100
KE9LK/112
W9YSX/185
KUØA/101

40 Meters

GU3MBS/118
JA7MF/122
JI2KXK/118
SM3JLA/102
UA9FAR/160
UV9FM/214
WP4U/106
W1ER/120
AA2DU/117
NZ2L/121
N2SU/123
WO2Q/111
WA3CGE/278
KC4GKY/103
KN4ZT/105
K4LRX/103
N4TO/166
W4BQF/180
W4CVX/104
AA5YU/140
AA6BR/103
KI6BU/108
W6UZ/131
WB7B/131
KC8FS/133
KF8VW/104
K8BCK/105
K8UNP/210
W8KZM/103
W8PC/137
KE9LK/101
WN9Q/105
W9EBY/109
W9YSX/211
KBØAUK/106
KEØOL/193
NJØU/113

10 Meters

F3TH/290
F5OIE/119
HB9BOS/146
JA4DUD/109
JA7MF/226
JG1UKW/124
JH1BAM/114
PY2BW/180
SM3JLA/123
SM7NDX/106
UA9FAR/196
UV9FM/275
VE1OC/125
VE6JAV/102
YO3YC/128
WS1A/112
W1ER/111
W1YIF/144
KA2NJE/164
KF2BH/186
NZ2L/171
N2DUW/100
N2JE/108
N2LVI/120
WA2CKP/176
WA2JBD/122
WB2LOS/111
WB2ROX/170
WO2Q/177
W3MDO/102
KD4FTY/137
KD4OZC/101
N4TO/136
WA4MCZ/164
WA4QDM/104
WB4YPY/112
W4CVX/200
W4LMJ/105
AA5YU/125
KG5EG/107
KT5V/125
KX5V/150
K5VIP/126
N5OGP/154
AA6BR/151
KC6QHA/111
KF6A/107
KI6BU/136
KM6CB/133
N6VB/132
WA6RFJ/130
W6UPI/156
W6UZ/184
NB7N/130
WB7B/203
KC8FS/133
KG8CZ/111
K8BCK/250
K8TDJ/112
K8UNP/191
WW8W/114
WZ8P/127
KB9EKO/136
KE9LK/115
KE9YR/115
WY9V/183
KDØZR/219
KFØZJ/107
KØHOA/129
KØKTP/159
NIØG/216

6 Meters

JF1IRW/106
ZP6CW/101

NEW HONOR ROLL MEMBERS

Mixed

326

W9WU/338

325

KC8QT/329

324

JA6YG/347

323

KC4ZH/326
KDØZR/332

322

JH8JBX/326
N2ERN/324
W2DE/327
WG3U/331
WA8VPN/329

321

JH2AYB/323
JH4GNE/323
JA6IVR/322
W5GAI/338
W6AYQ/334
K7LZJ/323
N8BEF/323

320

JAØDMV/329
LA2KD/335
KC1PY/324
NV1J/326
K2PH/329
NX2T/323
AE3S/331
W5ISF/330
K5XN/329
NA7R/322
NF9S/323

319

HK3YH/329
JA4BXL/321
OH3NM/336
VE1CCB/321
W1CYB/331
KG2T/321
NZ2L/321
W4JR/321
KC5CR/324
WC5E/322
KB7VD/322
W7KSK/323
KE9LK/321
NZ9Z/322
WA9WYB/324
KDØJL/321

318

HL1XP/321
JP1NWZ/322
LZ1YE/325
SM5LI/322
VE3PNT/321
KM1R/323
W1DOH/323
WB2ROX/322
KC3KE/321
WN4M/325
WA5IPS/321
WA6ARG/322
W6NIZ/321
KE9ET/320
WK9Z/321
W9XT/323
WAØJYJ/327

Phone

325

K9FD/331

322

N2ERN/324
W5RKK/329

321

HK4DF/347
JF1HOH/331
JH4GNE/323
JH8JBX/324
W2XN/362
W5XQ/324
K6RK/337
K7LZJ/323
W8JQ/349
W9WU/330
WØIJR/324

320

IK7DBB/323
JH2AYB/322
KC1PY/324
W1YY/329
N2KA/332
N8BEF/322
WA8VPN/327
WB8LFO/325
W8NUV/338

319

JA6IVR/320
JAØUUA/321
W1CYB/329
NZ2L/321
N9RD
K2FL
K2UO

12 Meters

IK2MRZ
KB7VD/322
K7OH/322
KC8QT/322
K8UNP/321
KE9LK/321

318

AK1N/324
W1DOH/323
WB2RQX/322
KC3KE/321
WA4JGV/324
WA6QBI/325
W6NIZ/321
W6PUW/320
KE9ET/320
KØJZM/323
NOACH/324

CW

324

W8PR/332

323

F3TH/326
W7ULC/328

322

JF1HOH/326
K1NTR/325

321

JF1KKV/329
K7NN/327

320

W9DH/326

319

W1GG/326
W1LQQ/326
WA2UKA/322
K4XI/325
N8MC/326
K9ALP/322

318

GM3YTS/322
VE7AHA/322
WG3U/320
W6DU/321
K7ZBV/323
W7EKM/323
K9CW/323
NIØG/321

5BDXCC

WK9Z
W4ZYT
KUØA
UW4HM
W4CVX
LA6MP
WO2Q
HB9CRV
EA7BJ
LAØEW
K2IJ
OZ1HX
AA2DU
FK8CP
SM3JLA
N4TO
KA1ERL
K6KLY
HA5NK
KC6X
WB7B
W1ER
KE9LK
K4LRX

17 Meters

IK2MRZ
FK8CP
K9FD
W9LKJ
K2TK
W2UE
N9RD
K2FL
K2UO

ENDORSEMENTS

Mixed

AH6AZ/182
AL7EL/345
A61AD/229
CX3AN/331
DJ2BW/374
DJ6DU/326
DL1JW/368
DL1PM/360
DL1SCQ/316
DL2SCQ/315
DL6DK/325
DL9TJ/340
EA7HAL/282
*F1JTL/302
F1NTV/319
F5OZF/318
F6BKI/339
F6ELE/329
F6GBH/183
F9XL/325
G3AEZ/294
G3CWW/199
G3GMY/226
G3OLU/287
G3TXF/339
G4OBK/307
GØNOA/162
GM3AWW/344
GM3YTS/326
GM4KLO/324
GU3MBS/228
HA3GJ/209
HA5NK/315
HB9BMZ/292
HB9BOS/273
HB9CMZ/320
HB9CRV/298
HB9DX/363
HL2KOS/177
I1PME/224
I5EFO/327
I7OYT/316
I8TOH/326
IØAMU/374
IØIKV/275
IK1FRI/250
IK2GNW/325
JA1DCO/292
JA1SNA/336
JA1STF/300
JA1TNV/270
JA1UQP/349
JA2DLM/328
JA2NNF/327
JA2TBS/326
JA3DLE/301
JA3LDH/312
JA3MNP/343
JA4DND/341
JA4DUD/228
JA7QFU/328
JA8EAT/343
JA9BEK/316
JAØBYS/324
JAØUUA/328
JF1KKV/334
JF2WXS/279
JF7DZA/328
JG1WNO/305
JH1BAM/252
JH1UBK/250
JH4FEB/336
JH8UQJ/302
JHØBBE/331
JHØLME/190
JI1DHY/280
JM2DRM/215
JR2PAU/305
KH6CD/376
KP4AM/314
KP4AOD/289
KP4AZ/332
LA1NO/295
LA2IJ/284
LA7JO/340
LA7QI/319
LA8CE/301
LA9PHA/259
LAØEW/284
NH6T/200
OD5PL/201
OE3EVA/334
OK1MP/363
OM3MM/370
ON4ACG/316
ON4TX/361
OZ1ABA/301
OZ1HX/229
PY2BW/344
PY3EM/335
*PY5EG/336
PY7ZZ/343
RT5UO/306
SM4DDS/287
SM4DHF/344
SM5PLW/253
SM5SWA/299
SM6AWW/293
SM6LIF/330
SM7NDX/252
SMØMO/340
SP9UH/255
SV1ADG/337
SV1JA/329
TU2QW/240
UA9FAR/312
VE1RH/165
VE1ZZ/246
VE2GHZ/317
VE3ADP/309
VE3BGG/156
VE3DMC/333
VE3HO/338
VE3JFS/324
VE7AHA/338
VE7AQ/308
VE7IU/309
VE7SV/356
VK5QW/328
VK6HD/350
VY2OX/325
WP4U/306
XE1L/335
XE1MD/328
XE2FL/301
XE2MX/315
YO3YC/275
ZS6EZ/310
AA1AC/303
AC1O/268
AD1C/329
AK1N/330
KA1A/327
KA1CB/328
KA1ERL/324
KB1JU/324
KB1NS/228
KB1U/326
KC1AG/326
KG1V/306
KM1A/276
KV1J/276
KX1T/280
K1DII/324
K1DPB/308
K1LEC/313
K1MEM/342
K1RH/333
K1VKO/334
K1VR/337
K1WJB/328
K1ZZ/334
NF1J/136
NJ1Q/142
NW1S/183
NX1L/325
N1CPC/314
N1FNN/236
N1GMU/307
WA1DVE/325
WA1EHK/159
WA1G/336
WA1N/327
WA1SMH/190
WA1URV/333
WB1J/330
WD1X/206
WS1L/133
WV1X/310

WW1N/349
WZ1R/292
W1AM/343
W1AX/379
W1BIH/376
W1CJK/309
W1ENE/357
W1ER/345
W1EYT/322
W1FAB/346
W1FJ/360
W1FYI/286
W1GD/334
W1GG/355
W1GKK/383
W1HSB/334
W1JR/373
W1KSZ/334
W1LQQ/353
W1LRR/269
W1MLG/342
W1NG/351
W1ODY/341
W1OHA/354
W1OPB/312
W1RFW/284
W1UBG/207
W1VV/336
W1YIF/286
W1YY/344
AA2UU/318
AA2XX/328
AA2Z/325
KA2BZS/332
KA2CDJ/289
KA2CKS/304
KA2HMJ/318
KB2BBG/225
KB2HQ/277
KB2JLW/219
KB2KLK/158
KB2NU/332
KB2XL/327
KD2WU/269
KE2ZU/283
KF2U/339
KK2I/335
KM2P/349
KS2M/307
KZ2I/340
K2AM/325
K2CL/352
K2ENT/334
K2EYJ/333
K2FL/373
K2HPV/178
K2IJ/328
K2KIB/317
K2LE/354
K2MFB/283
K2NJ/336
K2OLG/327
K2PBP/252
K2PEQ/327
K2PLF/332
K2QIL/339
K2SHL/273
K2TK/333
K2UO/337
K2UVG/183
K2WR/206
NA2M/339
NA2Q/227
NJ2D/329
NN2G/330
N2AIF/327
N2BIM/327
N2DEM/206
N2HOS/298
N2HYD/293
N2ITG/142
N2JE/201
N2KA/336
N2LDU/138
N2SU/189
WA2FIJ/330
WA2HZT/250
WA2IZN/333
WA2UKA/328
WA2UUK/329
WA2WYR/220
WB2GOG/304
WB2MWW/324
WB2PCF/324
WB2SON/317
WB2ULI/325
WB2YQH/349
WE2K/290
WE2L/325
WF2Y/316
WI2J/296
WR2G/326
WU2W/316
WY2V/308
W2AAN/329
W2AX/371
W2BHM/368
W2BZH/188
W2DX/267
W2FB/332
W2FP/350
W2GWT/291
W2HI/361
W2HTI/368
W2LZX/339
W2MIG/344
W2OKM/376
W2OW/283
W2PK/318
W2QM/371
W2OV/261
W2SEG/271
W2SM/341
W2SY/348
W2TQC/370
W2UE/372
W2VT/307
W2WD/356
W2XI/313
W2XN/367
W2YY/366
W2ZO/269
AA3BK/254
AA3DI/338
AI3N/329
AJ3H/331
KB3KV/310
KC3J/292
KE3GA/131
KQ3S/300
KS3F/319
K3AV/361
K3FN/338
K3FRU/173
K3GYD/336
K3NW/342
K3ZO/338
NM3C/322
NY3T/256
N3WH/302
WA3CGE/339
WA3MKB/225
WB3JFS/298
W13W/288
W3ACE/341
W3EE/308
W3ELT/333
W3FM/348
W3HRF/319
W3IOP/344
W3KRB/312
W3TFA/190
W3TVB/335
W3UT/166
W3WYP/241
W3ZBF/325
AA4EL/303
AA4MM/352
AA4NA/327
KC4APN/151
KC4GKY/257
KK4DK/191
KK4TK/194
KN4O/190
KN4RI/302
KN4ZT/235
KO4XF/241
Kx4H/329
K4EZ/373
K4FCT/345
K4FDP/204
K4FJ/359
K4HP/305
K4ID/359
K4JLD/333
K4LHH/211
K4LNA/311
K4LRX/336
K4LW/313
K4RBZ/288
K4VUD/179
K4XI/343
K4YI/320
N4AIG/156
N4AXR/335
N4CC/345
N4DRC/327
N4GCK/200
N4GYT/201
N4JED/190
N4JQQ/311
N4JR/312
N4KW/334
N4NX/336
N4OLE/310
N4QD/179
N4SU/378
N4TB/353
N4TJ/322
N4TO/356
N4UH/352
N4VSN/238
N4WP/221
N4XO/363
N4XX/334
WA4CXZ/339
WA4DRU/346
WA4TQE/168
WA4VGC/336
WB4EEA/154
WB4FHF/298
WB4OSN/335
WB4QNP/343
WT4T/336
W4BAA/372
W4EEE/368
W4EEU/359
W4FX/367
W4HY/333
W4IF/368
W4JKC/326
W4JVU/356
W4LMJ/192
W4MGN/365
W4MPY/331
W4NKI/355
W4OO/362
W4OWJ/360
W4SSU/364
W4VQ/361
W4WKB/208
W4ZYT/306
AA5GS/211
AE5H/334
KA5SWC/294
KB5IM/312
KB5MDD/220
KD5R/252
KE5OO/303
KE5RM/307
KF5AL/319
KF5MY/330
KF5QR/295
KG5EG/306
KG5GD/198
KI5JA/306
KJ5LJ/291
KT5V/214
KU5L/280
KY5I/310
K5AO/350
K5AVH/317
K5EC/252
K5EE/327
K5ESW/303
K5HT/329
K5KLA/341
K5OT/332
K5RPC/313
K5SSB/316
K5VIP/202
K5VH/295
K5WE/327
N5FW/339
N5MHZ/270
N5OGP/301
N5ORT/316
WA5NOM/290
WA5SUE/315
WA5ZEK/153
WB5HBR/266
WD5GJB/334
WD5K/348
WG5G/317
WS5E/326
WT5N/126
WV5S/327
WW5L/315
W5HL/313
W5IZ/356
W5QK/367
W5QKR/346
W5RKK/329
W5XX/343
AA5BR/260
AA5PI/362
AB5U/190
AB5FI/222
KC5X/319
KD5EU/262
KD5PY/343
KD5UO/208
KE5LT/326
KF5A/331
KF5E/246
KG5JW/301
KI5BU/326
KI5PG/254
KI5VY/148
KI5X/273
KJ5FY/217
KJ5HO/305
KJ5NZ/323
KM5CK/178
KM5HB/219
KN5DI/170
KN5DQ/185
KN5EL/303
KT5BZS/228
K5CBL/341
K5HHD/328
K5IR/346
K5KLY/325
K5NL/319
K5QPZ/263
K5OS/326
K5RK/344
K5SD/329
K5XJ/344
NB5L/339
ND5G/326
N5BK/336
N5BOI/313
N5FX/363
N5JV/341
N5MB/341
N5MG/343
N5RA/349
N5TD/304
N5VB/285
N5VO/329
N5VR/339
WA5CTX/319
WA5GIN/248
WA5OGW/339
WA5OBI/327
WA5TJM/326
WA5VNO/314
WB5SOF/203
WB5SRK/293
WB5VIN/328
WB5ZUC/339
WD5DAB/255
WD5L/252
W5AUG/323
W5BJI/347
W5DU/347
W5FSJ/372
W5GC/346
W5GO/342
W5GR/355
W5GYM/325
W5HYG/368
W5KTE/356
W5KUS/308
W5NVN/301
W5OAT/351
W5OSP/333
W5PBI/355
W5PT/372
W5RFF/329
W5RGG/349
W5SQP/370
W5TUI/329
W5TUR/275
W5US/342
W5UZ/318
W5XP/347
AA7AN/260
AA7TP/336
KC7V/330
KG7EM/266
KG7IZ/297
KV7L/333
KX7J/325
K7KG/354
K7KJM/232
K7LJO/322
K7NN/348
K7NPN/139
K7OXB/343
K7RLS/336
K7SFN/335
K7SP/336
K7TCL/321
K7ZBV/334
NB7N/320
NS7J/361
NX7K/341
N7JXS/216
N7RK/342
N7SEJ/183
N7UT/337
WA7BNM/246
WA7BPI/334
WA7HRR/265
WA7NIY/148
WB7B/326
WJ7S/271
WS7W/288
WY7K/221
W7DAA/320
W7DOZ/193
W7DQM/352
W7EKM/345
W7GXC/333
W7KJJ/303
W7KSG/346
W7NP/321
W7TE/339
AD8O/330
AD8V/295
AI8M/334
KA8QKY/245
KA8ZPE/306
KB8DB/334
KC8EU/329
KC8FS/317
KD8V/330
KF8VW/317
KR8N/331
KX8W/333
K8AAI/305
K8BCK/329
K8CH/347
K8CS/341
K8DB/329
K8DR/368
K8HLH/153
K8IKE/328
K8IP/352
K8JP/342
K8JRM/327
K8MC/333
K8OHG/357
K8ONV/360
K8OT/274
K8RA/344
K8RYU/259
K8TDJ/261
K8UNP/323
K8YSE/328
K8YVI/324
NE8Z/345
NJ8X/150
NX8J/334
N8CLJ/301
N8EL/345
N8MC/334
N8ZA/358
WA8MEM/315
WA8OSE/343
WB8IZM/292
WB8LFO/326
WD8LTM/298
WD8NUD/209
WD8QFB/314
WD8QBP/250
WT8C/330
WU8A/274
WW8W/250
WZ8P/325
W8BE/353
W8BI/204
W8CY/335
W8DN/312
W8GKM/348
W8GOC/307
W8ILO/354
W8IQ/359
W8IWJ/304
W8JO/356
W8KZM/325
W8NUV/356
W8PC/311
W8PHZ/372
W8PR/359
W8QY/369
W8RHY/161
W8TIV/249
W8UVZ/343
W8WOJ/343
W8XD/329
W8YA/349
KA9OTD/314
KB9EKO/261
KD9YE/293
KE9F/323
KE9XN/317
KE9YR/164
KF9AF/298
KJ9I/331
KM9J/335
KM9W/302
KS9B/332
KS9Z/334
K9ALP/346
K9BB/342
K9CW/341
K9EFR/262
K9FD/337
K9GS/209
K9HQM/339
K9IW/334
K9KA/342
K9KU/333
K9LCR/309
K9MM/351
K9MZJ/244
K9PQG/338
K9RN/334
K9WMM/177
K9XJ/342
K9ZO/336
K9ZXG/333
N9AU/333
N9BAF/275
N9GK/337
N9HFR/311
N9QX/301
N9RO/329
WA9CVK/332
WA9MAG/332
WA9MFF/245
WB9EJE/282
WB9GYU/338
WB9RNF/264
WB9TOW/280
WB9Z/338
WD9FLI/306
WD9HTC/127
WD9IPP/245
WE9R/321
WG9R/184
WI9U/336
WN9Q/308
W9AGH/310
W9CL/289
W9DH/360
W9EBY/224
W9EQP/337
W9FO/369
W9FR/344
W9JZ/310
W9LKJ/349
W9LT/349
W9LYA/210
W9MCJ/317
W9NT/282
W9RGL/366
W9RF/346
W9ROK/302
W9RXJ/345
W9UO/290
W9VA/340
W9WAQ/331
W9XX/335
W9YCV/269
W9YSX/370
W9ZR/350
AA0DQ/229
AB0P/335
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KB8DB/206
K8BL/128
K8CH/139
K8CS/126
K8IKE/117
K8YSE/203
WA8MEM/115
WT8C/149
W8UVZ/262
W8YA/295
K9ALP/127
K9FD/221
K9HQM/129
N9RD/116
WA9YSD/112
WB9GYU/201
W9AGH/122
W9ZR/322
ABØP/213
KØII/214
KØSR/210
NØZA/137
WØIZ/139

40 Meters

A92BE/184
DJ2BW/321
DL1PM/316
DL9TJ/247
F6BLP/275
HL1XP/122
JA1UQP/332
JA2NNF/188
JA3MNP/327
JA7QFU/266
JA8EAT/335
OK1MP/283
ON4ACG/226
PY2BW/253
SM4DHF/187
SV1ADG/334
VE7AHA/297
VK6HD/331
ZS6EZ/203
AD1C/202
AD1S/115
KA1CB/197
K1MEM/328
K1MM/334
K1NTR/270
K1ZZ/198
NV1J/157
NX1L/254
WA1G/140
WB1DQC/113
WV1X/182
WW1N/144
WZ1R/205
W1AX/279
W1ENE/163
W1JR/327
W1KSZ/259
W1NG/330
W1YY/309
KT2C/126
K2FL/302
K2KIB/194
K2PLF/217
K2SHU/110
K2TK/197
K2UO/272
NY2E/142
WA2UKA/257
WA2UUK/256
WB2DND/239
WE2L/112
W2MIG/114
W2UE/140
W2YY/263
K3FN/322
K3NW/295
K3UA/313
WG3U/230
W3AP/317
AA4EL/117
KE4VU/185
K4XI/254
N4CC/283
N4LUF/161
N4ONI/221
N4XR/239
W4VQ/329
W4WJ/235
K5AQ/257
K5KLA/257
WW5L/120
AA6PI/216
KJ6HO/130
N6JV/259
WD6L/110
KC7V/239
K7OXB/175
K7SP/202
NX7K/253
WA7BPI/307
KA8ZPE/142
KB8DB/250
K8BL/185
K8CH/199
K8CS/184
K8IKE/124
K8JP/132
K8YSE/220
WA8MEM/204
WB8IZM/114
WT8C/245
W8IQ/184
W8UVZ/324
KC9YX/121
K9ALP/211
K9FD/255
K9HQM/203
K9IW/246
K9ZXG/227
N9RD/138
WB9GYU/237
WS9V/122
W9AGH/181
W9ZR/331
ABØP/294
KAØCDN/251
KUØA/131
KØII/284
KØOST/130
KØSR/302
NZØR/158
NØZA/214
WØIJR/250
WØIZ/224
WØPGI/268
WØYDB/141

10 Meters

A92BE/254
DL1PM/317
DL9TJ/244
EA1KK/224
F5OZF/279
GU3MBS/167
HB9ARE/154
HB9BMZ/190
HL1XP/144
IK7DBB/165
JA1FYS/156
JA2NNF/239
JA2TBS/131
JA3LDH/202
JA3MNP/328
JA8EAT/331
JH4FEB/174
JH8JBX/178
JH8UQJ/223
JHØBBE/328
LA8CE/150
NH6T/130
OK1MP/320
PY3EM/138
SM4DHF/270
SM5PLW/215
SM5SWA/257
SM6AWW/285
SM6LIF/304
SMØMC/209
SV1ADG/334
VE3DIT/134
VE3PNT/136
VE7AHA/251
ZS6EZ/234
AD1C/276
KA1CB/250
KA1ERL/276
KC1PY/198
KX1T/131
K1MEM/327
K1NTR/251
NQ1K/213
NV1J/184
NX1L/292
N1FNN/153
N1GMU/194
WA1G/227
WB1DQC/260
WD1X/133
WV1X/243
WW1N/122
WZ1R/184
W1AX/297
W1ENE/294
W1HLF/158
W1JR/321
W1KSZ/290
W1NG/335
W1YY/316
AA2DU/192
AA2Z/156
KA2CDJ/142
KB2BBG/225
KB2HQ/190
KB2JLW/156
KB2MER/157
KE2ZU/202
KT2C/143
K2BPQ/202
K2FL/342
K2KIB/257
K2OLG/323
K2PBP/240
K2PLF/258
K2TK/260
K2UO/289
K2WR/135
N2DEM/206
N2LDU/138
WA2UUK/310
WB2DND/295
WB2KSK/138
WE2L/208
WR2G/134
WU2W/207
W2BZH/132
W2UE/203
W2YY/300
AJ3H/284
K3BEQ/329
K3FN/322
WA3CGE/298
WT3W/134
W3AP/326
W3EE/132
W3TFA/143
W3TVB/268
KC4APN/150
KC4GHM/151
KE4VU/212
KK4TK/138
KM4QM/174
KR4M/327
K4XI/277
N4CC/293
N4LUF/234
N4OLE/245
N4ONI/313
N4XR/248
WA4QMQ/289
WB4FHF/142
W4VQ/324
KB5NME/130
KF5QR/161
KJ5LJ/128
KY5I/151
K5AQ/283
K5KLA/263
N5DUO/217
N5ORT/249
WV5S/187
WW5L/209
WY5H/156
W5PKE/188
AA6PI/245
KF6E/143
KJ6HO/205
KM6HB/135
K6CBL/264
K6KLY/156
K6QPZ/123
N6JV/269
WA6ARG/168
WD6L/187
W6ESJ/160
KC7V/263
K7NN/185
K7OXB/179
K7SP/235
NX7K/276
N7JXS/147
WA7BNM/156
WA7BPI/141
WA7NIY/148
KA8ZPE/239
KB8CUS/262
KB8DB/317
KF8VW/299
K8AAI/151
K8BL/278
K8CH/230
K8CS/197
K8IKE/137
K8JP/141
K8YSE/294
N8IBW/189
WA8MEM/235
WB8IZM/175
WD8LTM/149
WT8C/280
WT8S/297
W8IQ/246
W8KZM/149
W8UVZ/301
KA9OTD/153
KC9YX/137
KE9ET/230
KE9F/201
KE9XN/255
KF9AF/159
K9ALP/282
K9EFR/240
K9FD/288
K9HQM/219
K9IW/286
K9ZXG/284
N9RD/195
WA9CDY/304
WB9GYU/219
WD9FLI/230
WN9Q/190
W9AGH/232
W9LYA/139
W9ROK/178
W9XT/184
W9YSX/322
W9ZR/331
ABØP/306
KAØCDN/262
KBØAUK/128
KEØOL/289
KIØW/184
KRØI/142
KUØA/187
KØDEQ/252
KØOST/226
KØSR/311
NZØR/206
NØZA/239
WAØGOZ/166
WGØO/132
WØIJR/268
WØIZ/268
WØPGI/309
WØRWS/187
WØYDB/268

6 Meters

JA4MBM/156
JA6RJK/133
JI1CQA/110
W4CKD/113

*Corrections to a previous monthly listing.

QST

Hamfest Calendar

Administered By Christine N. Hushin
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. For example, your information would have to reach HQ by **January 5** to be listed in the **March** issue. Hamfest information is accurate as of our deadline; contact the 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 raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

California (Livermore)—Jan 2, 7 AM-noon. *Spr:* Livermore ARK, Las Positas College (because of college security concerns, buyers and sellers must stay off college property until after 6 AM the day of swap). Swap meet. *TI:* 147.045 from the W, 145.35 from the E. Noel Anklam, 510-447-3857 eves.

†**California (Monterey)—Jan 15,** 8 AM-1 PM. *Spr:* Naval Postgraduate School ARC, Monterey Peninsula College Armory. ATV, satellite, packet, MARS, ARES, flea market, tailgating, refreshments, seminars. *TI:* 146.97. *Adm:* free. Beverly McKinney, KC6AMI, 408-663-6117 or Pat Carter, KA6IRS, 408-649-4444 ext 20.

Colorado (Loveland)—Jan 22; set up 7 AM, public 9 AM-3 PM. *Spr:* Northern Colorado ARC, Larimer County Fairgrounds, 700 S Railroad. Free parking, commercial exhibits, refreshments, VE sess (Trent Hays, WBØHZL, 303-484-8315). *TI:* 144.515/145.115, 146.25/85. *Adm:* $3. Tables: $8 each (Orlin Jenkins, KØOJ, 303-353-7094). General info: Musser Moore, NØUMN, 303-221-3698.

†**Florida (Crystal River)—Jan 22,** 8:30 AM-5 PM. *Spr:* Sky High ARC, National Guard Armory, ¼ mile E of US 19 on Seven Rivers Dr, S side of Crystal River. Refreshments. *TI:* 146.355/.955. *Adm:* $4 until Jan 1, $5 thereafter. Bill McEown, KO4ZA, 904-382-5755.

†**Florida (Ft Myers)—Jan 8-9;** set up Fri 6 PM-9 PM, Sat 6 AM-9 AM, public Sat 9 AM-5 PM, Sun 9 AM-3 PM. *Spr:* Ft Myers ARC, Araba Shrine Temple Hall, 2010 Hanson St, 1 block E of US Rte 41. Free parking, RV parking (no hookups), tailgating ($5), refreshments, VE sess (Sat 1:30 PM, Sun 10:30 AM), ARRL forums, traffic handling, RACES/ARES, packet. *TI:* 147.345. *Adm:* adv $5, door $6 (send SASE to FMARC, PO Box 061183, Ft Myers, FL 33906). Tables: $12 for both days. Jerry Deutscher, KQ4UW, 813-472-5130, Dale Hardin, KD4UAO, 813-275-8360 or G. E. Sammons, WA4DQE, 813-936-1431.

Florida (Orlando)—Jan 8, 7 AM-noon. *Spr:* UCF ARC, University of Central FL, Main Campus, University Blvd and Alafaya Trail. *TI:* 146.64, 147.06, CTCSS 103.5 Hz. *Adm:* Free. Frank Louden, WA3ZBM, 770 Bayou Dr, Casselberry, FL 32707, 407-699-4492.

Florida (Sarasota)—Jan 29, 9 AM-5 PM. *Spr:* Sarasota ARA, Sarasota County Fairgrounds, 3000 Ringling Blvd. Exhibits, tailgating, forums, free parking, refreshments, VE sess. *TI:* 146.31/.91, 146.13/.73. *Adm:* adv $5, door $7. General info Gene Marino, W1IDH, 813-355-0675; ticket info Val Lopez, KC4YAY, 813-951-1072; or write Hamfest, PO Box 3182, Sarasota, FL 34230.

Indiana (LaPorte)—Feb 26; set up 6 AM, public 8 AM. *Spr:* LaPorte ARC, LaPorte Civic Auditorium. *TI:* 146.61. *Adm:* no adv, door $4. Tables: $5 each. SASE to LPARC, PO Box 30, LaPorte, IN 46350.

†**Indiana (South Bend)—Jan 2,** 8 AM-3 PM. *Spr:* Michiana Valley Hamfest Assn, US 33 N at Jefferson Blvd. Refreshments. *TI:* .52, .39, .09, 145.29. *Adm:* adv $4, door $5. Bob Denniston, KA9WNR, 21970 Kern Rd, S Bend, IN 46614, SASE please, 219-291-0252, 7-10 PM EST weekdays.

†**Louisiana (Hammond)—Jan 15;** set up 7:30 AM, public 9 AM. *Spr:* SE LA University ARC. I-12 or I-55 to Hammond, take Columbus Dr to SLU University Ctr. Limited free swap tables, ARRL, LCARC meetings, MARS, QCWA, ARES, VE sess. *TI:* 147.00, 444.25. *Adm:* Free. Robert Priez, WB5FBS, 125 Florence Dr, Hammond, LA 70401, 504-542-1470.

†**Maryland (Odenton)—Jan 30,** 8 AM-2 PM. *Spr:* MD Mobileers ARC, Odenton Volunteer Fire Dept Hall, 1425 Annapolis Rd, (Rte 175). Flea market, free parking, refreshments, VE sess (prereg with Jerry Gavin, NU3D, 7801 Overhill Rd, Glen Burnie, MD 21060, 410-761-1423). *TI:* 146.205/.805. *Adm:* $3. Tables: adv $5. Tom Wilkinson, KA3OMU, 592 Eason Dr, Severn, MD 21144, 410-969-2639 eves.

Massachusetts (Mattapoisett)—Jan 16. Knights of Columbus Hall, Rte 6, from Rte 195 E or W exit on the Mattapoisett. Flea market. *Adm:* $1. Tables: $10. Judy Rapoza, 508-993-3993.

Michigan (Flint)—Jan 22, 8 AM-1 PM. *Spr:* ARAY & SW Academy RC, SW Academy High School, I-69 & Hammerberg Rd. VE sess (9 AM). *TI:* 145.29, 224.18, 224.54. *Adm:* adv $3, door $4. Tables: $1/foot. Keith Allen, N8QNA, 313-635-4123.

Minnesota (Blaine)—Feb 12; commercial set-up Fri 4-11 PM, public Sat 7 AM-2 PM. *Spr:* Robbinsdale ARC, National Sports Ctr, 1700 105th Ave, between 65 & 35W. *TI:* 147.00. *Adm:* adv $4, door $7. RARC, PO Box 22613, Robbinsdale, MN 55422, 612-537-1722.

†**Missouri (St Joseph)—Jan 15,** 9 AM-4 PM. *Sprs:* Missouri Valley ARC, Green-Hills ARC & Ray-Clay ARC. Ramada Inn, I-29 and Frederick Ave, (exit 47 on I-29). VE sess, exhibitors, flea market, free parking. *TI:* 146.85, 444.925. *Adm:* adv $2 each or 3 for $5, door $3 each or 2 for $5 (prereg requests received after Jan 4 will be held at the door). Tables: $9 each 1st 2 tables, write to NW MO Winter Hamfest, PO Box 182, Cameron, MO 64429. General info: Gaylen Pearson, WBØW, 1210 Midyett Rd, St Joseph, MO 64506, 816-232-8786.

†**Missouri (St Charles)—Jan 29;** set up Fri 5 PM-10 PM, Sat 5 AM-7:30 AM, public 8 AM-2 PM. *Spr:* St Louis Repeater. I-70 to exit 229 (Fifth St) at St Charles Exposition Hall in the Mark Twain Mall. VE sess (prereg required), free parking, refreshments, flea market, dealers. *TI:* 146.94, 442.1 Adm: $2. Tables: $12, electricity extra. 314-567-8777 (24 hrs), or write to St Louis Repeater, PO Box 50202, St Louis, MO 63105.

New York (Lockport)—Jan 29, 3 PM. *Spr:* Lockport ARA. *TI:* 146.82. Edmund Busch, 5316 Ernest Rd, Lockport, NY 14094.

New York (Yonkers)—Jan 16; vendors 7 AM, public 9 AM-3 PM. *Spr:* Metro 70 cm Network. NYS Thruway, N & S to Yonkers Ave, W on Yonkers Ave to St John's Ave, make left to Tereasa Ave, 1 block to school. Refreshments, free tuneup. *TI:* 146.31/.91, 440.425/445.425 (CTCSS 156.7 Hz), 223.76/222.16 (CTCSS 67 Hz). *Adm:* $5. Otto Supliski, WB2SLQ, 53 Hayward St, Yonkers, NY 10704, 914-969-1053.

†**Ohio (Dover)—Jan 30,** 8 AM. *Spr:* Tusco ARC. Exit I-77 at exit 87 (Strasburg), turn right at exit stop, go to 1st light. Hamfest is on right. Refreshments. *TI:* 146.13/.73. *Adm:* Free. Howard Blind, KD8KF, 6288 Echo Lake Rd, NE, New Philadelphia, OH 44663, 216-364-5258.

Ohio (Middletown)—Jan 15, 9 AM. *Sprs:* Engineering Technology Dept of Miami University, Middletown Dial RC and the OH Packet Council. Thesken Hall, Middletown Campus. Free parking, exhibits of packet/digital gear, seminars on beginning packet, intermediate digital modes. *TI:* 146.01/.61. *Adm:* free. Hank Greeb, N8XX @ KC8TW.OH.USA CompuServe 72277,706, 513-385-8363 after 6 PM, or write 6580 Dry Ridge Rd, Cincinnati, OH 45252.

Ontario (St Catharines)—Feb 5. *Spr:* Niagara Peninsula ARC, CAW Hall, 124 Bunting Rd. *TI:* 147.24/.84. *Adm:* $5. Tables: commercial $15, noncommercial $10. NPARC, PO Box 20036, Grantham Postal Outlet, St Catharines, Ontario, L2M 7W7, 905-937-6208.

†**Pennsylvania (Lancaster)—Jan 23,** 9 AM-4 PM. *Spr:* Columbia Area ARC. Rte 30 E of Lancaster from W, Rte 283 to Rte 30 go E at Host Convention Ctr. Vendors, commercial displays, free parking. *TI:* 146.115/.715. *Adm:* $5. Dutch Country Hamfest & Computer Shows, PO Box 682, E Petersburg, PA 17520, 717-560-2072 or fax 717-872-0857.

†**South Carolina (Charleston)—Feb 5,** 8:30 AM-4 PM. *Spr:* Charleston ARS. Charlestowne Landing State Park, 1500 Old Town Rd, off Hwy 17I. Refreshments, VE sess. *TI:* 146.19/.79. *Adm:* no adv, door $5, under 12 free. Jenny Myers, WA4NGV, 2630 Dellwood Ave, North Charleston, SC 29405-6814, 803-747-2324.

Tennessee (Gallatin)—Jan 22; set up Fri 4 PM-8 PM, Sat 5 AM-8 AM, public 8 AM. *Spr:* TN Valley AR Network. Volunteer State Community College, US 31E between Gallatin and Hendersonville. Refreshments, free parking, packet forum (10 AM-noon), VE sess (reg 9 AM-11 AM, testing 11 AM, for prereg send SASE before Jan 8 to Ronnie Gilley, 512 Hillside Dr, Gallatin, TN 37066). *TI:* 147.90/.30 (CTCSS 114.8 Hz), 442.60. *Adm:* $5, under 16 free. Tables: $10. SASE to Bill Ferrell, 1120 Douglas Bend Rd, Gallatin, TN 37066, 615-452-3962.

†**Virginia (Richmond)—Jan 16,** 8:30 AM-3:30 PM. *Spr:* Richmond Amateur Telecommunications Society, The Showplace, 3000 Mechanicsville Turnpike, ½ mi off I-64 on Rte 360, exit 192. VE sess (7:30 PM). *TI:* 146.28/.88, 144.83/145.43. *Adm:* $5. Reservations: Mark Huff, WA4DHY, 804-747-0227; general info: Bill Mason, AB3P, 804-745-5822. QST

†ARRL Hamfest

Coming Conventions

1994
February 18-20
Southeastern Division, Orlando, FL
February 26-27
Great Lakes Division, Cincinnati, OH
ARRL NATIONAL CONVENTIONS
June 10-12, 1994—Arlington, TX

FLORIDA STATE CONVENTION

February 5-6, 1994, Miami
The Florida State Convention is sponsored by the Dade RC of Miami and will be held at the Youth Fair/Expo Center at SW 112 Ave & Coral Way. Doors are open Sat 9 AM-5 PM, Sun 9 AM-4 PM. Features include onsite camping with full facilities, $40 for three nights, $55 four nights (no one- or two-day sites available); FCC forum with Ralph Haller; DX forum featuring Chip Margelli, K7JA, of Yaesu; ARRL forum; AMSAT forum; NTS/ARES forum; packet presentation; Amateur Auxiliary forum; special youth forum; VE sess. Admission $5 advance (until Feb 1), $6 at the door. Checks and money orders for tickets and camping should be made payable to Dade RC of Miami and mailed to Evelyn Gauzens, W4WYR, 2780 NW 3 St, Miami, FL 33125, 305-642-4139 or fax 305-642-1648. Headquarters Hotel is the Airport Marriott ($69 double or single) call 305-649-5000 and mention "Tropical Hamboree" for special rate. QST

Conducted by John C. Hennessee, KJ4KB
Regulatory Information Specialist

The New "Business Rules" are Here!

On September 13, 1993, the FCC relaxed Amateur Radio's business rules. Refer to October 1993 *QST*, p. 82 for the text of the revised rules. A copy of the actual Report and Order in PR Docket 92-136 is available from the Regulatory Information Branch at HQ for a business-size SASE.Certain previously prohibited practices are specifically allowed by the rules, which permit greater flexibility for hams in their public service and personal communications without altering the basic purpose of the Amateur Radio service. The newly revised Section 97.113 is a response to the increasing communications needs of amateurs and to changes in technology. Here's a look at the rules and how they affect you:

Q: ***Public service is one of the basic purposes of the Amateur Radio service. Why was there any question as to the legality of public service communications in the first place?***

A: Some amateurs were being cited by the FCC for their good faith public service communications because, technically, they were breaking a Part 97 rule. Many amateurs have received quizzical looks from event organizers who requested "logistical" support and were correctly told that hams weren't allowed to provide this type of communication. "Logistical" communications might involve the supplying, moving or quartering of participants. Under the old rules, if it primarily benefited the sponsor rather than the general public, it was a violation.

The confusion started about 1970, when there were concerns about possible abuses of the Amateur Radio service by nonamateur and business interests. These concerns led to a ban on amateur communications "to facilitate the business or commercial affairs of any party" or "as an alternative to other authorized radio services." This led to progressively more literal interpretations of the rules and had a chilling effect on public service communications. It seemed that amateurs were spending more time interpreting the rules than operating. Can I call my wife's workplace on the autopatch and ask her to bring home a loaf of bread? What if someone answers with the name of the company? Am I allowed to state over the air that I'm passing by McDonalds?

In February 1991, several East Coast packet BBS operators were cited for allowing a message urging the use of a "900" telephone number to proceed through their boards. Several amateurs who were providing communications for Alaska's annual Iditarod dog sled race were threatened to be cited for ordering supplies, even though they were many miles from the nearest telephone. The FCC told hams they could not send messages to their volunteer ARRL Section Managers, if the information in the messages might eventually end up in *QST*.

All of these examples illustrate the amateur community's confusion and the fact that we were being overly restricted by our own rules. All of these situations are now allowable under the new rules.

Q: ***Gee, just when I had a firm grasp on what was and wasn't allowed, the rules change and I have to rethink all my business rule interpretations. Why couldn't the FCC have left the rules alone? The rules are confusing enough already.***

A: The intent of the rules revision is to make the business rules easier, not harder, to interpret. Have you ever been "talked in" to a hamfest or convention over the air? If the answer is "yes," then you could have been cited for breaking the old, overly restrictive rules, because the FCC has stated that, under the old rules, this was a violation—hamfests are the "business" of clubs.

Q: ***So, what's the point? How does this change the way the business rules are to be interpreted?***

A: Through the new rules, the FCC has changed the regulatory focus from the *content* of the communications. This point is crucial. Amateurs need to remember four main principles when interpreting these new rules:

1) Amateurs can't be paid for communications. This has been understood and followed without much controversy since the early days of Amateur Radio. See Section 97.113(a)(2) in October 1993 *QST*, p. 82.

2) Communications for the benefit of one's employer are prohibited. See Section 97.113(a)(3). It you own a pizza restaurant, you can't use Amateur Radio to dispatch your drivers, for example.

3) Communications in which the control operator or licensee has a pecuniary interest are prohibited. See Section 97.113(a)(3). This would prohibit the businessman, for example, from calling his office for messages via Amateur Radio. Checking your business messages is your regular business because you're paid to do it.

4) Is it specifically prohibited? If the communication isn't, and if it isn't in violation of these four principles, then it's okay.

Also, the Amateur Radio service can't be regularly substituted for other licensed radio services. See Section 97.113(a)(5). An amateur or group of amateurs may provide communications for the Tournament of Roses Parade—an occasional event—even though other services could be used. Amateurs can't use their radios as a substitute for other services on a routine basis, however.

Q: ***Under the old rules, the FCC specifically mentioned that "swap nets" were legal. Are they still legal and can we mention prices over the air?***

A: Section 97.113(a)(3) also states that we can mention the availability of amateur gear and this includes mentioning the price, as long as it's not done on a regular basis by an individual control operator. FCC officials have stated that they aren't in favor of over-the-air "haggling".

Q: ***Can we conduct club business over the air?***

A: Sure, if the control operator or station licensee have nothing to gain monetarily.

Q: ***Why won't the FCC define what's meant by the term "on a regular basis?" How many times a year is "regular?"***

A: Amateurs shouldn't want the FCC to define that phrase and the Commission won't define it, anyway. A reasonable interpretation of that phrase is "not on a daily basis" or "not a usual part of amateur operation." The FCC never intended to assign a numerical value to this term, but rather, to depend on amateurs themselves to make sure that our spectrum isn't abused. The FCC wants us to use our heads when making rule interpretations and to apply the basic guidelines they've given us. After all, the FCC has quite a bit more to deal with than Amateur Radio. The fact that the FCC entrusts amateurs with these responsibilities demonstrates the confidence the FCC has in amateurs and it is something for which we should all be proud.

Q: ***Doesn't the relaxation of the business rules open the door to abuse?***

A: Possibly, but the potential for abuse has always been there. The revision of Section 97.113 allows the Amateur Radio service far more latitude for self-regulation, while removing the obstacles to true public service and personal communications. Nonamateurs may seek to gain private advantage from Amateur Radio communications, but it's up to individual amateurs to make sure that Amateur Radio isn't exploited. You may not be able to define "exploitation," but you'll know it when you see it!

Q: ***The rules state that we can't be paid to operate our ham stations. How does the revised Section 97.113 affect professional teachers who use Amateur Radio in the classroom? How about WIAW station operators? Operators in these situations are paid.***

A: True, but Section 97.113(c) now states that teachers may use Amateur Radio for classroom instruction even though they're being paid to teach. The old rules had a chilling effect on this use of Amateur Radio. There's been no

change to the old rule that control operators of club stations transmitting code practice and information bulletins may be compensated under certain limited circumstances. Specific conditions must be met before this narrow rule applies. See Section 97.113(d).

Q: ***Did any other parts of Section 97.113 remain the same?***

A: Yes. Section 97.113(a)(4) states that the following are still prohibited: Music; communications intended to facilitate a criminal act; messages in codes and ciphers intended to obscure the meaning; obscene or indecent words or language; and false or deceptive messages, signals or identification. Incidental music from space shuttle transmissions may be retransmitted, however.

Section 97.113(b) states that amateurs are still prohibited from broadcasting to the general public and from transmitting one-way communications, unless specifically provided for elsewhere in the rules. Amateur Radio still can't be used for program production for broadcast purposes unless such communications would save lives or protect property and if there isn't any other way to get the information to the public. Section 97.113(f) concerning automatic retransmissions remains the same.

Q: ***What about retransmissions from other radio services?***

A: It's still a violation to retransmit programs and signals emanating from other radio services, but there are exceptions. Propagation and weather forecast information intended for reception by the general public may be retransmitted, as long it's originated by a US government station, such as WWV and NOAA weather bulletin stations. The new rules also state that communications originating on US government frequencies between a space shuttle and its associated Earth stations may be retransmitted, including incidental music, as long as permission is obtained from NASA and the retransmissions are for the exclusive use of amateurs. These communications can't be conducted on a regular basis, but only occasionally. Amateurs have received blanket permission from NASA to rebroadcast these communications as long as it's done for educational purposes.

Q: ***Why won't the FCC give us a list of what is permissible and what isn't?***

A: The FCC declined to comply with the ARRL's request for a list of permitted and prohibited practices because there are thousands of examples. The FCC went on to state that it doesn't have the staff resources to create and maintain such a list.

Q: ***How, then, are we supposed to know what's legal and what isn't?***

A: The FCC said that it will rely on the amateur community to determine whether specific communications should be transmitted on amateur frequencies. As stated earlier, the rule of thumb now is that any amateur-to-amateur communication is permitted unless specifically prohibited, or transmitted for compensation, or unless done for the pecuniary benefit of the station control operator or his or her employer. Amateur Radio may be used as an alternative to a more appropriate radio service only on an occasional basis.

Q: ***I've heard that we can even order food, like pizza, over the air.***

A: Well, why not order a steak from the local steak house? The new rules don't apply only to pizza orders. As long as you don't benefit monetarily and as long as the restaurant isn't your employer, you're golden. The FCC says we can conduct our own personal business over Amateur Radio.

Q: ***I don't think it's right to conduct any type of business over the air. I'm not going to let anyone order pizza or anything else through my repeater. I just don't think that it's right and I don't care if the rules say we can. I can do that, can't I?***

A: Sure you can. Repeaters are private property and you can restrict users in any way you like if they're operating through your repeater. Nobody owns a frequency. You own a repeater, but not the frequency it's on. You may want to use CTCSS tones to permit only certain users to access your repeater.

Q: ***Our club worked hard to get the phone company to allow our repeater phone line to be assessed a residential rate. It was based on the fact that we can't conduct business on Amateur Radio. Will this new rule jeopardize our residential rate?***

A: Following the meeting with the FCC Commissioners in which the Notice of Proposed Rulemaking in PR Docket 92-136 was approved, FCC Private Radio Bureau Chief Ralph Haller was asked what effect increased use of autopatches would have on phone companies. He replied that the volume of calls was so small that it wouldn't be a problem and that it was an incidental part of Amateur Radio operation.

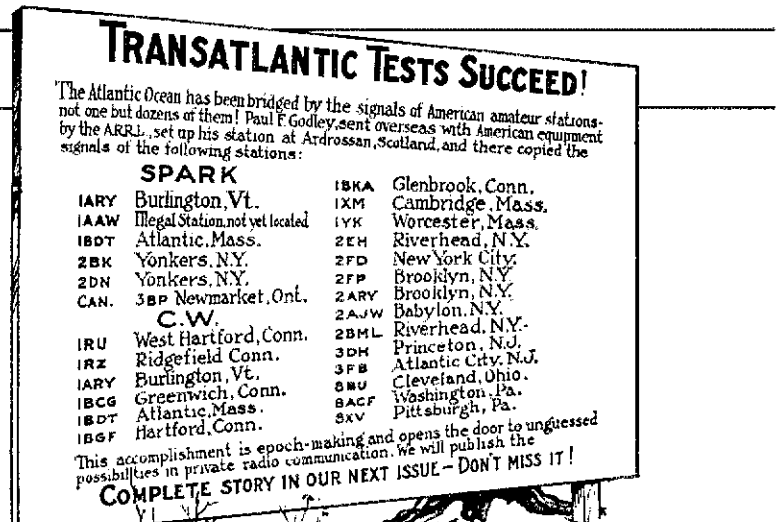
The revised rules are cause for celebration. Let's use them to our advantage.

Questions in this column have been prepared by ARRL HQ and are typical of those asked of ARRL Directors, HQ staffers and the FCC. We welcome your input for future columns. Questions may be sent to John Hennessee, KJ4KB, at ARRL HQ. QST

Strays

◊ One particularly exciting event in the early days of Amateur Radio was the success of the second amateur transatlantic tests. In December 1921, Paul F. Godley, 2XE, was sent to Scotland by the ARRL to listen for North American amateur signals. Assisted by D. E. Pearson, he heard nearly 30 stations in this history-making shortwave-listening work. (For accounts of this event, see K. B. Warner, "The Story of the Transatlantics," *QST*, Feb 1922, pp 7-14; Paul F. Godley, "Official Report on the Second Transatlantic Tests," *QST*, Feb 1922, pp 14-28, 36-40, 46; Robert C. Higgy, "The Successful Transatlantics," *QST*, Mar 1922, pp 11-18; Sumner B. Young, "*QST*—Volume V," December 1956, pp 50-59, 148, 150, 152, 154; and Clinton B. DeSoto, *Two Hundred Meters and Down*, ARRL, 1936, pp 72-74. DeSoto's book is available from the ARRL; see the Publications Catalog elsewhere in this issue).

Ray Faber, WB1AVE, of Waterbury, Connecticut, recently wrote HQ to remind us that Jim Russell, whose signals as 8BU were heard by Pearson, is still alive and well, and holds the call sign W8BU. This raises interesting questions in our minds at *QST*: How many others of the hams heard by Godley and Pearson in Scotland are still alive and how many of them still hold amateur licenses? If you can help, please send any information you can furnish to *QST* Managing Editor Al Brogdon, K3KMO, at ARRL HQ. A first cut at a listing of the call signs of some of the amateurs heard by Godley and Pearson appeared on the cover of January 1922 *QST*, reproduced above.


TRANSATLANTIC TESTS SUCCEED!

The Atlantic Ocean has been bridged by the signals of American amateur stations—not one but dozens of them! Paul F. Godley, sent overseas with American equipment by the ARRL, set up his station at Ardrossan, Scotland, and there copied the signals of the following stations:

SPARK

1ARY	Burlington, Vt.	1BKA	Glenbrook, Conn.
1AAW	Illegal Station, not yet located	1XM	Cambridge, Mass.
1BDT	Atlantic, Mass.	1YK	Worcester, Mass.
2BK	Yonkers, N.Y.	2EH	Riverhead, N.Y.
2DN	Yonkers, N.Y.	2FD	New York City
CAN.	3BP Newmarket, Ont.	2FP	Brooklyn, N.Y.
		2ARY	Brooklyn, N.Y.
	C.W.	2AJW	Babylon, N.Y.
1RU	West Hartford, Conn.	2BML	Riverhead, N.Y.
1RZ	Ridgefield Conn.	3DH	Princeton, N.J.
1ARY	Burlington, Vt.	3FB	Atlantic City, N.J.
1BCG	Greenwich, Conn.	8BU	Cleveland, Ohio.
1BDT	Atlantic, Mass.	8ACF	Washington, Pa.
1BGF	Hartford, Conn.	8XV	Pittsburgh, Pa.

This accomplishment is epoch-making and opens the door to unguessed possibilities in private radio communication. We will publish the

COMPLETE STORY IN OUR NEXT ISSUE—DON'T MISS IT!

The 1994 Handy Reference Section

Here it is! A list of important operating events, hamfests, conventions and contests. It's the 1994 ARRL Calendar—and more! We've included a ton of useful information: information on using the ARRL Incoming QSL Bureau and Outgoing QSL Service, W1AW schedule, a chart of ham frequency allocations and a large section about the League's services—and how you can take advantage of them!

You'll probably want to photocopy this section and keep it in your shack. So go ahead, do it!

GUIDE TO ARRL SERVICES

As an ARRL member, you are entitled to a host of benefits and services. The HQ staff, along with hundreds of local volunteers, stand ready to serve you.

QST. Long considered the world's premiere ham radio magazine, the ARRL membership journal is packed with information on operating techniques, ham radio technology and all the enjoyable things you can do with a ham radio license. Whether you're a newcomer or an old-timer, *QST* is indispensable.

Other League Publications. ARRL publishes top-notch books on all ham radio subjects. Have a question about a League publication? Contact the Technical Department at HQ. If you want to order a book, contact Publication Sales.

New Ham Help. Are you a new ham looking for some basic assistance in navigating around your new hobby? The Educational Activities Department at HQ will be glad to help.

ARRL Membership Bulletin Board. Have a computer and a modem? Many timely and useful items are available from the "Hiram" BBS at (203) 666-0578. For assistance, call Luck Hurder at ARRL HQ.

ARRL Field Organization. Interested in serving the League and Amateur Radio in the areas of government liaison, traffic handling, emergency communications, information management or public relations? Want to be an official League volunteer in the Field Organization? Contact Field Services at HQ, or your Section Manager (see page 8) for information and an application form.

Amateur Radio Emergency Service. Join more than 25,000 other hams who have registered their capabilities with local Emergency Coordinators. Your EC will call on you and other ARES members for vital assistance if disaster should strike your community. Contact your EC, Section Manager or ARRL HQ for more information.

Traffic Handling. Want to get involved in traffic handling and the National Traffic System? Contact your Section Manager for help in getting started. Field Services at HQ can provide you with training materials and operating aids.

Amateur Auxiliary, Official Observers. Have an OO notice and want to talk about it? Want to join the program? Contact your OO Coordinator, your Section Manager and/or Field Services at League HQ for information and an application form.

Technical Information Service. Have a question of a technical nature? Contact your field-based ARRL Technical Coordinator or Technical Specialist for help. Your Section Manager can give you the name of your local TS or TC. Bibliographies on a number of subjects are available from the Technical Secretary at ARRL HQ.

RFI Problems. Have a neighbor-relations problem over radio-frequency interference? Contact your local Technical Coordinator or Technical Specialist for personalized assistance. Contact the ARRL HQ Technical Department Secretary for a free RFI package.

Regulatory Information. Need help with a thorny antenna zoning problem? Having trouble understanding an FCC regulation? Traveling to a faraway place and want to know how to get permission to operate there? Contact Regulatory Information at ARRL HQ.

Ham Radio Equipment Insurance and **Club Liability Insurance.** ARRL members can sign up to protect all their mobile and home-station gear, and ARRL-affiliated clubs can protect themselves against mishaps. Contact Field Services at ARRL HQ for a brochure and application form.

Volunteer Counsel. Need legal representation for a local antenna hearing? Volunteer Counsels are ham lawyers who have experience in this area. HQ can help you get in touch with one.

QSL Service. For information on how to send and receive your QSL cards, send an SASE to HQ. Information also appears in this special section.

Operating Awards. Like to collect wallpaper? ARRL sponsors a wide range of certificates and awards. For information on the DX Century Club (DXCC), Worked All States (WAS), Worked All Continents (WAC), VHF/UHF Century Club (VUCC), and other awards, write to the Membership Services Department at ARRL HQ.

W1AW Code Practice and Bulletin Service. For a schedule of regular transmissions from the ARRL HQ station, send an SASE to W1AW at ARRL HQ. The latest schedule also appears in this special section.

Licensing Classes. Looking for a local licensing class? Want to register a class with HQ? Contact the Educational Activities Department at ARRL HQ.

Instructors. Need assistance in teaching a ham radio class? Have a question about the Space Shuttle Amateur Radio Experiment (SAREX)? Want to know when the next Educational Workshop will be held? Contact the Educational Activities Department at ARRL HQ.

Examinations. Need info on local exam opportunities? Contact the ARRL/VEC at League HQ for a printout.

Conventions/Hamfests. Need help in getting official ARRL sanction for your event? Want a consignment, prizes and/or handouts? Contact the Convention Branch at HQ.

Clubs. Need the name of a local club? Is your club looking to become affiliated with ARRL? Already affiliated, and looking to become a Special Service Club? Contact Club Services for information and application forms.

ARRL Contests. Need log sheets for the next ARRL contest? Send an SASE to Special Requests, ARRL HQ. (Postage requirements are described in contest announcements in *QST*.) If you have a contest question, contact the Contest Branch.

Field Day. Contact the Contest Branch at ARRL HQ for answers to questions on Field Day.

International Travel Host Exchange. Want to exchange residences with an overseas ham while you're on vacation? For information on this program, contact the Regulatory Information Branch at ARRL HQ.

Public Relations. Have a hot story on your hands? Contact your local Public Information Officer for assistance in getting it into the hands of the media. (Your Section Manager can tell you how to contact your PIO.) Tell the ARRL Public Information Manager (at HQ) about it.

Exhibit Kits. Need promotional materials for your next shopping mall display? Contact the Educational Activities Department for an Exhibit Kit.

Satellite operating. Questions about ham satellites should be directed to Steve Ford at League HQ.

ARRL Foundation. Want to make a donation in memory of a friend or relative to a scholarship or other charitable program of benefit to Amateur Radio? Consider the ARRL Foundation. Contact the ARRL Foundation Secretary at League HQ.

Audio-visual Library. Need a program for your next club meeting? You can borrow a video tape from the League's video library at HQ. There are many to choose from, including popular titles on Amateur Radio's role in Operation Desert Storm and space shuttle activities. Contact the Educational Activities Department at HQ.

Blind, Disabled Ham Help. For a list of resources available to you, and for information on the Courage HANDI-HAM System, contact the ARRL Program for the Disabled at ARRL HQ.

National Repeater Coordinator's Data Base. Contact Jay Mabey, Regulatory Information Branch, at ARRL HQ, for assistance with the NRDB.

Ham Ads. Want to advertise something related to Amateur Radio in *QST*'s "Ham Ads"? Contact the Advertising Department at HQ.

THE ARRL INCOMING QSL BUREAU SYSTEM

Purpose

Within the US and Canada, the ARRL DX QSL Bureau System is made up of numerous call area bureaus that act as central clearinghouses for QSL cards arriving from foreign countries. These "incoming" bureaus are staffed by volunteers. The service is free and ARRL membership is not required.

How it Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL Outgoing QSL Service. The member sends his cards to his outgoing bureau, where they are packaged and shipped to the appropriate countries.

A majority of the DX QSL cards are shipped directly to the individual incoming bureaus, where volunteers sort the incoming QSLs by the first letter of the call sign suffix. One individual may be assigned the responsibility of handling one or more letters of the alphabet. Operating costs are funded from ARRL membership dues.

Claiming your QSLs

Send a 5 × 7½- or 6 × 9-inch self-addressed, stamped envelope (SASE) to the bureau serving your call sign district. Neatly print your call sign in the upper left corner of the envelope. Place your mailing address on the front of the envelope. A suggested way to send envelopes is to affix a First Class stamp and clip extra postage to the envelope. Then, if you receive more than 1 oz. of cards, they can be sent in the single package. Some incoming bureaus sell envelopes or postage credits in addition to the normal SASE handling. They provide the proper envelopes and postage upon the prepayment of a certain fee. The exact arrangements can be obtained by sending your inquiry with an SASE to your area bureau. A list of bureaus appears below.

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. The people who work in the area bureaus are volunteers providing you with a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

- DO keep self-addressed 5 × 7½- or 6 × 9-inch envelopes on file at your bureau, with your call sign in the upper left corner, and affix at least one unit of First-Class postage.
- DO send the bureau enough postage to cover SASEs on file and enough to take care of possible postage rate increases.
- DO respond quickly to any bureau request for SASEs, stamps or money. Unclaimed card backlogs are the bureaus' biggest problem.
- DO notify the bureau of your new call sign as you upgrade. Please send SASEs with your new call sign, in addition to SASEs with your old call sign.
- DO include a SASE with any information request to the bureau.
- DO notify the bureau in writing if you don't want your cards.

DON'Ts

- DON'T send domestic US-to-US cards to your call-area bureau.
- DON'T expect DX cards to arrive for several months after the QSO. Overseas delivery is slow. Many cards coming from overseas bureaus are more than a year old.
- DON'T send your outgoing DX cards to your call-area bureau.
- DON'T send SASEs to your "portable" bureau. For example, AA2Z/1 sends SASEs to the W2 bureau, not the W1 bureau.
- DON'T send SASEs to the ARRL Outgoing QSL Service.

ARRL INCOMING DX QSL BUREAU ADDRESSES

First Call Area: All calls*
W1 QSL Bureau
YCCC
PO Box 80216
Springfield, MA 01138-0216

Second Call Area: All calls*
ARRL 2nd District QSL Bureau
NJDXA, PO Box 599
Morris Plains, NJ 07950.

Third Call Area: All calls
C-CARS, PO Box 448
New Kingstown, PA 17072-0448

Fourth Call Area: All single-letter prefixes (K4, N4, W4)
Mecklenburg Amateur Radio Club
PO Box DX
Charlotte, NC 28220

Fourth Call Area: All two-letter prefixes (AA4, KB4, NC4, WD4, etc)
Sterling Park Amateur Radio Club
Call Box 599
Sterling, VA 20167

Fifth Call Area: All calls*
ARRL W5 Incoming QSL Bureau
PO Box 50625
Midland, TX 79710

Sixth Call Area: All calls*
ARRL Sixth District DX
QSL Bureau
PO Box 1460
Sun Valley, CA 91352

Seventh Call Area: All calls -
Willamette Valley DX Club, Inc
PO Box 555
Portland, OR 97207

Eighth Call Area: All calls
8th Area QSL Bureau
PO Box 182165
Columbus, OH 43218-2165

Ninth Call Area: All calls*
Northern Illinois DX Assn
PO Box 519
Elmhurst, IL 60126

Zero Call Area: All calls*
WØ QSL Bureau
PO Box 4798
Overland Park, KS 66204

Puerto Rico: All calls*
KP4 QSL Bureau
PO Box 1061
San Juan, PR 00902

US Virgin Islands: All calls
Virgin Islands ARC
GPO Box 11360
Charlotte Amalie
Virgin Islands 00801

Hawaiian Islands: All calls*
Wayne Jones, NH6GJ
PO Box 788
Wahiawa, HI 96786

Alaska: All calls*
Alaska QSL Bureau
4304 Garfield St.
Anchorage, AK 99503

Guam: MARC
PO Box 445
Agana, Guam 96910

SWL: Mike Witkowski, WDX9JFT
4206 Nebel St
Stevens Point, WI 54481

QSL cards for Canada may be sent to:
RAC Incoming QSL Bureau
PO Box 51
St John, NB E2L 3X1

QSL cards for Canada may also be sent to the individual bureaus:

VE1,VE9,VEØ,VY2* -
James Wade, VE1DH
PO Box 141
Petitcodiac, NB E0A 2H0

VO1, VO2 - Roland Peddle, VO1BD
PO Box 6
St John's, NF A1C 5H5

VE2 - A. G. Daemen, VE2IJ
2960 Douglas Ave
Montreal, PQ H3R 2E3

VE3 - Garry Hammond, VE3XN
5 McLaren Ave
Listowel, ON N4W 3K1

VE4 - Adam Romanchuk, VE4SN
26 Morrison St
Winnipeg, MB R2V 3B4

VE5*- Bj. Madsen, VE5FX
739 Washington Dr
Weyburn, SK S4H 3C7

VE6*- Norm Waltho, VE6VW
PO Box 1890
Morinville, AB T0G 1P0

VE7*- Dennis Livesey, VE7DK
8309 112th St
Delta, BC V4C 4W7

VE8*- Rolf Ziemann, VE8RZ
2 Taylor Rd
Yellowknife, NWT X1A 2K9

VY1 - W.L. Champagne, VY1AU
PO Box 4597
Whitehorse, YU Y1A 2RB

*These bureaus sell envelopes or postage credits. Send an SASE to the bureau for information.

THE ARRL OUTGOING QSL SERVICE

The ARRL Outgoing QSL Service should not be used to exchange QSL cards within the 48 contiguous states.

One of the greatest bargains of League membership is being able to use the ARRL Outgoing QSL Service to conveniently send your DX QSL cards overseas to foreign QSL Bureaus. Your ticket for using this service is your *QST* address label and just $2 per pound. For those not quite so DX active (sending 10 cards or less), enclose $1. You can't even get a deal like that at your local warehouse supermarket! And the potential savings over the substantial cost of individual QSLing is equal to many times the price of your annual dues. Your cards are sorted promptly by the Outgoing QSL Service staff, and cards are on their way overseas usually within a week of arrival at ARRL HQ. Approximately two million cards are handled by the Service each year.

QSL cards are shipped to QSL Bureaus throughout the world, which are typically maintained by the national Amateur Radio society of each country. While no cards are sent to individuals or individual QSL managers, what you might lose in speed is more than made up in the convenience and savings of not having to address and mail QSL cards separately. (In the case of DXpeditions and/or active DX stations that use US QSL managers, a better approach is to QSL directly to the QSL manager. The various DX newsletters, the W6GO QSL manager directory, and other publications, are good sources of up-to-date QSL manager information.)

As postage costs become increasingly prohibitive, don't go broke before you're even halfway toward making DXCC. There's a better and cheaper way—"QSL VIA BURO" through the ARRL Outgoing QSL Service!

How To Use The ARRL Outgoing QSL Service

1) Presort your DX QSL cards alphabetically by parent call sign prefix (AP, C6, CE, DL, ES, F, G, JA, LY, PY, U, YL, 5N, 9Y and so on). When sorting countries that have multiple prefixes, keep that country's prefixes grouped together in your alphabetical stack. *Addresses are not required.* ***DO NOT*** *separate the country prefix by use of paper clips, rubber bands, slips of paper or envelopes.*

2) Enclose the address label from your current copy of *QST*. The label shows that you are a current ARRL Member.

3) Enclose payment of $2 per each pound of cards—approximately 150 cards weigh one pound. A package of 10 cards or fewer costs only $1. Please pay by check (or money order) and write your call sign on the check. Send "green stamps" (cash) at your own risk. **DO NOT** send postage stamps or IRCs.

4) Include only the cards, address label and check in the package. Wrap the package securely and address it to the ARRL Outgoing QSL Service, 225 Main St, Newington, CT 06111.

5) Family Members may also use the service by enclosing their QSL cards with those of the primary Member. Include the appropriate fee with each individual's cards and indicate "family membership" on the primary Member's *QST* address label.

6) Blind Members who do not receive *QST* need only include the appropriate fee along with a note indicating that the cards are from a blind Member.

7) ARRL affiliated-club stations may use the service when submitting club QSL cards by indicating the club name. Club secretaries should check affiliation papers to ensure that affiliation is current. In addition to sending club station QSL cards through this service, affiliated clubs may also "pool" their members' individual QSL cards to effect an even greater savings. Each club member using this service must also be a League Member. Cards should be sorted *en masse* by prefix, and a *QST* label enclosed for each ARRL Member.

Recommended QSL Card Dimensions

The efficient operation of the worldwide system of QSL bureaus requires that cards be easy to handle and sort. Cards of unusual dimensions, either much larger or much smaller than normal, slow the work of the bureaus, most of which is done by unpaid volunteers. A review of the cards received by the ARRL Outgoing QSL Service indicates that most fall in the following range: Height = 2¾ to 4¼ in (70 to 110 mm), Width = 4¾ to 6¼ in (120 to 160 mm). Cards in this range can be easily sorted, stacked and packaged. Cards outside this range create problems; in particular, the larger cards often cannot be handled without folding or otherwise damaging them. In the interest of efficient operation of the worldwide QSL bureau system, it is recommended that cards entering the system be limited to the range of dimensions given. IARU Region 2 has suggested the following dimensions as optimum: Height 3½ in (90 mm), Width 5½ in (140 mm).

Countries Not Served By The Outgoing QSL Service

Approximately 260 DXCC countries are served by the ARRL Outgoing QSL Service, as detailed in the ARRL DXCC Countries List. This includes nearly every active country. As noted previously, cards are forwarded from the ARRL Outgoing Service to a counterpart bureau in each of these countries. In some cases, there is no Incoming bureau in a particular country and cards therefore cannot be forwarded. However, QSL cards can be forwarded to a QSL manager. The ARRL Outgoing QSL Service cannot forward cards to the following countries:

A5	Bhutan
A6	United Arab Emirates
C9	Mozambique
D2	Angola
EP	Iran
ET	Ethiopia
J5	Guinea-Bissau
KC4	US bases in Antarctica
KC6	Belau
KH0	Mariana Is
KH1	Baker and Howland Is
KH4	Midway I
KH5	Palmyra and Jarvis Is
KH7	Kure I
KH8	Am Samoa
KH9	Wake I
KP1	Navassa I
KP5	Desecheo I
OD	Lebanon
P5	North Korea
S2	Bangladesh
S7	Seychelles
T2	Tuvalu
T3	Kiribati
T5	Somalia
TJ	Cameroon
TL	Central African Republic
TN	Congo
TT	Chad
TY	Benin
TZ	Mali
V4 (VP2K)	St Kitts & Nevis
V6 (KC6)	Micronesia
VP2E	Anguilla
VP2M	Montserrat
VR6	Pitcairn Island
XT	Burkina Faso
XU	Kampuchea
XW	Laos
XX9	Macao
XZ (1Z)	Myanmar (Burma)
YA	Afghanistan
YI	Iraq
ZD7	St Helena
ZD9	Tristan da Cunha
ZK3	Tokelau
3C0	Pagalu I
3C	Equatorial Guinea
3V	Tunisia
3W, XV	Vietnam
3X	Guinea
5A	Libya
5H	Tanzania
5R	Madagascar
5T	Mauritania
5U	Niger
5X	Uganda
7O, 4W	Yemen
7Q	Malawi
8Q	Maldives
9G	Ghana
9N	Nepal
9Q	Zaire
9U	Burundi
9X	Rwanda

The countries that currently restrict forwarding of QSL cards to members of that country's national radio organization include the following:

Egypt	Monaco
France	Morocco
Germany	Portugal
Japan	

NOTE: SWL cards can be forwarded through the Outgoing QSL Service.

NOTE: We no longer hold cards for countries with no Incoming bureau. Only cards indicating a QSL manager for a station in these particular countries will be forwarded.

The "Considerate Operator's Frequency Guide"

The following frequencies are generally recognized for certain modes or activities (all frequencies are in MHz).

Nothing in the rules recognizes a net's, group's or any individual's special privilege to any specific frequency. Section 97.101(b) of the Rules states that "Each station licensee and each control operator much cooperate in selecting transmitting channels and in making the most effective use of the amateur service frequencies. No frequency will be assigned for the exclusive use of any station." No one "owns" a frequency.

It's good practice—and plain old common sense—for any operator, regardless of mode, to check to see if the frequency is in use prior to engaging operation. If you are there first, other operators should make an effort to protect you from interference to the extent possible given that 100% interference-free operation is an unrealistic expectation in today's congested bands.

1.800-1.830	CW, RTTY and other narrowband modes
1.830-1.840	CW, RTTY and other narrowband modes, intercontinental QSOs only
1.840-1.850	CW, SSB, SSTV and other wideband modes, intercontinental QSOs only
1.850-2.000	CW, phone, SSTV and other wideband modes
3.590	RTTY DX
3580-3620	RTTY
3620-3635	Packet
3.790-3.800	DX window
3.845	SSTV
3.885	AM calling frequency
7.040	RTTY DX
7.080-7.100	RTTY
7.171	SSTV
7.290	AM calling frequency
10.130-10.140	RTTY
10.140-10.150	Packet
14.070-14.095	RTTY
14.095-14.0995	Packet
14.100	NCDXF beacons
14.1005-14.112	Packet
14.230	SSTV
14.286	AM calling frequency
18.100-18.105	RTTY
18.105-18.110	Packet
21.070-21.100	RTTY
21.090-21.110	Packet
21.340	SSTV
24.920-24.925	RTTY
24.925-24.930	Packet
28.070-28.120	RTTY
28.120-28.189	Packet
28.190-28.225	Beacons
28.680	SSTV
29.000-29.200	AM
29.300-29.510	Satellite downlinks
29.520-29.580	Repeater inputs
29.600	FM simplex
29.620-29.680	Repeater outputs

Note

ARRL band plans for frequencies above 28.300 MHz are shown in the *ARRL Repeater Directory* and *FCC Rule Book*. For detailed packet frequencies, see *QST*, September 1987, page 54, and March 1988, page 51.

W1AW schedule

Pacific	Mtn	Cent	East	Sun	Mon	Tue	Wed	Thu	Fri	Sat
6 am	7 am	8 am	9 am			Fast Code	Slow Code	Fast Code	Slow Code	
7 am	8 am	9 am	10 am			Code Bulletin				
8 am	9 am	10 am	11 am			Teleprinter Bulletin				
9 am	10 am	11 am	noon							
10 am	11 am	noon	1 pm		Visiting Operator Time					
11 am	noon	1 pm	2 pm							
noon	1 pm	2 pm	3 pm							
1 pm	2 pm	3 pm	4 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
2 pm	3 pm	4 pm	5 pm	Code Bulletin						
3 pm	4 pm	5 pm	6 pm	Teleprinter Bulletin						
4 pm	5 pm	6 pm	7 pm	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
5 pm	6 pm	7 pm	8 pm	Code Bulletin						
6 pm	7 pm	8 pm	9 pm	Teleprinter Bulletin						
6:45 pm	7:45 pm	8:45 pm	9:45 pm	Voice Bulletin						
7 pm	8 pm	9 pm	10 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
8 pm	9 pm	10 pm	11 pm	Code Bulletin						
9 pm	10 pm	11 pm	Mdnte	Teleprinter Bulletin						
9:45 pm	10:45 pm	11:45 pm	12:45 am	Voice Bulletin						

❑ ***Morse code transmissions:***

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 1992 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 WPM.

❑ ***Teleprinter transmissions:***

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are send at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Saturdays at 6:30 PM Eastern time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

❑ ***Voice transmissions:***

Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

❑ ***Miscellanea:***

A DX bulletin replaces or is added to the regular bulletins between 8 PM Eastern time Thursdays and 8 PM Eastern time Fridays.

W1AW is open to visitors during normal operating hours: from 1 PM until 1 AM on Mondays, 9 AM until 1 AM Tuesday through Friday, from 1 PM to 1 AM on Saturday, and from 3:30 PM to 1 AM on Sundays. FCC licensed amateurs may operate the station from 1-4 PM Monday through Saturday. Be sure to bring your current FCC amateur license or a photocopy.

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.

Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day. On the first Thursday of September, Headquarters and W1AW will be closed during the afternoon.

Major ARRL Operating Events and Conventions–1994

(Check *QST* monthly for updates)

JANUARY

1	Straight Key Night
2	ARRL Hamfest (South Bend, IN)
8-9	ARRL RTTY Roundup
8-9	ARRL Hamfest (Ft Myers, FL)
15	ARRL Hamfest (Monterey, CA)
15	ARRL Hamfest (Hammond, LA)
15	ARRL Hamfest (St Joseph, MO)
16	ARRL Hamfest (Richmond, VA)
22	ARRL Hamfest (Crystal River, FL)
22-24	ARRL January VHF Sweepstakes
23	ARRL Hamfest (Lancaster, PA)
29	ARRL Hamfest (St Charles, MO)
29-Feb 6	ARRL Novice Roundup
30	ARRL Hamfest (Odenton, MD)
30	ARRL Hamfest (Dover, OH)

FEBRUARY

5	ARRL Hamfest (Charleston, SC)
5-6	Florida State Convention (Miami)
12	ARRL Hamfest (Goshen, NY)
12	ARRL Hamfest (Owensboro, KY)
13	ARRL Hamfest (Mansfield, OH)
14-18	School Club Roundup*
18-20	Southeastern Division Convention (Orlando, FL)
19-20	ARRL International DX Contest, CW
20	ARRL Hamfest (Elkin, NC)
26	ARRL Hamfest (Brooksville, FL)
26	ARRL Hamfest (Pensacola, FL)
26-27	Great Lakes Division Convention (Cincinnati, OH)
27	ARRL Hamfest (Dearborn, MI)

MARCH

5	ARRL Hamfest (Cave City, KY)
5-6	ARRL International DX Contest, phone
12	ARRL Hamfest (Scottsdale, AZ)
12	ARRL Hamfest (Puyallup, WA)
12-13	ARRL Hamfest (Charlotte, NC)
13	ARRL Hamfest (Conneaut, OH)
18-20	Nebraska Section Convention (Norfolk)
19	ARRL Hamfest (Marietta, GA)
20	ARRL Hamfest (Sterling, IL)
20	ARRL Hamfest (Monroeville, PA)
20	ARRL Hamfest (Maumee, OH)
26-27	Maryland State Convention (Timonium)
27	ARRL Hamfest (Grayslake, IL)
27	ARRL Hamfest (Kinston, NC)
27	ARRL Hamfest (Charleston, WV)

APRIL

9	ARRL Hamfest (Lawton, OK)
10	ARRL Hamfest (New Castle, DE)
10	ARRL Hamfest (Madison, WI)
15-16	Arkansas State Convention (North Little Rock)
15-17	International DX Convention (Visalia, CA)
17	North Carolina State Convention (Raleigh)
17	ARRL Hamfest (Sullivan, IL)
18	144-MHz Spring Sprint (Mon)
26	222-MHz Spring Sprint (Tue)
29-May 1	West Coast VHF/UHF Conference (Cerritos, CA)
29-May 1	Dayton HamVention*

*Not an ARRL event

MAY

4	432-MHz Spring Sprint (Wed)
7	ARRL Hamfest (Klamath Falls, OR)
7-8	ARRL Hamfest (Fresno, CA)
8	ARRL Hamfest (Medina, OH)
13-14	Nebraska State Convention (South Sioux City)
14	ARRL/VEC National Exam Day
14	902-MHz Spring Sprint (Sat)
14	1296-MHz Spring Sprint (Sat)
14	2304-MHz Spring Sprint (Sat)
14-15	ARRL Hamfest (Yakima, WA)
15	ARRL Hamfest (Pedtone, IL)
15	ARRL Hamfest (Wrightstown, PA)
15	ARRL Hamfest (Wheeling, WV)
15-16	Alabama State Convention (Birmingham)
20-22	Atlantic Div/NY State Convention (Rochester)
20-22	West Gulf Division Convention (Tulsa, OK)
21	ARRL Hamfest (Kansas City, KS)
21	ARRL Hamfest (Paducah, KY)
21	ARRL Hamfest (Godfrey, IL)
21-22	50-MHz Spring Sprint (Sat-Sun)
21-22	ARRL Hamfest (Baton Rouge, LA)
22	ARRL Hamfest (Hagerstown, MD)
28-29	ARRL Hamfest (Cody, WY)

JUNE

4-5	Northwestern Division Convention (Seaside, OR)
4	ARRL Hamfest (Teaneck, NJ)
4	ARRL Hamfest (Wilmington, NC)
4-6	ARRL June VHF QSO Party
5	ARRL Hamfest (Princeton, IL)
5	ARRL Hamfest (Tamaqua, PA)
5	ARRL Hamfest (Manassas, VA)
10-12	ARRL National Convention (Arlington, TX)
12	ARRL Hamfest (Willow Springs, IL)
17-18	Georgia State Convention (Albany)
18	ARRL Hamfest (Russellville, AR)
18	ARRL Hamfest (Milford, OH)
18	Tennessee State Convention (Nashville)
25-26	Field Day

MAJOR ARRL OPERATING EVENTS AND CONVENTIONS–1994

(CHECK *QST* MONTHLY FOR UPDATES)

JULY

9	ARRL Hamfest (Salisbury, NC)
9	ARRL Hamfest (Texas City, TX)
9-10	IARU HF World Championship
9-10	Central Division Convention (Indianapolis, IN)
10	ARRL Hamfest (Alexander, NY)
15-17	Montana State Convention (East Glacier)
17	ARRL Hamfest (Van Wert, OH)
17	ARRL Hamfest (Washington, MO)
24	ARRL Hamfest (Stickney, IL)
31	ARRL Hamfest (Port Huron, MI)

AUGUST

5-7	ARRL Hamfest (Idaho Falls, ID)
6-7	ARRL UHF Contest
7	ARRL Hamfest (Peotone, IL)
7	ARRL Hamfest (Randolph, OH)
7	ARRL Hamfest (Warrington, PA)
7	ARRL Hamfest (Berryville, VA)
14	ARRL Hamfest (Cedar Rapids, IA)
20	New Mexico State Convention (Albuquerque)
20-21	ARRL 10-GHz Cumulative Contest
21	ARRL Hamfest (Cincinnati, OH)
26-28	Southwestern Division Convention (San Diego, CA)
28	ARRL Hamfest (Matamoras, PA)

SEPTEMBER

10	ARRL Hamfest (Statesboro, GA)
10	ARRL Hamfest (Ft Wayne, IN)
10	ARRL Hamfest (Erie, PA)
10	ARRL Hamfest (Berlin, VT)
10-12	ARRL September VHF QSO Party
11	ARRL Hamfest (Findlay, OH)
11	ARRL Hamfest (Butler, PA)
17	ARRL Hamfest (Wichita Falls, TX)
17	ARRL Hamfest (Buffalo, NY)
17-18	ARRL 10-GHz Cumulative Contest
17-18	ARRL Hamfest (Peoria, IL)
17-18	Roanoke Division Convention (Virginia Beach, VA)
18	ARRL Hamfest (Mt Clemens, MI)
24-25	ARRL Hamfest (York, PA)
25	ARRL Hamfest (Cleveland, OH)

OCTOBER

1-2	New England Division Convention (Boxboro, MA)
8-9	Delta Division Convention (Memphis, TN)
14-16	Midwest Division Convention (Omaha, NE)
29	ARRL Hamfest (St Paul, MN)
29	ARRL/VEC National Exam Day

NOVEMBER

5-7	ARRL November Sweepstakes, CW
19-21	ARRL November Sweepstakes, phone
19-20	Indiana State Convention (Ft Wayne)

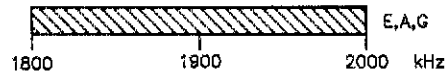
DECEMBER

2-4	ARRL 160-Meter Contest
10-11	ARRL 10-Meter Contest

US AMATEUR BANDS

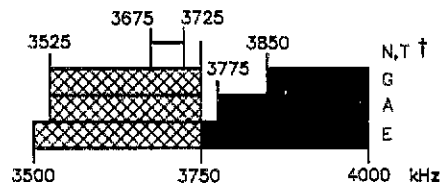
December 1, 1993

160 METERS



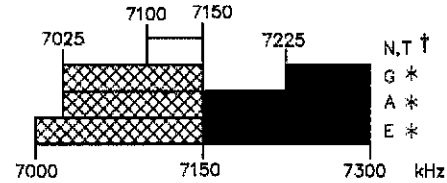
Amateur stations operating at 1900–2000 kHz must not cause harmful interference to the radiolocation service and are afforded no protection from radiolocation operations.

80 METERS



5167.5 kHz (SSB only): Alaska emergency use only.

40 METERS

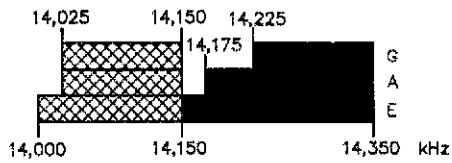


* Phone operation is allowed on 7075–7100 kHz in Puerto Rico, US Virgin islands and areas of the Caribbean south of 20 degrees north latitude; and in Hawaii and areas near ITU Region 3, including Alaska.

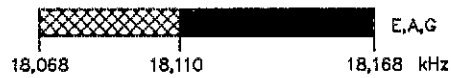
30 METERS

Maximum power on 30 meters is 200 watts PEP output. Amateurs must avoid interference to the fixed service outside the US.

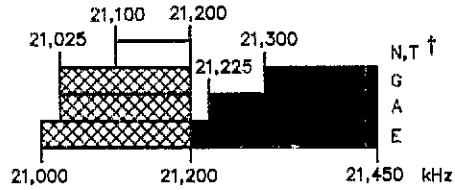
20 METERS



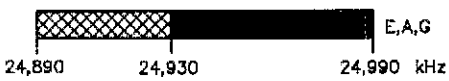
17 METERS



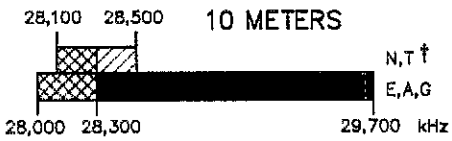
15 METERS



12 METERS

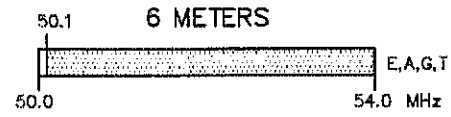


10 METERS



Novices and Technicians are limited to 200 watts PEP output on 10 meters.

6 METERS



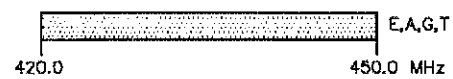
2 METERS

1.25 METERS

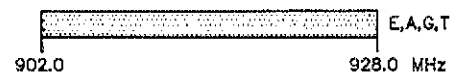
Until Feb 1, 1994, Novices are permitted to use ONLY 222.1–223.91 MHz

Novices are limited to 25 watts PEP output from 222 to 225 MHz.

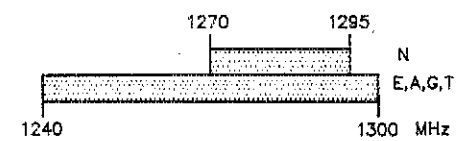
70 CENTIMETERS **



33 CENTIMETERS **



23 CENTIMETERS **



Novices are limited to 5 watts PEP output from 1270 to 1295 MHz.

US AMATEUR POWER LIMITS

At all times, transmitter power should be kept down to that necessary to carry out the desired communications. Power is rated in watts PEP output. Unless otherwise stated, the maximum power output is 1500 W. Power for all license classes is limited to 200 W in the 10,100–10,150 kHz band and in all Novice subbands below 28,100 kHz. Novices and Technicians are restricted to 200 W in the 28,100–28,500 kHz subbands. In addition, Novices are restricted to 25 W in the 222–225 MHz subband and 5 W in the 1270–1295 MHz subband.

Operators with Technician class licenses and above may operate on all bands above 50 MHz. For more detailed information see The FCC Rule Book.

KEY

- = CW, RTTY and data
- = CW, RTTY, data, MCW, test, phone and image
- = CW, phone and image
- = CW and SSB
- = CW, RTTY, data, phone, and image
- = CW only

E =EXTRA CLASS
A =ADVANCED
G =GENERAL
T =TECHNICIAN
N =NOVICE

† Only Technician–class licensees who have passed a 5 – WPM code test may use these frequencies.

** Geographical and power restrictions apply to these bands. See The FCC Rule Book for more information about your area.

Above 23 Centimeters:

All licensees except Novices are authorized all modes on the following frequencies:

2300–2310 MHz
2390–2450 MHz
3300–3500 MHz
5650–5925 MHz
10.0–10.5 GHz
24.0–24.25 GHz
47.0–47.2 GHz
75.5–81.0 GHz
119.98–120.02 GHz
142–149 GHz
241–250 GHz
All above 300 GHz

For band plans and sharing arrangements, see The ARRL Operating Manual or The FCC Rule Book.

Conducted By Emil Pocock, W3EP*

One Year and Counting!

It's been just over a year since I started writing this column, and my thanks go to all of you who have sent reports and kind words of encouragement. They are all much appreciated. My records show that 502 readers wrote letters, sent in activity news or updated their standings boxes during the previous 12 months. That is quite a number, and even though I acknowledge every communication, more are always welcome! In addition, Mike Owen and I received more than 200 requests for copies of *BD*, his bearing and distance program. Requests still trickle in at the rate of one or two a week.

Certain columns and issues generated the largest share of the correspondence. Certainly the requests for *BD* (offered in the June column) indicate that quite a number of VHF/UHFers are interested in DXing. A table of claimed DX records by band and mode will appear each April. The August column on coaxial cables provoked reactions ranging from comments about the elementary nature of the information, to complaints about its incompleteness, to curiosity about the variety of new cables available. More information on cables appears this month. In addition, judging by the correspondence alone, it seems that the standings boxes are by far the most popular feature. Answers to some of the most common questions and clarification of new policies round out this month's lead.

More on Coaxial Cable

For many years, distributors have sold coaxial cable with specifications similar to RG types at attractive prices. These are often bargains, but quality varies considerably with materials and manufacturing techniques. Distributors contract with leading manufacturers to produce lines of proprietary coaxial cables that are sold under the distributor's name; the manufacturer usually goes unmentioned. Quality depends largely on the distributor's integrity and reputation. Many such cables are advertised in *QST* and other amateur journals.

The popularity of Belden's 9913 coaxial cable prompted several distributors to market their own versions of RG-8 type air-dielectric coax. Cable X-Perts (800-828-3340), SSB Electronic USA (717-868-5643), The Wireman (800-727-9473) and the Radio Works (804-484-0140), among others, also offer improved versions of this type of cable that are more flexible.

Prices are attractive and attenuation figures are significantly lower than other RG-8 types, but these cables require specially fitted center pins for N connectors. Special care must also be taken to prevent moisture contamination of the air dielectric and to ensure that the center conductor does not pull the pins from N-type connectors.

The August column also mentioned an even newer line of coaxial cables manufactured by Kansai Tsushin Densen with microfoam dielectric, solid inner conductor, foil shield and an outer braid. Attenuation figures were comparable to similarly sized 9913 types, but without the potential moisture, bending and center-pin problems. The larger-sized cables in this line have even lower losses. These cables are widely advertised in Japanese and European journals, but it turns out that Comet has marketed a nearly identical line of cables, manufactured in Japan by Nippon Tsushin Densen, for some time. Many of the larger US distributors handle Comet cable and reasonably priced UHF, N and BNC connectors to fit.

Since I wrote the August column, The Wireman announced a new series of US-manufactured coaxial cables that appear to be similar to the Japanese types, except that both solid and stranded inner conductors are available and the sizes are a bit different. The CQ 1000 (solid) and 1001 (stranded) cables are the same diameter as RG-8 types with slightly lower claimed attenuation than Belden 9913.

Two larger-diameter versions have even lower attenuation figures, approaching that of half-inch copper Hardline. The Wireman offers a variety of connectors for each cable. Not all the cables and connectors were available when this was written in November, so contact The Wireman for details.

Standings Boxes

Some changes are in order for the standings boxes, primarily to regularize the criteria and to simplify reporting. As noted last month, 6-meter reporting forms no longer require you to list each country worked with call signs and dates. Non-EME band listings will include DXCC countries instead of the often confusing call areas. Canadian provinces will also be listed along with US states as soon as a significant number of updated forms include them. There are 12 Canadian provinces and territories: Newfoundland, including Labrador (VO1 and VO2); Prince Edward Island (VY2/VE1); New Brunswick (VE9/VE1); Nova Scotia (VE1); Quebec (VE2); Ontario (VE3); Manitoba (VE4); Saskatchewan (VE5); Alberta (VE6); British Columbia (VE7); Yukon (VY1); and the Northwest Territories (VE8).

Deleted countries may be counted in the totals as long as the country was worked while it was on the ARRL DXCC Countries List. Some confusion may arise with countries such as Czechoslovakia (OK). Czechoslovakia can be counted for one country prior to its split on January 1, 1993. After that date, it's possible to add two new countries, the Czech Republic (OK) and the Slovak Republic (OM) for a total of three. Be sure to include the US, Hawaii, and Alaska in your country total. In all cases, ARRL DXCC rules apply.

You may include EME contacts in the regular standings box listings if you wish. Stations that do include EME contacts are designated with an asterisk to separate them from those who have made all their claimed contacts via terrestrial propagation modes. The EME annals are for EME contacts only. Many stations have worked 50 states and report that on the EME annals form, but unless they were all worked via moonbounce, they should not be reported in the EME-only standings. Some operators may

Table 1
Comparison of Newer Coaxial Cables

Type	Diameter mm	Diameter inch	Attenuation (dB/100 feet) 432 MHz	Attenuation (dB/100 feet) 1296 MHz	Average power at 432 MHz (watts)	Price per foot ($)
5D FB	7.3	0.299	3.7	6.7	320	0.56
RG-8 Foam	10.3	0.405	4.3	7.8	320	0.39
9913 Types	10.3	0.405	2.8	5.0	350	0.50
CQ 1001	10.3	0.405	2.7	4.8	420	0.69
8D FB	11.1	0.436	2.6	4.7		
Hardline	12.7	0.500	1.5	2.7	700	1.70
CQ 1006	12.7	0.500	2.2	3.9	550	
10D FB	13.1	0.515	2.1	3.7	750	1.30
CQ 1009	15.0	0.590	1.7	3.1	750	1.65
Hardline	22.3	0.875	0.8	1.5	2500	4.55

Note: The table provides approximate figures needed to compare various popularly sized coaxial cables. Nippon Tsushin Densen manufactures the 5D FB, 8D FB and 10D FB cables in addition to larger and smaller types. Comet currently distributes only the 5D and 10D. Belden manufactures 9913 cable, but 9913-type cable is available from many distributors. The *CQ (Certified Quality)* cable series is distributed by The Wireman and Radio Works. The stranded inner conductor versions are listed, but specifications are identical with the slightly lower-cost solid conductors. All prices are those quoted by the distributor or advertised in US publications.

*Send reports to The World Above 50 MHz, Box 100, Lebanon, CT 06249. Leave messages at 203-642-4347 or fax 203-665-7531.

want to revise their listings appropriately.

The listings assume that all claimed contacts were made from a single location, as defined by the rules for VUCC awards. For all bands below 1300 MHz, contacts must be made from one or more sites within the same grid or from multiple sites within an 80-km diameter circle in different grid squares. At 2300 MHz and higher, all contacts must be made within a single area no more than 300 meters in diameter. Portable and rover operations from different locations should be reported separately. Stations with many portable operations may have to be limited to one additional listing per state, in addition to their home operation. In any case, keep totals from all portable locations up to date.

Revised reporting forms are available for an SASE and will be sent automatically to those updating their boxes this year with older forms. The new forms have a small 1994 in the lower right corner. If you prefer to send in a computer listing, include the following information for the regular standings boxes: your call sign, name, address and six-place grid locator; and for each band, list total US states, Canadian provinces and territories, DXCC countries, grids and best non-EME distance worked in kilometers. Also note if any included contacts were made via EME. For the EME annals, provide name, address, and grid locator; and for each band, list total number of different stations worked, US states, DXCC countries, grids and best EME DX in kilometers. All claimed contacts should be made by EME only.

ON THE BANDS

The wintertime propagation blues began early this year, resulting in few reports. Tropo was scarce in October, but aurora sustained interest across the northern tier of states and southern Canada on October 1, 9, 25 and 27. Some unusual autumn sporadic E was also on hand for alert 6-meter operators. January should provide a short respite. The mid-winter sporadic-E mini-season should be in progress, and the VHF Sweepstakes often generates its own propagation. You might try running during the Quadrantids meteor shower in January. The normal hourly rate is actually the highest among all showers, but it's often overlooked because of its sharp peak.

50 MHz

September and October are statistically the least likely months for sporadic E, but the textbooks agree that sporadic E can happen at any time or season. The reports of the past two months confirm that you can never totally give up on 6-meter propagation. Mark Mendelkern, KN5S (DM62), worked XE1AVM (DK79) and XE1ABA (DK89) around 0500Z on October 15. Larry Lambert, NØLL (EM09), reports sporadic E on October 17-18 and 22-26, mostly in the late afternoon and early evening. Ken Neubeck, WB2AMU (FN30), likewise found a few hours' worth of sporadic E late during the afternoons of October 23, 24, 27 and 28.

Norman Fitch, G3FPK, mentions several days of European sporadic-E activity in his December "VHF/UHF News" column, which appears in *Radio Communications*. English stations reported the band open on October 9, 10, 14, 15, 17 and 22. Countries mentioned include OH, ES, I, YU, 9A, 9H, EA and CT. Ted Collins, G4UPS, also reports Eric Jauch, 5I5/F5JKK (now 5T5JC), worked 9H, F and EA on October 8 and G on October 10. Sporadic E sure sounds more interesting when you're working countries with exotic call signs,and that may be part of the reason 6 meters has remained so popular in Europe.

Larry Lambert, NØLL, at his shack in Smith Center, Kansas.

The spring and fall equinox periods are the best times for transequatorial (TE) propagation, especially during the peak years of the solar cycle. Six-meter newcomer Joshua Brem, AE2L (FM04), stumbled upon LU8EEM (FF95) on October 27 at 2143Z. Signals were 59 both ways. Al Olcott, K7ICW, reports that KB6IGC heard PY5CC on October 15 at 0005-0100Z. These were probably sporadic E to TE hookups, as most of the US is too far north to work into TE range directly. Sporadic E to TE links were apparently responsible for European contacts on October 12 with 7Q7 and on October 18 with 7Q7 and A22.

Six-meter EME is also growing in popularity as the solar cycle wanes. A trio of Californians, K6MYC, K6QXY, and W6JKV, have been actively promoting the effort with specially designed moonbounce antennas. During the EME contest they worked W5FF, K5FF, WA4NJP, W7HAH, OH2BC, I5MXX, OZ5IQ, VK3OT, and at least one other European. K6MYC and K6QXY ended up with 10 contacts each, while W6JKV had 9. Mike Staal (K6MYC) says that a kW and a 2-wavelength antenna are enough to work moonbounce with a mutual horizon. Many stations are already in this class—why not give it a try?

VE3ONT and the EME Contest

The Toronto VHF Society operation via the Algonquin Radio Observatory's 46-meter dish was a fabulous success. Nine experienced VHFers operating under the club call VE3ONT made 560 contacts during the two weekends of the ARRL International EME Contest, according to Dennis Mungham, VE3ASO. Operations on 144, 432 and 1296 MHz went essentially as planned (see the October 1993 column for details).

VE3ONT made 235 144-MHz contest QSOs during the first weekend (about 20 contacts an hour)—a fantastic rate for EME. The group operated for two complete moon transits over two weekends on 432 MHz and made 246 contacts. The final transit was devoted to 1296 MHz, where they made 79 contacts and worked all continents, thanks to CX1BT, the lone South American worked on any of the three bands. The 560 contacts and 116 multipliers yielded a total score just shy of 6.5 million points. This will certainly outdistance any other multi-operator multiband effort, but as users of commercial equipment (the big dish), VE3ONT is not eligible for awards.

The VE3ONT signal was exceedingly strong on all three bands. Two-meter stations with single Yagis fixed on the horizon reported hearing VE3ONT with the moon as high as 30° above the horizon. The VE3ONT log is filled with 599 signal reports and perhaps as many as a quarter of all stations worked were not active moonbouncers. On 1296 MHz, the VE3ONT operators could hear their own echoes with as little as 1 watt of power!

As an adjunct to contesting, the VE3ONT operators took time to listen for a 437.1-MHz beacon from the lost *Mars Observer* satellite. Contact with the satellite was severed in September, just as it was due to enter Mars orbit. The reason is still unknown, but all the normal communications channels went dead. On board is a 1.3-watt beacon using an omnidirectional antenna that could have survived whatever catastrophe struck the satellite's main communications links. It was never intended to be heard on Earth, but was designed to prompt Russian balloon satellites in the Martian atmosphere to transmit data to the *Mars Observer* for relay to Earth. This beacon provided the opportunity to discover if the satellite entered Mars orbit and was potentially operational.

The VE3ONT group was in a prime position to find the lost satellite because the beacon signal was right in the amateur band. With advice from the Jet Propulsion Laboratory and optimal receiving gear, there was a small chance that the weak signal could be detected with the big dish. The VE3ONT operators used a computer-aided visual digital signal processor designed by Mike Cook, AF9Y. This system is a modification of the one Mike sells commercially, that integrates 1-Hz-bandwidth audio signals over many minutes instead of a much faster rate in 2-Hz channels. The system is capable of detecting a signal well below the noise floor normally associated with amateur equipment. In spite of three hours of listening, the digital processor indicated that no signal was present. They may try again next year when Mars is much closer to the Earth, assuming that the satellite actually made it into Mars orbit.

10 GHz in Australia

Eric Jamieson, VK5LP, writes in his November "VHF/UHF: An Expanding World" column, which appears each month in the Australian journal *Amateur Radio*, about 10-GHz work down under. Last March and April, Roger Bowman, VK5NY, and Bill Pickering, VK5ACY, took 160-mW narrowband transferers and 40-cm dishes to various portable locations in southern Australia. They gradually extended their distances worked, from an initial contact of 118 km, to more than 250 km in April. On April 22, they set a new Australian DX record of 355 km between Cape Banks (QF02) and Kangaroo Island (PF84). The Australians have their eyes on extending their paths considerably, perhaps 2000 km across the Great Australian Bight, the scene of

Activities in January

1-2	Very good EME conditions
3	Quadrantids meteor shower peaks at 1843Z
22-24	VHF Sweepstakes
29-30	Very good EME conditions

Microwave Standings

Microwave standings are compiled each November 1 for publication in January. At least five grids or a minimum distance worked, which varies by band, are required for inclusion. Information must be submitted within the previous two years to ensure that standings reflect recent activity. Stations dropped for lack of timely reports will be reinstated with a current update. It is not necessary to have worked additional states or grids to remain in the standings, but please confirm your continued interest at least every two years. Reporting forms are supplied on request. Column headings are: call sign and state, US states, DXCC countries, grids worked and best terrestrial DX in kilometers.

33 cm (902-928 MHz)
Minimum terrestrial DX = 250 km

W1RIL	MA	12	2	27	910
AF1T*	NH	11	—	—	515
W1JR	MA	10	3	28	634
KH6CP/1	VT	7	2	14	300
WA1MBA	MA	—	—	18	500
N2LIV	NY	9	1	14	—
N2WK	NY	8	2	28	575
W2PGC	NY	7	2	17	765
WA2FUZ	NY	7	2	11	380
KU2A	NY	6	2	11	665
WB2VVV	NJ	6	1	7	320
N3CX	PA	14	2	35	652
WØRSJ/3	PA	9	1	13	—
W3ZZ	MD	8	1	12	516
N4MW	TN	7	—	12	676
WB4DBB	VA	4	1	9	420
WB5LUA*	TX	16	2	42	1725
AA5C	TX	9	1	25	1581
N5QGH	TX	4	1	15	1062
W5RCI	MS	3	1	5	—
WB5LUA/5	LA	3	1	4	435
N6CA	CA	2	3	17	509
W6CPL	CA	1	—	17	825
N8DJB	OH	9	—	23	869
W8VO	MI	3	—	5	—
WB9OJR	IL	10	1	27	1403
WØUC/9	WI	2	1	6	140
WØRAP	IA	5	2	7	—

23 cm (1240-1300 MHz)
Minimum terrestrial DX = 250 km

W1RIL	MA	15	2	32	1858
K1FO	CT	15	—	21	753
W1JR*	MA	13	4	36	1054
KH6CP/1	VT	10	2	18	500
WA1HYN	RI	8	—	10	458
WA1MBA	MA	—	—	21	750
K2UYH*	NJ	34	28	—	1239
WA2LTM*	NJ	17	2	40	1239
N2WK	NY	16	2	39	940
K2LME/1	NJ	15	2	36	906
W2PGC	NY	14	2	32	1536
N2LIV	NY	12	1	24	—
WB2VVV	NJ	9	1	11	640
WA2FUZ	NY	8	2	11	380
KU2A	NY	5	2	13	444
N3CX	PA	14	2	33	1046
K3UA	PA	14	2	24	600
WØRSJ/3	PA	12	1	18	—
W3RUE	PA	10	—	17	850
K4QIF*	VA	27	18	—	1271
WB4AXQ	AL	16	1	35	—
WA4OFS*	FL	14	11	35	1677
KC4EG	KY	13	1	—	724
K4CAW	NC	12	—	28	—
KK4NO	SC	11	1	25	821
N4MW*	TN	9	—	36	676
WB4DBB	VA	6	1	14	608
WD4AFY	GA	5	—	8	—
NI4Z	FL	4	1	19	1712
WB5LUA*	TX	34	27	170	2060
WD5AGO*	OK	28	—	101	1353
K5UR	AR	16	1	54	1102
W5RCI	MS	16	1	54	—
AA5C	TX	16	1	48	1275
W5DFU	OK	15	—	49	1658
N5QGH*	TX	14	7	45	1545
K5SW	OK	12	1	42	1583
W5AL	TX	6	1	34	1100
WB5IGF	AR	8	—	17	—
WB5LUA/5	LA	4	1	6	810
N5BBO	TX	3	—	14	1677
N6CA*	CA	8	11	43	3979
W6CPL	CA	3	—	27	3984
N6OLD/6	CA	1	1	11	272
W6SFH/6	CA	1	1	—	450
KE7CX	OR	3	1	13	574
WA7KYM	WY	3	1	7	—
W7YOZ	WA	2	—	14	454
N8DJB	OH	19	—	46	1609
WB8PAT	OH	10	2	22	1407
WB8TGY	MI	9	2	25	938
W8VO	MI	8	—	23	—
KU8Y	MI	6	1	10	380
WB9OJR	IL	18	—	52	1403
W9UD	IL	16	—	38	1223
WB9SNR	IL	14	2	27	1250
WB9MSV	IL	13	—	35	1075
WØUC/9	WI	7	1	26	1180
WB5TCO/9	WI	6	—	24	714
WØRAP*	IA	19	13	85	1100
KØFQA	MN	14	1	39	1215
KØIFL	MO	14	1	29	689
WAØBWE	MN	10	1	27	740
WQØP	KS	9	—	34	—
KBØHH	KS	9	1	34	—
KØRZ	CO	8	1	34	678
NØLL	KS	8	—	34	712
NTØV	ND	6	2	10	1284
WDØCJM	MN	5	11	—	810
WØHHE	CO	4	1	20	—
NØHJZ	MN	3	1	8	322
KBØZQ	MN	2	1	7	—
WAØNTT	MN	2	1	5	—
KAØVYB	MN	1	1	5	—
VE4MA*	MB	21	21	85	1287
VE3KDH	ON	4	—	11	—
VE4KQ	MB	2	1	3	300

13 cm (2300-2310, 2390-2450 MHz)
Minimum terrestrial DX = 250 km

W1JR	MA	9	—	11	414
W1RIL	MA	8	—	15	499
KH6CP/1	VT	7	1	10	500
AF1T	NH	4	—	4	373
WA1MBA	MA	—	—	8	300
WA2LTM	NJ	18	2	42	1240
N2WK	NY	7	2	19	940
W2PGC	NY	6	2	14	765
N3CX	PA	10	1	19	885
WØRSJ/3	PA	4	1	6	—
N4MW	TN	5	—	9	676
WB5LUA*	TX	17	13	59	1533
W5RCI	MS	11	1	11	—
AA5C	TX	6	1	15	1048
W5DFU	OK	6	—	13	885
WB5LUA/5	LA	2	1	3	357
W6CPL	CA	1	—	10	508
W6HCC	CA	1	1	2	257
W7YOZ	WA	1	1	5	167
WB8TGY	MI	7	1	14	938
WB9SNR/8	OH	4	1	7	495
WB8TGY/8	MI	2	—	11	245
W9ZIH	IL	9	1	10	1184
WB9SNR	IL	6	1	7	510
AA9D/9	IL	4	1	13	300
WB9OJR	IL	2	1	13	360
WAØBWE	MN	3	1	7	720
KØRZ	CO	2	1	11	238
KØFQA	MN	2	—	7	605
NTØV	ND	1	2	3	400
VE4MA*	MB	9	12	32	362

9 cm (3300-3500 MHz)
Minimum terrestrial DX = 200 km

W1RIL	MA	4	1	6	405
KH6CP/1	VT	3	1	3	352
AF1T	NH	3	—	3	373
WA2LTM	NJ	10	1	18	472
N2WK	NY	3	1	12	415
N3CX	PA	5	1	6	925
WB5LUA	TX	6	13	17	1187
AA5C	TX	5	1	10	1048
N5QGH	TX	4	1	12	1013
WB5LUA/5	AR	3	—	5	461
W5DFU	OK	2	1	5	350
WB5LUA/5	LA	1	1	2	357
N6CA	CA	3	3	12	3974
W6CPL	CA	1	—	8	508
WB9SNR/8	OH	2	1	3	430
W9ZIH	IL	6	1	6	1184
WB9OJR	IL	2	1	9	248
AA9D/9	IL	2	1	6	175
KØRZ	CO	2	—	6	130

5 cm (5650-5925 MHz)
Minimum terrestrial DX = 200 km

KH6CP/1	VT	3	1	4	352
WA2LTM	NJ	5	1	8	452
N2WK	NY	3	1	8	415
WB5LUA	TX	3	1	14	428
AA5C	TX	3	1	9	391
N5QGH	TX	1	1	6	256
WB5LUA/5	LA	1	1	1	326
N6CA	CA	3	3	15	3974
WB9SNR/8	OH	2	1	3	450
W9ZIH	IL	6	—	6	386
AA9D/9	IL	1	1	6	125
WB9OJR	IL	1	1	2	201
KØRZ	CO	2	—	5	125

3 cm (10-10.5 GHz)
Minimum terrestrial DX = 150 km

KH6CP/1	MA	8	1	9	259
KH6CP/1	VT	6	1	9	352
W1RIL	MA	4	—	3	290
W2TTM	NJ	11	—	13	772
W2VC	NJ	10	—	13	365
K2UYH	NJ	5	1	7	—
WB5LUA*	TX	5	1	14	335
AA5C	TX	3	1	11	215
N5QGH	TX	3	10	8	294
WB5LUA/5	LA	1	1	2	357
WA6EXV/6	CA	4	2	31	337
N6OLD/6	CA	2	1	15	383
N6CA	CA	2	2	15	840
W6CPL	CA	1	—	9	510
W6SFH/6	CA	1	—	4	661
W6HCC	CA	—	2	34	864
KØRZ	CO	2	—	6	130

12.5 mm (24-24.25 GHz)

WB5LUA	TX	1	1	1	10
AA5C	TX	1	1	1	10
W6CPL	CA	1	—	5	175
N6CA	CA	1	1	5	155
N6OLD/6	CA	1	1	3	201

2 mm (142-149 GHz)

WA1MBA	MA	1	1	1	4

Coherent Light

N6RMJ	CA	1	—	4	—

—Information not supplied.
* Some stations worked via EME.

previous microwave records.

VHF/UHF/MICROWAVE NEWS

Evasive Noise Blanking

Mark Mandelkern, KN5S, published an article on tunable noise blankers in the August issue of *QEX* that should be of interest to VHF operators. Several decades ago, Collins Radio included a noise blanker in its KWM-2 mobile transceiver that used 40 MHz for noise sensing. This considerably reduced the problem of blanking because of strong adjacent signals, but one disadvantage was that noise sensed at 40 MHz may not correspond to noise on the operating frequency.

Mark took this basic idea a step further by designing a noise blanker that sensed closer to the operating frequency while avoiding strong in-band signals that cause blanking. This is accomplished by separately tuning the noise blanker frequency to avoid sensing where there are strong signals. This seems like a common-sense approach, but there have been few practical examples using this technique.

Mark originally built a tunable noise blanker that sensed above 51 MHz for his old 6-meter Heath SB-301. This arrangement worked well, but the SB-301 became outdated. Mark's newest tunable noise blanker is designed for his home-brew transceiver, but the principles incorporated into his circuit can be adapted to many other receivers. ARRL members can subscribe to *QEX* for $12 a year.

VHF/UHF Contesting in *NCJ*

In case you didn't notice, the results of the 1993 ARRL VHF/UHF Spring Sprints appear in November/December *National Contest Journal*. Probably half of all the entries came from members of the Upper Midwest VHF/UHF Society. Much credit for this activity belongs to Rich Westerberg, NØHJZ, editor of the group's monthly newsletter. If Rich can revive VHF/UHF activity in the upper Midwest, surely other groups can do the same.

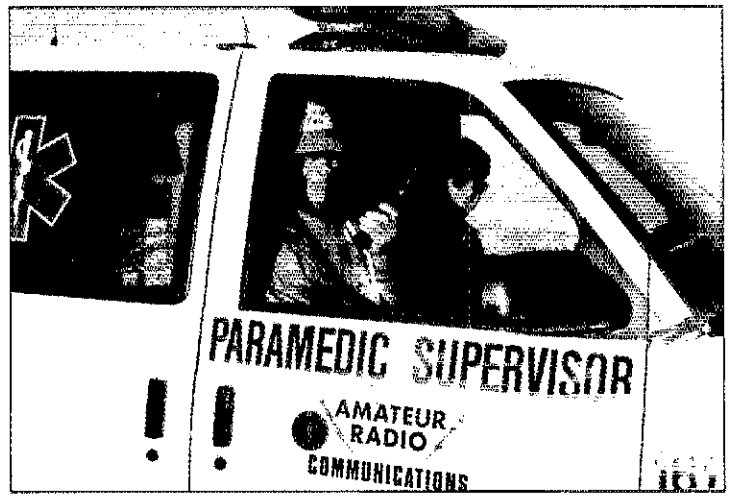
The same issue contains the first VHF-UHF Contesting! column written by Jon Jones, NO0Y. Jon reviews the current controversy over rover scoring in ARRL contests and promises that future columns will include profiles of notable VHF contesters. Why not give Jon and VHF/UHF contesting your support by subscribing to *NCJ*? A year's subscription is $10 from ARRL.

QST

Conducted By Rick Palm, K1CE
Field Services Manager

Hams Support Cycle Oregon VI Along the Oregon Trail

By Judy Glenn, WZ7S
670 NW Survista Ave
Corvallis, OR 97330



Dale LeBarron, W7FBP, and paramedic supervisor Dave Fuller. *(KZ7T photo)*

Forward Ho! The wheels of 2000 bicyclists rolled out of Baker City, Oregon, to celebrate the sesquicentennial of the Oregon pioneer journey by following the historic Oregon Trail. This year, Cycle Oregon VI covered 448 miles across desert, mountains and valleys, from Baker City to Oregon City, with participants from 41 states and Canada. There were overnight stays in Baker City, LaGrande, Ukiah, Ione, Moro, Dufur and Welches. Residents of the small towns were amazed when Cycle Oregon arrived and boosted their overnight population by 2000.

In contrast to the wagon train days, the cyclists were accompanied by support personnel that included three ambulances, 14 bicycle repair units, seven "sag wagons," and several water tankers and tractor-trailers hauling showers, sinks, portable toilets, luggage and tents. Linking everything were 14 Amateur Radio operators stationed with each of the two directors of the event, the paramedic supervisor, the food director, the seven sag wagon vans and the mission-control motorhome.

Four months prior to the event, five radio operators followed the route to establish net control station (NCS) locations, to check the range of the available repeaters, and to request permission for their use. Because of the terrain and scarcity of repeaters in the areas covered, simplex was used for five of the seven days. Maintaining contact was a challenge in a few areas, where a relay system was used to pass communications from the NCS to the sag wagons.

The Day's Routine

At 4:30 AM, the NCS would leave camp and head for the preselected location for the best reception and set up antennas. The two NCS operators, Randy Stimson, KZ7T, and Jim Schaefer, KB7ADH, rotated daily the major job of keeping track of all of the radio operators' locations. The NCSs reported receiving their share of stares at the array of antennas out in the middle of nowhere!

The day began at 5:30 AM for the crew in the first sag wagon, which would count cyclists and let the NCS know when 150-200 cyclists had left camp. The NCS would move Sag 1 to the first checkpoint, where they'd place an orange marker cone and checkpoint sign. The cyclists knew where the checkpoints, water and lunch stops were for each day, and that each sag wagon had radio communication. When the next 150-200 cyclists left camp, Sag 2 would move to Sag 1's position, which would move on to the next checkpoint and so on through Sag 6. Sag 7 was "sweep," which didn't leave the campground area until the last cyclists were on the road, and remained behind the last cyclists until they arrived in camp that evening. The sag wagon positions rotated each day, giving each crew an opportunity to be first out and set up cones or to be "sweep" and pull signs and cones. The cyclists recognized the last sag wagon by the broom attached to the front grill!

In addition to the 14 amateurs, one of the water truck drivers, Gerald Sabin, W7UVI, checked in occasionally to keep the NCS abreast of what was happening at his location. Several cyclists who had radios with them would check in to see what frequencies were being used each day so they could monitor and assist in an emergency.

Hams Link with Medics

The ham with the paramedic supervisor was the link to the medical personnel in the three ambulances that accompanied the ride. The hams worked through the NCS, except when they were at the scene of a fallen cyclist and an ambulance was needed. In this case, the ham at the accident scene would contact the ham with the paramedic supervisor, who would in turn dispatch the nearest ambulance.

Radio communication was valuable in locating cyclists in case of emergency. Each participant had a cyclist number. If someone was needed because of a home emergency, the number was posted on the back and sides of the sag wagons. The sag wagon crew would be flagged down or met at one of the checkpoints by the person who saw her/his number on it.

Sags Always Watching

As the sag wagons moved slowly from checkpoint to checkpoint, the crew watched the cyclists to see if anyone needed assistance. Cyclists would give a "thumbs down" signal if help was needed. The radio operator would call the NCS for assistance, whether it was to locate the closest bicycle repair unit, to locate an ambulance for a nonemergency medical, or to report that the sag wagon had picked up a passenger and bicycle and give the cyclist's number to the NCS.

Cyclists who "sagged" in one of the vans were astonished to hear all the behind-the-scenes work that goes on via radio. The hams were thanked repeatedly by cyclists (especially those who had sagged) for the valuable assistance.

Day's End

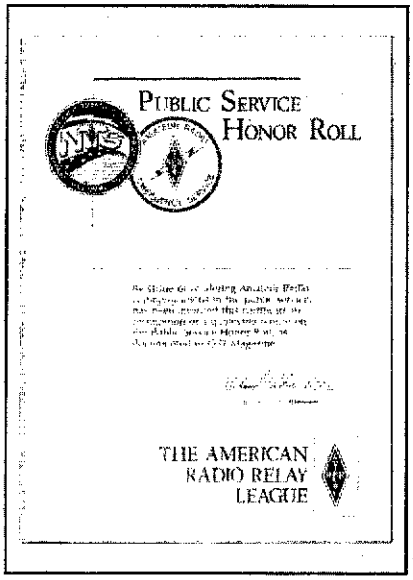
At the end of each day's ride after the passengers and bicycles were unloaded, the hams met for a dinner meeting to discuss the events of the day and to plan for the following day.

Helping Hams Receive Thanks

During and after Cycle Oregon every year, the directors and staff praise the radio amateurs' work. This year, because of the remote locations where cellular telephones were virtually inoperable, the staff stressed, "We couldn't do it without you hams."

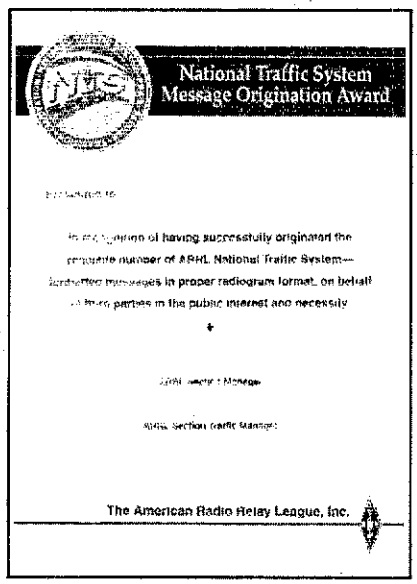
Public Service Awards Program

The League offers a number of public-service-oriented awards for new and veteran hams. The awards consist of handsome certificates that would look great on your shack's wall. Go get 'em!



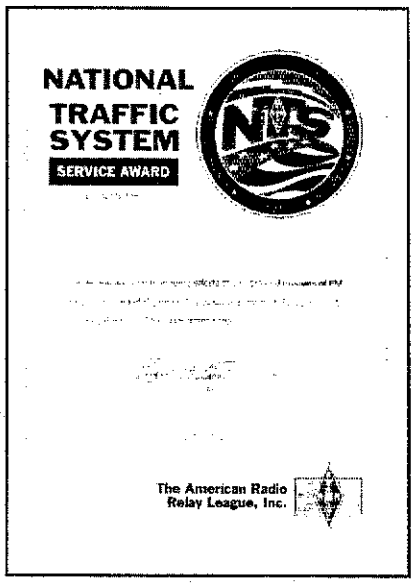
Public Service Honor Roll (PSHR)

This award recognizes hams who make an exemplary commitment to public service programs such as the ARRL National Traffic System (NTS) and the ARRL Amateur Radio Emergency Service (ARES) on a regular basis. The PSHR ham checks into NTS and ARES nets regularly, performs special net functions, such as liaison to other nets and acting as Net Control Station (NCS), and participates in other public service aspects. For qualifying criteria, see the next page.



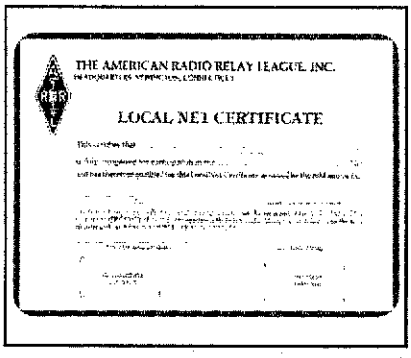
Message Origination Award

Designed for new hams, this award is conferred when the applicant has successfully originated at least four radiograms in the NTS. Contact your Section Manager (see page 8) or Section Traffic Manager for application information and how to originate a message.



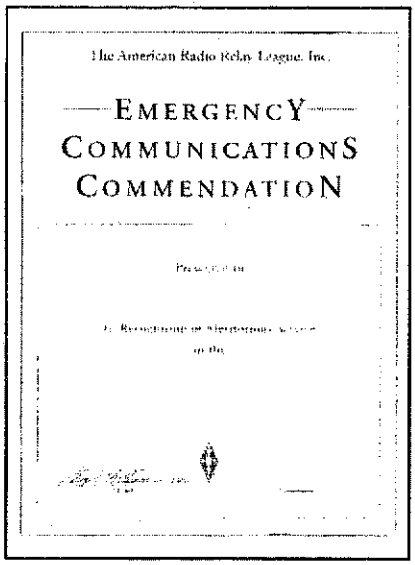
National Traffic System Service Award

This award is issued by an ARRL Section official to owners and trustees of systems (usually repeaters, digipeaters and packet bulletin boards) that provide support for NTS operations. For information on these awards or ARRL programs, including the NTS and ARES, contact the Field Services Department at League Headquarters or your Section Manager (see page 8).



Local Net Certificate

Reports from around the country indicate that new hams are flocking to local NTS and ARES nets on local repeaters. If you're one of them, you're eligible, based on regular participation standards prescribed by the Net Manager (NM) or Emergency Coordinator (EC), to receive a *Local Net Certificate*. Contact your EC or NM for information on how to get yours.



Emergency Communications Commendation

These awards serve the same purpose as the Public Service Commendations described at right, except that they're awarded for service during real emergencies, such as blizzards, fires, earthquakes and hurricanes. The awards are issued by the Section Manager or his delegate.

Public Service Commendation

Public Service commendation certificates are issued by ARRL officials in your area for exemplary service and performance in a public, nonemergency event, such as a parade or marathon. Hams are often called upon to provide supporting communications to public safety agencies in such public events, and this certificate recognizes that service.

Field Organization Reports October 1993

Section Emergency Coordinator Reports

There are 36,980 ARES members accounted for in SEC records. The following Sections reported this month: CO, CT, EPA, GA, IN, KY, LA, MDC, ME, MN, NE, NTX, MI, NH, NM, OH, OK, SD, SFL, STX, TN, VA, WMA, WNY, WPA and WV.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	769	24.81	0.785	94.9	
CAN	31	981	29.77	0.940	96.7	
PAN*	62	558	9.00	0.562	100.0	
Region Nets						
1RN	62	560	9.03	0.602	99.5	100.0
2RN	62	292	4.70	0.384	95.8	100.0
3RN	31	85	2.74	0.222		87.1
4RN	62	409	6.60	0.330	77.0	100.0
5RN	62	741	11.95	0.552	94.0	100.0
6RN	50	230	4.60	0.350	100.0	100.0
7RN						100.0
8RN	61	371	6.08	0.419	100.0	96.8
9RN						90.3
TEN	62	539	8.69	0.581	81.0	100.0
TWN	61	187	3.06	0.431	88.0	100.0
ECN						83.9
Cycle Three						
Area Net						
EAN	30	188	6.27	0.490	79.0	
Region Nets						
1RN	31	70	2.26	0.283	95.9	93.3
2RN	31	98	3.16	0.259	98.7	93.3
3RN	25	13	0.52	0.100	64.5	86.6
4RN						66.6
8RN						90.0
ECN						73.3
Cycle Four						
Area Nets						
EAN	31	994	32.06	1.258	100.0	
CAN	31	622	20.06	1.054	100.0	
PAN	26	432	16.61	0.635	100.0	
Region Nets						
1RN	62	396	6.39	0.635	95.6	100.0
2RN	60	221	3.68	0.490	97.5	100.0
3RN	59	184	3.12	0.300	94.5	100.0
4RN	62	503	8.11	0.398	93.5	100.0
5RN	59	364	6.10	0.426	88.0	100.0
6RN						100.0
7RN	62	346	5.58	0.512	93.0	100.0
8RN	60	247	4.12	0.340	93.0	100.0
9RN	62	339	5.46	0.885	98.0	100.0
TEN	62	325	5.24	0.528	75.8	100.0
TWN	40	116	2.90	1.900	100.0	100.0
ECN	58	76	1.31	0.254	90.0	100.0
ARN	31	77	2.48	0.081	100.0	

*PAN operates cycles one and two.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CO, CT, DE, EMA, ENY, EPA, EWA, GA, IA, IL, IN, KS, LA, MDC, ME, MI, MN, MO, MS, NC, NLI, NNJ, NTX, OH, OK, ORG, SC, SD, SDG, SFL, STX, SV, TN, VT, VA, WI, WMA, WNY, WPA, WTX, WV and WWA.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	110	88.70	345	740
TCC Central	81	87.10	726	1452
TCC Pacific	104	83.87	745	1250
Summary	295	86.56	1816	3442
Cycle Three				
TCC Eastern	31	100.00	n/a	28
Cycle Four				
TCC Eastern	101	87.83	260	964
TCC Central	54	72.00	141	296
TCC Pacific	93	75.00	311	708
Summary	248	78.27	712	1968

NTS *APLink* Total: 3496.

TCC ROSTER

TCC Eastern Area Cycle 2: KW1U, Director. N1DHT KC1DI W1FYR WA1KKP KT1Q W1WCG W2FR KA2GJV N2LTC W2MTA N2XJ N3DRM N3EFW AA4AT N4GHI WX4H K4MTX N4SS K8TPF WD8V KA8WNO WB8YDZ VE3AJN VE3GNW VE3GSQ VE3ORN.

TCC Eastern Area Cycle 3: W2FR, Director. N1OTC W1WCG WA1KKP W2FR W3OKN AA4AT K8TPF KA8WNO.

TCC Eastern Area, Cycle 4: W2FR, Director. K1EIC KT1Q KW1U W1CE W1NJM W1UD W1WCG WA1KKP N2XJ W2FR W2GKZ W2LWB W2MTA W2RQ N3DRM W3PQ AA4AT K4MTX K4SCL K4WJR K4ZK N4GHI N4SS W4UO WX4H N6ANQ AA8AN K8TPF KA8WNO W8PMJ WD8V VE3AWE.

TCC Central Area, Cycle 2: W4CKS KC5BGY W5CTZ KG5GE N5HWK W5JDF N5KKI WB5NKC WB5NKD KG5TL W5QFU K5UPN KD5UY W5YQZ KE5ZV W9CBE WØFE WBØWNJ VE5KZ.

TCC Central Area, Cycle 4: K5GM, Director. W4ZJY K5GM W5JDF K5RG N5TC W5TFB K5UPN KB5W W9CBE W9FC K9PUI WA9QCF WØGRW NØSM.

TCC Pacific Area, Cycle 2: ND5T, Director. W5JOV ND5T KT6A WB6DOB AB6EU KF7AG W7TGU W7IGC KA7YYR WAØYNP NØFBW.

TCC Pacific Area, Cycle 4: W7GB, Director. ND5T KE6BFB W6EOT K6LL WF6O W6VZT NR7E WA7EES KA7EKL W7EP W7GB W7GHT KB7GZU NN7H W7LG N7MPS W7VSE KJØG WTØG KØTER.

NTS *APLink* Stations: W1FYR N2JAW W3GL WX4J W4KAU KK4CQ K7BUC WI7D W7DCR AA7HS K7SLI KD7UM WA9FCH WA9WCN NØIA KAØJRQ.

Public Service Honor Roll

This listing is available to amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following eight categories (as reported to their SMs). Please note maximum points for each category:

1) Checking into a public service net, using any mode, one point each; maximum 60.
2) Performing as Net Control Station (NCS) for a public service net, using any mode, three points each; maximum 24.
3) Performing assigned liaison between public service nets, three points each; maximum 24.
4) Delivering a formal message to a third party, one point each; no limit.
5) Originating a formal message from a third party, one point each; no limit.
6) Serving as an ARRL field appointee or SM, 10 points each appointment; maximum 30.
7) Participating in a communications network for a public service event, 10 points each event; no limit.
8) Providing and maintaining an automated digital system that handles ARRL radiogram-formatted message traffic, 30 points.

Stations that qualify for 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 upon written notification of qualifying months to the Public Service Branch at HQ.

571 NM1K
558 N2JAW
517 NZ2T
339 WB5NKC
338 WD8V
309 WTØG
291 KA2VZX
NY1H
260 N9BDL
KI5NL
258 KØBXF
248 KD4GR
246 AB6EU
KC6ZEC
236 KB2JRT
213 AA2CX
211 WØOYH
208 NR1W
203 KA2ZNZ
197 N2OWN
193 KJ5GE
191 KB2KLH
188 N2SAA
185 WA2SPL
182 K2YAI
178 WB5NKD
N5SKG
176 K5DPG
175 K4SCL
N5UQA
173 N2PIF
WA1TBY
N2DXP
WA9VND
KB5SFE
171 W9YCV
170 WA8HED
W1WCG
AD4KA
169 WA2UKX
168 KB2EPU
W4AET
N8FPN
W3YVQ
WA7EES
166 KM4QQ
165 KK1A
K4FQU
164 KA4HHE
WØNBT
161 KO4DR
WB6DOB
K9DHR
W2RRX
K4ZK
KC3Y
160 WA1FNM
159 WI2G
158 WB2ZIE
N5NAV
N7UOF
157 WA2YBM
AF2K
156 KA9EIZ
N4GHI
155 W9CBE
KD1LE
154 K2PBP
WA4PFK
153 NR2F
N2LTC
WA4AHV
149 KD6CCF
N3LDY
K4BGZ
148 WX4H
N5IKN
147 N1IST
WA8AHV
146 NR9K
145 KT6A
N2UIT
144 WØUCE
N4CYC
143 WB2VUK
W1EFW
N1FWV
KE2JX
142 KT1Q
N7SUB
141 KM4DY
KR6K
KA2GJV
W2MTA
N5TTU
140 AA4AT
WAØSXR
139 K6UYK
WB4BZA
K2DN
NØMEA
138 WE2G
WA4NDA
W7GB
W2PTZ
K3GHH
137 WX4J
WA4QXT
NY2V
KA1EXJ
KW1U
K2GNZ
W7WAT
136 WA3UNX
ND2S
KA9KLZ
N1LKJ
KI5TI
WDØGUF
135 N1HYF
NY8W
W2QNL
WBØLES
134 KA3LTN
NX1A
WB8SYA
N2XJ
133 N2JBA
KA1GWE
W2DMM
KG5GE
132 N2GUN
N2ULY
WB2FTX
KA4FZI
131 N1FLO
130 KD8HB
W5IGM
W2FR
KI4YV
129 W7AZU
K2BCL
NZØM
128 WM1C
N1OTC
K2VX
WAØTFC
127 N5ZCC
WBØWNJ
126 WBØPLY
KF2MH
N3PDK
W9UMH
124 W7GHT
123 NØJL
122 W3OKN
KQ4ET
KB5GLV
121 K3JL
K5WOD
WA4EIC
W5YQZ
KFØFI
120 WF6O
KC6SKN
N2QPJ
KB7NTL
AA9HN
119 KD3SF
KO4BJ
NØGYR
KB1AF
WI3B
WB4WYG
K4DOR
W5TFB
KAØARP
118 KØERM
KK3F
W5CTZ
KA7AID
KBØBXE
117 KI5LQ
WD4DSS
K9KSA
KA9FVX
116 K4VHF
KD7ME
K4AVX
AA4GL
KI5LP
KB5YAM
115 N4GMU
K2EB
KAØPDM
114 N2SRE
N5OWQ
113 KA6TND
KD1NX
112 W7NWP
KA1WCD
K6AGD
111 N8FWA
W2MTO
WA2PCS
KD5UY
KD3JK
N1DHT
N5OUJ
110 KB8HJJ
AG9G
N4DCC
K8LUY
N5TFB
109 N4JAQ
KB2KOJ
WB2QIX
WØMZI
108 N8RBE
AD4IF
KA4UIV
KEØAH
K7GXZ
KC4PZG
KJ3E
KN4US
N5KCL
WB5YDD
107 KB2GEK
KB4MON
106 K9CNP
N5YED
105 N2SSS
WA8DHB
KB9ENO
N2GJ
WD4EKA
104 WNØY
KDØYL
WD5GKH
WD4GGS
WJ3K
KA3ZCI
102 N6GIW
101 KF2ER
KD4RZP
N2TOY
KA7YYR
99 KD4ITI
W1JTH
N9KHD
98 K8ZJU
N1LAH
WB9SHT
97 WD8IKC
N2AKZ
KA1WIF
WA5FXQ
96 WB2IJH
N1PNN
KB4WBY
N8QVT
KJ9J
95 N8HSC
WD9FLJ
94 W7LBK
KA5YDJ
WA4TVS
93 N8MJY
K3UWO
92 KC4ZHF
N1OBL
KA3ZCI
91 KØORB
N2VDT
N4JTG
90 KG2D
KQ4AG
89 WB5ZJN
AD4CN
KB2ETO
88 WB2IIV
N2DLN
WB3LTA
N4KSO
WB4ZNB
KD4JMA
87 N8JSO
N2WPB
N7THH
86 N4LST
W1YOL
W2OD
N2SU
85 KA8CPS
84 NM2M
KA1RSY
83 WA4EYU
AA5LT
WA4GLS
KI4W
82 KA4LRM
WB8BGY
W2CC
WB3V
AA3CN
KD5GM
N5TNV
61 N2WKT
80 N2JOA
N4VJK
79 KB6ECH
78 KA2JFU
N1KXJ
77 KD1JT
76 N6FWG
NU2U
KA1VEC
75 KD1DS
KD4ELI
KD4JMV
N5VGV
NØTNK
73 WT0E
72 WØYMB
WX1G
71 W6UVP
70 KA2JMA
N5WOY

The following stations qualified for PSHR during September, but weren't listed in the column: N2AKZ, WD4GGS, W4SVG. (Aug) KD1NX. (Jul) WØUCE. (Jan '93) WØUCE.

Brass Pounders League

Call Sign	Orig	Rcvd	Sent	Dlvd	Total
NZ2T	308	1958	1429	11	3706
W3CUL	856	721	1360	35	2972
WB9YPY	0	1428	81	1021	2510
WBØWNJ	0	219	2275	9	2503
W1WCG	1	1207	1256	11	2475
N2JAW	204	796	834	186	2020
WB5NKC	0	549	658	227	1534
NM1K	451	189	662	6	1308
N5SKG	0	499	546	25	1070
W3VR	296	251	410	35	992
W9IHW	0	524	54	351	929
WA9VND	9	404	380	36	829
KK3F	6	400	380	20	806
KA2VZX	25	348	351	68	792
NR2F	7	375	359	11	752
WX4H	5	336	393	10	744
K4DOR	94	257	351	10	712
WB6DOB	0	309	327	42	678
K6UYK	285	210	157	11	663
NØBQP	32	322	70	204	628
K1UGM	0	310	310	0	620
K9DCX	43	333	0	232	608
W1UD	18	273	251	37	579
AA2CX	30	278	241	25	574
KGØAO	31	321	0	198	550
N4GHI	5	300	215	13	533
WT0G	78	186	175	93	532
NL7TC	0	263	264	5	532
NØDKK	30	289	0	203	522
KB4WBY	1	347	153	1	502

BPL for 100 or more originations plus deliveries: WØLVI 163, WD4IIO 162, KF5BL 135, AB6EU 120, KI5NL 111, N1FWV 100.

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	31	331	374
BEARS of Manchester	31	429	399
Carrier Net	26	66	798
Central Gulf Coast Hurricane Net	31	47	2492
Clearing House Net	31	163	816
Empire Slow-Speed Net	31	111	430
Golden Bear Amateur Radio Net	31	23	1269
Great Lakes Emergency & Traffic Net	31	65	1094
Green Mountain Net	26	24	631
Hit and Bounce Net	31	918	712
IMRA	26	594	1603
Midwest RTTY Net	31	100	353
Mission Trail Net	31	68	886
NYSPTEN	31	63	446
Southwest Traffic Net	31	739	1417
Vermont Phone Net	5	23	101
West Coast Slow-Speed Net			
7290 Traffic Net	47	564	3433
20-Meter ISSB Net			
75-Meter ISSB Net	31	180	1180

Packet Perspective

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716-2755
Internet: horzepa@gdc.com

Packet by Air

By Nick Smith, WA4GKM
108 Cardinal Loop
Crossville, TN 38555

Ham radio causes quite a pileup at 41,000 feet.

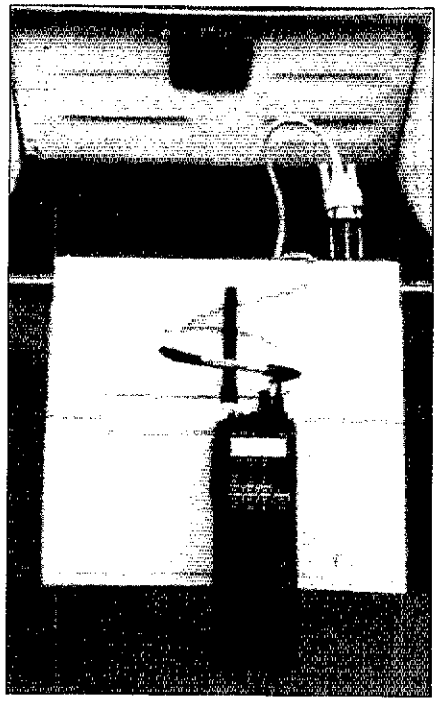
Being fascinated with airplanes and radio, since 1970 I've sought ways to enjoy both at the same time. During that year, I installed a 2-meter antenna on the underside of my aircraft (a Cessna 172) and began making contacts on 2-meter FM. Operating simplex was the mainstay of my enjoyment and the most rewarding. Repeaters weren't as numerous as they are now, so you could use a lot of machines and not key a distant one on the same frequency. They've become so closely spaced today that it's virtually impossible to operate on repeaters from the air.

I've had many QSOs from the sky and caused several pileups on the 146.52 national simplex frequency.

About two years ago I became an avid packet operator and because of my occupation as a pilot (on call 24 hours a day, seven days a week), I couldn't get enough of it: Just as I'd start a new project, I'd have to leave for a trip with my job. Fortunately, I seldom work seven days in a row. The excitement of operating on the ROSE network conversing keyboard-to-keyboard was my first endeavor in packet. Then came PBBSs and exchanging messages, reading bulletins and notices of items for sale. I rediscovered many old ham friends from years past, and made lots of new friends through packet. I recently began operating on the satellites and PACSATs using voice and digital modes.

When you travel, it gets tiring to carry luggage from city to city, so I try to carry a minimum of baggage. I take my hand-held transceiver with me because it doesn't take up much room, and I use it for aeronautical mobile ham operation when I go on a trip. My thoughts focused on a packet station small enough for a briefcase that could be carried with me on the aircraft and not add to the baggage I had to carry to the hotel. My home station consists of an 80386 computer with all-mode 70-cm and 2-meter rigs for OSCAR and 2-meter packet. This works great for a base station, but it's not very portable. I have essentially the same gear at the apartment where I'm based, so I have a station to operate from at home or at work. All I lacked was a packet station that I could take with me while I travel, which is most of the time.

After some thought and planning, I decided to use my laptop machine as a packet computer because it's small and lightweight. Next I needed a TNC that was small and which required no external power. One day, while reading *QST*, I saw an ad by Jack Reed, WA7LNW, of Phoenix, Arizona (Colorful QSLs), for the PC-COM, smaller than a penny matchbox (going back a ways), and that's tiny! It requires no batteries or external power source. Simply insert it into the RS-232 serial port and you're ready to go. An excellent computer program comes with it; the first disk I received had German software (I couldn't make out much of the help text and prompts), but I soon got the newer English version. An RS-232 cable with small connectors for hand-held transceivers was included. After a few tries and parameter changes, I connected to a local ROSE switch.



The author's complete aeronautical mobile packet station sits on the airplane's steps. It consists of a laptop computer, hand-held VHF transceiver and a subminiature packet interface device that plugs into a standard RS-232 serial port. *(photo courtesy of the author)*

My next trip afforded me the chance to try it out, but I needed a antenna that was portable and worked well with a hand-held. Just before I left, my order arrived and the station was complete, with a roll-up 2-meter antenna. When I arrived at Pittsburgh, after checking in at the motel, I connected to three local PBBSs, a station, swap net and a DX *PacketCluster*.

This was lots of fun because I could send messages via my local PBBS to my friend, Bobby Raymer, KO4GF, back in Cookeville, Tennessee. I had assembled a complete packet station that I carry with me on all trips across the country and check in from my hotel room. Next came the biggest thrill—I had tried a few times to operate packet from our aircraft, but the rubber duck antenna on my hand-held rig just wasn't enough to get out. I could receive packet, but I couldn't connect to anyone.

I asked the aircraft radio shop to install an external 2-meter antenna on the aircraft, but they suggested using an existing VHF Com antenna and putting on a BNC connector for me to use on my hand-held rig. This worked great. At 41,000 feet, I called CQ and to my astonishment, all eight packet windows filled up with connections. Needless to say, I couldn't get back to all those who connected, and I was busy with my duties as captain on a British Aerospace Hawker jet, so I only worked a few stations the first time. Since then, I've picked times to operate when we weren't busy talking to ground controllers. I can now operate packet from almost any location. If I could just figure out how to drive and read the computer screen at the same time....

ARRL DIGITAL CONFERENCE

Planning has begun for the 1994 ARRL Digital Communications Conference, to be held in the Minneapolis/St Paul area. All amateurs interested in digital communications are invited, with special emphasis on presentation of formal papers. The purpose of the conference is to provide a national/international exchange of ideas concerning digital communications in Amateur Radio. In the coming months you'll hear a lot about the conference in detail, but at press time, here's the information we have:

A date and site haven't yet been established, but the primary date under consideration is August 19-21 (a secondary date is August 6-8), and 12 sites in Bloomington and Eagan are being checked. All have free shuttle bus service to the airport and the Mall of America. (Organizers plan to announce a firm date and location by Dec 31, 1993.) Formal conference activities will be held on Saturday, with informal activities, including field trips, on Friday evening and Sunday morning. The event is an official ARRL Conference, sponsored by the TwinsLAN ARC. For information, contact Carl Estey, WAØCQG, 276 Walnut Ln, Apple Valley, MN 55124; tel 612-432-0699;Internet estey@skyler.mavd.honeywell.com;packet WAØCQG@WAØCQG.#MSP.MN.USA.NA.—*WA1LOU*

Progress in Lesotho

Editor's note: On the first appearance of this feature, in the February 1993 issue, we reported on a new radio club at the National University of Lesotho. Thanks to Rick Atherton, 7P8EB/KC4LLA, Secretary of the Lesotho Amateur Radio Society, here's a progress report.

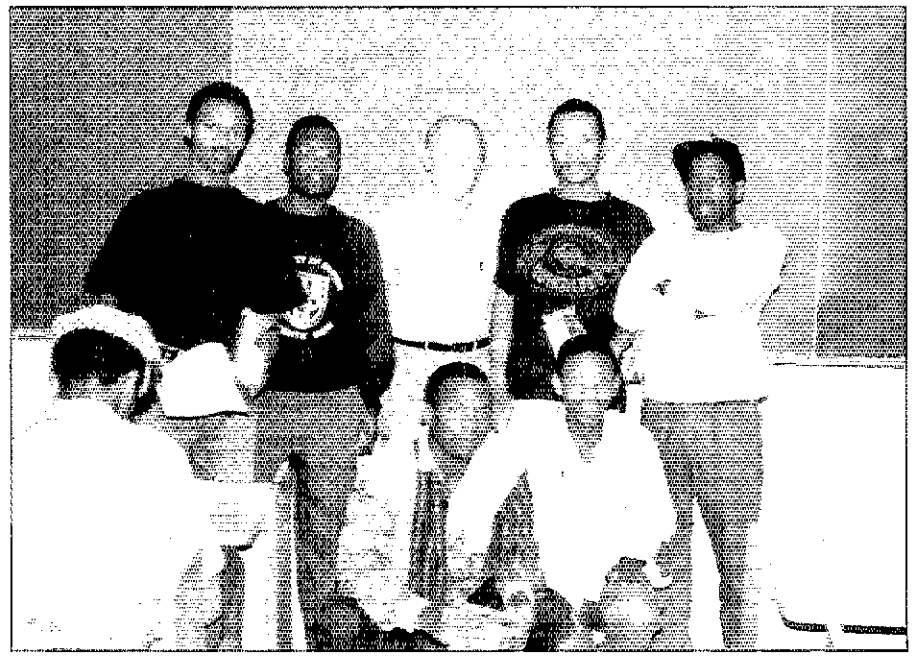
It came to the attention of our local IARU member-society, the Lesotho Amateur Radio Society, that IARU Region 1 had a working committee devoted to Promoting Amateur Radio in Developing Countries, or PADC (now called Support of the Amateur Radio Service, or STARS—*Ed*). This committee was looking for likely spots in southern Africa in which to set up model club stations. Because of my work at the National University of Lesotho (NUL) in Roma as director of the Campus Crusade for Christ ministry, I was able to contact students and faculty and saw that there was real interest. So, I wrote up a proposal for a club station and sent it off to the PADC.

The radio club at the university actually began back in 1991. I was gone on furlough from October 1991 to March 1992. By the time I returned, the PADC coordinator for southern Africa, Hans van de Groenendaal, ZS6AKV, (who is now on the IARU Region 1 Executive Committee—*Ed*) had secured the equipment from the IARU for our club station: a Kenwood TS-140S, tuner, power supply and G5RV antenna. The Science Department provided a room for the station.

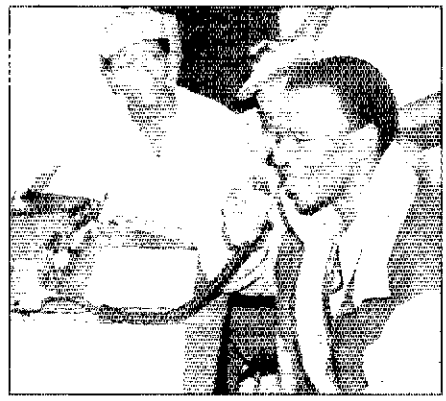
Setting up the club station provided a real boost to the NUL Radio Club. Now the students could listen to actual amateur communication, aside from just reading about it. Seven third-year science students and one physics technician registered for the radio exam to be given in South Africa in November 1992. We began meeting weekly for a study session, using the Radio Society of Great Britain manuals provided by the IARU. There was a lot for them to grasp: Imagine what it would be like for your first ham exam to be at the Advanced level! That's what they were facing.

Finally the big day arrived. Seven of the eight made the trip with me across the border to sit for the exam. They were excited, quizzing each other all the way over. The exam went smoothly and everyone had plenty of time to complete all the questions, but they weren't sure how they had done; some were talking about being better prepared for the next exam opportunity, in May 1993.

No news arrived before the Christmas break. Finally, the day after the students had left, the envelopes arrived. I was so pleased that of the six students who sat the exam, five had passed! The physics technician also passed.



The first licensed members of the NUL Radio Club, standing (l-r): Thabo, 7P8FM; Anthony, 7P8FN; Rick, 7P8EB; Chabeli, 7P8FK; and Mofo, 7P8FL. Kneeling: Tsepo, 7P8FI; and Likotsi, 7P8FJ.



Tsepo, 7P8FI, makes his first contact from the club station.

IARU Scoreboard

Member-societies, end of 1992: 134
New members as of December 1, 1993:
5 (VP5, Z3, OK, OM, VP2E)
Resignations: 1 (Czechoslovakia)
Total members, December 1, 1993: 138
Pending applications: 3
(Bosnia-Herzegovina, Qatar, Ukraine)

The next step, of course, was to get them licensed in Lesotho. I had spoken with the official at our telecommunication authority who handles amateur licensing and worked out the details. Shortly after they returned to school in January 1993, they received their own official licenses. You are most likely to hear them operating as 7P8NUL, but their names and call signs are: Tsepo Chaotsane, 7P8FI; Likotsi Morienyane, 7P8FJ; Chabeli Ramaisa, 7P8FK; Mofo Setloboko, 7P8FL; Thabo Mathibeli, 7P8FM; and Anthony Matobo, 7P8FN.

From the beginning, it's been my desire to emphasize the experimental nature of Amateur Radio and to get them involved in building their own equipment. A good friend back in the US, Lea Salter, KN4JW, has been a big help in this endeavor. First, he donated 10 modified Neophyte receiver kits in 1992. When Lea learned they'd gotten their licenses, he sent over 10 QRP 40-meter transmitter kits. With these sets, the students will be able to keep in touch with one another from their homes around the country.

It's really been a joy to play such a direct role in helping these young people expand their horizons through Amateur Radio. I hope you have the pleasure of contacting these new hams on the air. Now if only we could get a Novice license initiated in Lesotho, we'd really be going places!– *Rick Atherton, 7P8EB/KC4LLA* QST

Conducted By Brian Battles, WS1O
QST Features Editor

VHF Contesting

It's time for the ARRL January VHF Sweepstakes! Where were you during the last VHF contest? Did you miss the ARRL Spring Sprints in April and May? The ARRL UHF Contest in August? The September VHF QSO Party? Will you be ready for the VHF Sweepstakes this month?

The standard answers are, "I'm not a contester," "I don't have an all-mode rig for those bands," or "I don't have time to stay on the air all those hours." Fortunately, none of these standard answers are valid reasons to ignore the events. You may say, "The only ham radio activities I like are handling traffic and chatting with friends on the local repeater." It's funny how that's not much different from operating in a VHF contest.

"I'm Not a Contester"

Who is? Only a person who elects to participate in a contest. And even then, you aren't really known as a contester by anyone else unless you submit an entry log. If your main interest is ragchewing, helping with public service activities, organizing emergency communications or handling traffic on the local repeater, you can also have fun by trying your hand at a VHF contest. Making a contact is easy. You simply exchange your call sign and grid square. Unlike the big HF contests, an FM contest QSO can be much more leisurely. There's rarely any QRM to fight, and because there are fewer stations in range, there isn't the frantic pace HF contesters must maintain. By the way, some of the best contesters come from the ranks of traffic handlers, which makes sense because contest operation requires the ability to copy the other station accurately and efficiently.

"I Don't Have an SSB or CW Rig"

You don't need one. Every ARRL VHF/UHF contest lets participants use FM. You simply can't use repeaters. There aren't any special multipliers for working DX stations or having a 1000-watt amplifier feeding a stacked array of Yagis. Each FM simplex contact with a neighbor is worth just as many points as a CW contact with a station 1000 miles away. That hand-held 2-meter FM transceiver can net you enough points to make a strong showing in your Section—if you go to the trouble of using it. How much trouble? Pick a simplex frequency (see below) and listen for—or call—"CQ contest."

"I Don't Have Time"

If you plan to be on the air at all over a contest weekend, you have time to join the fun. Simply exchange the necessary information and write it in your log. There's no minimum number of operating hours or contacts you have to make, no bonus points for staying awake all night, no special awards or certificates for climbing Pike's Peak or Mt McKinley, operating from a submarine or autogiro, or standing on your head. (Although some of those could be great opportunities to take a photograph and send it in for Up Front in *QST*!) You can take a stab at the contest while sitting comfortably in your shack, living room or car for an hour or two. If your home isn't an ideal spot for VHF/UHF line-of-sight propagation, grab your gear, hop in the car, and head for a nearby hilltop. If you live in an urban area, try the roof of a parking garage or office building (ask permission first). One year, I discovered that if I drove over and parked just two streets from my house, on the crest of a gentle ridge, the nearly silent 446-MHz simplex frequency came alive with stations I could easily work with my dual-band FM rig. Grab a snack and a mug of coffee or hot chocolate, a couple of pencils and a log sheet. If you don't have a blank contest log, use a plain piece of paper. You can always copy the info onto a standard contest log afterward, if you decide to "officially" enter. If you prefer, boot up a contest logging program on your computer and let the silicon do the thinking. You can get such software by mail order, by downloading it from local telephone BBSs or national online services, or ask for a copy from almost any contester you know.[1]

"I Never Hear Anyone Using FM During Contests"

If no one else is calling "CQ Contest," then *you* may as well do it. You'd be surprised at how many others might pop out of the woodwork to make a QSO. An almost foolproof strategy is to recruit your friends and members of your club to join you to give each other contacts. This can lead to hundreds of "easy" points and give your contest log a shot in the arm. The January VHF Sweepstakes features three categories of competition for ARRL-affiliated clubs. Pool your logs as a club entry and share the glory. There's even a certificate for the high scorer in each club. (See page 124 in this issue for details.) Other hams you convince to try it may also become regular contesters, too, and perhaps you can form the nucleus of your own team. (As an added incentive, if you can get 25 people you know to get on the air during the ARRL September VHF Sweepstakes, and each of you works everyone else, you'll *all* be eligible for participation pins!) If you want to make it easier to convince friends or club members to participate, ask them to call or listen on a particular frequency at the top of each hour from, say, 1 PM to 6 PM. That way, they'll be more likely to find someone and make a contact or two, rather than randomly turning on the rig, hearing nothing and giving up. There are well-known frequencies to go hunting on: Try the following frequencies: 144.9-145.0, 146.49, 146.55, 146.58, 147.42, 147.45, 147.48, 147.51, 147.54, 147.57; 223.5; and 446.0 MHz. *Don't* use the 2-meter national simplex frequency, 146.52 MHz, or frequencies coordinated for repeater use in your area, for calling or soliciting contacts.

"What's in it for Me?"

Contests put a lot of hams on the air. The FM simplex frequencies that may be normally quiet most of the time will usually be fairly busy. You'll get a better idea of how effectively your station functions, what kind of range your station is capable of spanning, how propagation and seasonal conditions affect your station, and what neighboring stations you can hear.[2] You might get your call sign or your club's name into the contest results write-up in *QST*. In some Sections with a smaller active ham population, your modest effort could even earn a certificate or plaque! You can make new friends on the air, who probably don't live too far away. You might discover a propagation "opening" and experience the thrill of working someone hundreds of miles away with your hand-held transceiver. You'll hand out QSOs for points to other contest operators. (As a newcomer, you'll quickly learn how welcome you are, because your call sign will be very noticeable to regular local VHF contesters who may be frustrated by always hearing nothing but the same bunch of stations during every contest.) Most important, it's almost certain that you'll have fun.

[1]Excellent programs are readily available and inexpensive. You can try several varieties of *freeware*, which costs nothing to use, or *shareware*, which you may use free for a trial period, but requires a nominal registration fee if you plan to use it regularly. If you have a modem, but don't know where to start looking for contesting software, try the ARRL HQ BBS (203-666-0578), or such commercial online services as CompuServe, NVN, America Online, GEnie, Prodigy, etc. Commercial contesting software is available from vendors who advertise in *QST* and the *National Contest Journal*.

[2]I've been astonished by the possibilities of long-distance communications on 2-meter FM. For example, there was a band opening one evening when I made simplex contacts from my home in Connecticut with stations in Cape Hatteras and in Maine, and I was even called by a station in Panama City, Florida (!), although I couldn't complete a two-way QSO with that station. I wasn't using an exotic rig, antenna, power amplifier or preamp: my trusty ICOM IC-2GAT hand-held transceiver (about 8 watts output) was feeding a 5/8-wavelength whip antenna on top of the chimney of a two-story house.—*WS1O*

Conducted By Connie Dunn, KB5LES
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ATV: What is It, and What Can YLs Do with It?

YLs who get involved with amateur television (ATV) find themselves looking into the face of the future.

For years, Amateur Radio has been the testing ground for new technologies. For example, in the past couple of years, packet radio, pioneered largely by hams, has become a well-known commodity in the commercial world. And if telecommunications companies have their way, technology similar to ATV will be used to bring wireless video telephones to the marketplace.(You've probably seen the AT&T ads: "Have you ever called home and tucked your baby in with your wireless video telephone? You will...")

Pat Carter, KA6IRS, sits with her ATV station setup in the field while trying to capture a balloon launch.

ATV doesn't require extensive or expensive equipment. "You take a basic video camera that you use for videotaping your vacation and connect it to your TV. If you want to transmit pictures to other hams, you buy a transmitter. To receive ATV video and audio, a simple downconverter and an antenna for the correct frequency range is all you need," says ATV expert Maryann O'Hara, WB6YSS, of Arcadia, California. Maryann and her OM, Tom, W6ORG, own P. C. Electronics in Arcadia, where, for the past 25 years, they have manufactured and marketed ATV equipment for a growing market.

"Most of our customers are men, but there are more and more women getting into this aspect of ham radio. Many of the newcomers are couples," notes Maryann.

A simple downconverter for use in the 420-450 MHz range costs about $90, and a good antenna is about the same price. This setup allows newcomers to receive ATV signals on their TV sets. Among the pictures you can receive are weather radar and space shuttle video retransmissions, plus an assortment of personal demonstrations on cooking, crafts, Amateur Radio and much more in areas where ATV is popular.

"Even if you only have a downconverter," says Rik Albury, W5SOQ, of Carrollton, Texas, "you can have two-way conversations." While you receive video and audio from someone transmitting an ATV signal, you can talk (voice only) to them on your 440-MHz FM rig. Through the use of an ATV repeater, ATV ops can cover wider geographical regions. "Virtually anything you do with a regular repeater, you can do with an ATV repeater," you simply use full-motion video to enhance it.

Although Rik's wife, Lu, WB5LNW, feels she is "mainly a spectator" in ATV, she does get on the air occasionally. "I don't think it's any more technical than voice," she emphasizes. "But I personally haven't seen too many YLs on. When they do get on, it's usually by accident."

But it's no accident that ATV enthusiast Pat (Patricia) Carter, KA6IRS, of Prunedale, California, spends time in front of or behind the camera. She says, "I had been a ham a long time, but I wasn't active until about five years ago. Then my husband and I went to a club meeting and I was impressed by the club's demonstration of ATV. After that, I went from Tech to Advanced."

After attending Winterfest, an educational Amateur Radio workshop in southern California, she asked for ATV equipment for her birthday and got it. She's been an avid ATV operator ever since.

"What I like best is, it's portable. I like being able to take it out and put it up in the middle of nowhere," she adds.

But she's also used ATV to help with the Big Sur Marathon and the Hot Air Affair, a hot air balloonfest. "One of the hams in the group is a balloonist, so I got to go up and send the signal back to the ground," she explains. During her participation in the marathon, she "sat on the press truck sending video to the repeater. Then it was downloaded at the finish line."

ATV can be creative and an appliance user's haven, says Pat. "You don't have to be so technical to use it. Nowadays, most people can't take their rigs apart to fix them. But they can get into ATV and be successful. ATV is easier than many modes. You see the results right away. A lot of our members (Naval Post Graduate School Amateur Radio Club in Monterey, California) are doing it. They stick you up on a hill with their equipment and you're only responsible for covering the shot."

Once you've seen ATV operate, Maryann, WB6YSS, adds, "you want to get involved in it." And the uses are almost endless, from sending video of the grandchildren, to demos on almost anything, to using ATV with remote control trains, airplanes, helicopters, gliders and rockets. To help combat increased crime, some groups now are using ATV to provide a high vantage point overlooking "parking lots where cars have been stolen or vandalized," she remarks. "ATV also has a big-time use in emergency services."

Ralph Cooper, N6NYK, of Arcadia, California, says his RACES group, which is about one-fourth women, works with different sheriff's substations and has just purchased ATV equipment that can be put on helicopters. "We also use ATV for Rose Parade communication. We often have as many as six to eight camera locations." The group plans to hook up ATV to use on helicopters and other platforms to aid in communications for crime prevention, searches for lost children and other uses.

Meanwhile, ATV operations in schools are helping teach students about technology and giving them the opportunity to star in their own personal video transmission. Describing a recent ATV demonstration, Carole Perry, WB2MGP, a teacher at Staten Island Intermediate School #72, notes that, "My students were filled with anticipation. They quickly spread the word to schoolmates and teachers. Before I knew it, I had several requests from other staff members to bring their classes to the auditorium to see the demonstration. A television appearance can bring out the 'ham' in all of us. The creativity of the students came out in full force as we let them become ATV stars. A group of students told us what they would do with their own amateur TV stations. Another was a budding comic who made the auditorium audience laugh with his antics and funny faces. And when the drama teacher became a star on ATV, she recognized what an advantage ATV would be for her classroom."

AMSAT-NA Space Symposium

For three days in early October, the movers and shakers of the ham satellite world gathered in a Dallas suburb to share ideas.

By Steve Ford, WB8IMY
Assistant Technical Editor

John Shew, N4QQ, answers VE3ONT's moonbounce CQ at the 11th AMSAT-NA Space Symposium. (*photos by WB8IMY*)

The La Quinta Motel in Arlington, Texas, will never be the same. On October 7-10, it was home to the 11th AMSAT-NA Space Symposium. The motel is right next door to Six Flags Over Texas, so I assume the staff has seen its fair share of unusual activity. But have the employees ever experienced a large group of Amateur Radio satellite operators concentrated in one location? (What *are* these people talking about? And who put up that *bizarre* antenna by the courtyard pool?)

We tend to equate the word "symposium" with dry, incomprehensible lectures, but this was hardly the case. It was standing room only for most presentations and everyone came away enlightened. For example, I had no idea how easy it is to work Mode S on OSCAR 13 until I listened to Ed Krome, KA9LNV, describe his portable station. He assembled his dish antenna in minutes before an astonished audience. (See the *Up Front* section of last month's *QST*.) Ed even claims to have listened to the Mode S downlink using a cooking wok as a parabolic reflector!

If you wanted to get the latest on the Phase 3D project, the AMSAT-NA symposium was the place to be. A detailed scale model of the satellite was on display and there were several presentations on the status of the project. Based on what I saw and heard, Phase 3D is going to be one incredible satellite.

You're constantly bumping into people you know—and enjoying new experiences, too. I had a pleasant conversation with Peter Guelzow, DB2OS, concerning OSCAR 21 and the popularity of its FM repeater mode here in the US. On the way back to my room, I passed the satellite antenna array in the courtyard. The coaxial cables snaked into the open door of a room where Doug Howard, KG5OA, had installed a portable station. John Shew, N4QQ, was at the paddles, trying to answer someone on CW. Which satellite was he on? I was amazed to discover that it was OSCAR Zero—the *Moon*. In all my years of hamming, this was the first time I had heard live moonbounce signals. The VE3ONT crew was using a huge dish antenna to bounce powerful "CQs" off the lunar surface. It seemed strange to be listening to their moon-reflected CW signals—as strong as anything you'd hear on the HF bands—while standing in a Dallas motel room.

The AMSAT-NA symposiums are not intended for the elite—they're for everyone. If you can attend next year's symposium, do so. It's money well spent!

Where else can you get a front-row seat as James Miller, G3RUH, explains the complexities of managing OSCAR 13?

Every member of the SAREX Working Group, except for Chairman Roy Neal, K6DUE, attended the AMSAT symposium. The Saturday evening banquet was the perfect place to award plaques given by the ARRL Board of Directors. Left to right are: Lou McFadin, W5DID, Johnson Space Center; Frank Bauer, KA3HDO, AMSAT's Vice President for Manned Space Flight; Karen Nickel, WD5EEU, and John Nickel, WD5EEV, Johnson Space Center Amateur Radio Club; and Rosalie White, WA1STO, ARRL HQ. QST

Ham Radio Goes to Camp

By Hal Turley, KC8FS
657 Forest Cir
South Charleston, WV 25303

For the second consecutive year, the Kanawha ARC (an ARRL Special Service Club) participated in the KIDS Camp held at the spacious Virgil Tate 4-H Camp near Charleston, West Virginia. KIDS is the acronym for Kids Involved in Doing Science and is in its third year.

Because of the tremendous response to the camp this year, it was offered in two different three-day sessions with 250 students attending. Kanawha ARC took part in both by demonstrating Amateur Radio to the young campers on June 28 for the first session (we hadn't recovered from Field Day!) and returning on July 1 for the second group.

The camp is a program designed for area students entering the fifth or sixth grades who are interested in learning more about science and math. KIDS Camp offers the young campers a sequence of hands-on activities that focused on the physical sciences, fundamental chemistry, physics, computers and electronics.

Hal Turley, KC8FS, demonstrates Amateur Radio to KIDS Camp attendees near Charleston, West Virginia. *(photo courtesy of KC8FS)*

Amateur Radio was featured as one of the "Hobbies with a Scientific Twist." The station included HF and VHF equipment. We were on the air as W8GK, the Kanawha club call sign. The campers were fascinated to participate in conversations with ham operators in Florida, Texas, Mississippi and North Carolina. We also set up a display on Morse code with a code practice oscillator and straight key. Since the end of camping season last summer, the Kanawha ARC and the Tri-County ARC have teamed up to offer Technician-class license training courses. So far, two courses have produced more than 70 new hams.

AMATEUR RADIO EXHIBITS AT NEW YORK STATE FAIR

Labor Day marked the end of the New York State Fair. In the minds of many fairgoers, the excitement of the event will live on for some time to come. To introduce Amateur Radio to the public, the Dill's Landing Wireless Society shared its booth space with the Erie Canal Historical Society. Together at the fair, both organizations successfully demonstrated to the public the history of the Erie Canal and Amateur Radio.

The Erie Canal, now referred to as the "Barge Canal," has undergone a metamorphosis. Once a commercial venture, it's now primarily recreational. Management has been turned over to the New York State Department of Transportation, which is ushering in a new era. Even the Dill's Landing Wireless Society participates in this new aspect of the canal. The club operates a marine mobile station as part of the annual ARRL Field Day exercise in June. Likewise, the Dill's Landing Wireless Society sees a new era of growth in Amateur Radio, with the codeless Technician license as an entry point into the service. The 12-day New York State Fair near Syracuse provided an opportunity to promote Amateur Radio classes offered through the Camillus Parks and Recreation Department.

The Department summarized the successful exhibit: "We feel that the presence of Dill's Landing Wireless Society at this great event demonstrates to the public that the Amateur Radio 'hobby' is not only important to our community, but that it shares a history with our culture."—*Camillus (New York) Parks & Recreation Department*

The Dill's Landing Wireless Society set up a joint exhibit with the Erie Canal Project at the 1993 New York State Fair. Manning the display are (l-r) Tom Psyck, N2MKC; Dave Brooks, KA2VEE; John Settimeri, Erie Canal Project; John Patchett, KB2ERJ. *(thanks to John Driscoll, N2MKH)*

100% ARRL CLUBS

Administered By Vicky Armentano

Congratulations to the following ARRL affiliated clubs for gaining the 100% ARRL Club status in 1993. Every member of an ARRL affiliated club must also be a current Member of the ARRL to be recognized in this way. Handsome certificates were mailed to all these clubs last fall.

Alamo DX Amigos, TX
Arkansas DX Association
Beacon Radio Amateurs, PA
Bethel ARA, OH
Bozo and the Lids, IN
Capeway RC of Massachusetts
Central Kansas ARC
Chicago Radio Traffic Association
Clay County DX Association, FL
Clover Leaf ARC, FL
Cumberland County Amateur Radio Service, PA
Delta DX Association, LA
Fist & Mouth Contest Company, LA
Gabilan ARC, CA
Grand Mesa Contesters, CO
Great Dismal Swamp DX Association, VA
Houston Amateur Radio Helpline
Indianapolis RCA ARC
Kibbee Radio Amateur Preservation Society, GA
Long Island DX Association, NY
Madison DX Club, WI
New Mexico Big River Contesters
96 Over the Hill Gang/Metro-Comm Inc, PA
North Alabama DX Club
North Augusta/Belvedere RC, SC
North Florida DX Association Inc
North Jersey DX Association
Northeast Convention Association, NH
Northern Arizona DX Association
Northern Illinois DX Club
OBP ARC, MO
OH-KY-IN DXers, OH
PA Emergency Communications ARC
Pilgrim ARC, MA
Punxsutawney ARC, PA
Racine Megacycle Club, WI
Radio Amateur Group Inc, NC
San Benito ARC, TX
Sandusky Valley ARC, OH
Shelby ARC, NC
Skagit ARC, WA
Southwest Oklahoma Repeater Association
Tu-Boro RC Inc, NY
Twin City DX Association, MN
Valley ARC, WA
Wantagh ARC, NY
Warren County Races Association, NY
Washington University ARC, MO
Western New York DX Association
Wisconsin Amateur Contest Organization
Yadkin Valley ARC, NC

At the Foundation

Conducted By Mary E. Carcia, N7IAL
Secretary, The ARRL Foundation, Inc

New Scholarship to Honor a Tall Texan

Friendship has its own rewards, but occasionally a special one can benefit others beyond the original circle of friends. The new Fred R. McDaniel Memorial Scholarship was born of the long-term admiration that Dr Herman Muns, W5UKM, and his wife Sandra Muns, KB5WHK, had for a well-known rancher and ham friend, the late Fred R. McDaniel, W5ZTW. Fred was a morning on-the-air fixture to hams throughout the Southwest and seemed to make a friend of everyone he met. Even at work on his Texas Panhandle ranch, this ham for more than 40 years would work 'em from his truck or tractor. When Fred passed away in August '93, the Muns wanted to honor the memory of an exemplary ham and to benefit young Amateur Radio operators. The first award of $500 will be made in the 1994-95 academic scholarship season. Contributions to this new fund may be sent to the Fred R. McDaniel Memorial Scholarship Fund, The ARRL Foundation Inc, 225 Main St, Newington, CT 06111.

Applicants must (1) be enrolled in an accredited institution beyond the high school level and hold a General or higher-class Amateur Radio license, with preference given to (2) candidates residing in the FCC Fifth Call District (Texas, Oklahoma, Arkansas, Louisiana, Mississippi and New Mexico) and attending school in that call district; (3) have an academic grade point average of 3.0 or higher; (4) be studying mathematics, electronics or engineering and seeking a baccalaureate or higher degree. Academic merit, financial need and a demonstrated interest in promoting the Amateur Radio service will be important in selecting a scholarship recipient.

MEET ME IN YOUR MAILBOX!

Electronic mail is a great time (and postage) saver. Many of you who contact the Foundation make use of e-mail when requesting our informational materials or scholarship applications. We respond to every request as rapidly as possible, but because our materials must be mailed via the postal system, your e-mail note should include your name, call sign and street address. If you haven't sent for your scholarship package by now, get moving! Our deadline for application is February 1; for transcripts, February 15. Write today to the ARRL Foundation Scholarship Program, 225 Main St, Newington, CT 06111 or (via Internet: mcarcia@arrl.org).

Dress up that Form 1040 schedule of your charitable deductions. The ARRL Foundation Inc is a not-for-profit, tax-exempt 501(c)(3) organization. Any contributions are tax deductible to the extent permitted by the IRS. We acknowledge every contribution regardless of size. Don't miss out next year—make a contribution now or anytime throughout the year. We'll do our part to make sure you have the appropriate receipt(s) to make next year's tax return a thing of beauty!

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Victor C. Clark Youth Incentive Fund

Phil Sager, WB4FDT
in memory of Lynn Wilson, K4DHB

The Jesse Bieberman Meritorious Membership Fund

Steel City ARC Inc (PA)
in memory of Earl Rapp, W3QCD

The Fred R. McDaniel Memorial Scholarship Fund

Dr and Mrs Herman Muns, W5UKM and KB5WHK

The Goldwater Scholarship Fund

Wolverine Single Sideband Net (MI)
in memory of
Kenneth Fisher, K8CWE

The Mississippi Scholarship Fund

W. P. Gearhiser, W5EPW
in memory of
Sheldon Hartel, K5IVA

The PhD Scholarship Fund

Ladies' Eating Society of the Cedar Valley ARC (IA)

The Paul and Helen L. Grauer Scholarship Fund

Marc Campbell Jr, WØRBO*
Clayton, WAØSFI, and Nadine Dodd*
*In memory of
Paul Grauer, WØFIR

The General Fund

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Ian Cummings, KB1SG
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Forrest Hogue, KS6L
in memory of
William Lee Johnson, WA6HBX
Marion ARC (OH)
in memory of
Henry Bohrman, W8GKG
Charles Clifford Jr, W6QMY
in memory of
Allison Tangeman, AA6OH
William Ballantine, K3FMQ
in memory of
John Tate Sr, K3KTY
Lauro Bandera, IW2AVF
Jun Maeta, JH4VLL
Ernst Vranka, OE1EVA
Antonio Colnaghi, P42WMI
R. Manohar, VU2RMO
Vilnis Vosekalns, YL2KF
United Way Sacramento Area (CA)
Patrick Couprie
Carl A. Fotch
William Lantz
Hendrik Luyckx

As received and acknowledged during **Sep** and **Oct.**

QST

Strays

I would like to get in touch with...

◊ anyone who has at least six Fairchild UL-9141Cs (circa late 1960s). Herman Stavaja, K8OUK, 5806 Chaparral Cir, Farmington, NM 87402.

◊ anyone who is using weatherfax, for research I'm doing. I'm interested in images of the following areas: Red Bluff, California, and the California-Oregon border; the eastern side of the Bitterroot Mountain range that forms the boundary between Idaho and Montana; Cairo and Murphysboro, Illinois, and Vincennes, Indiana; Eufala, Alabama, and Lake Eufala; northwestern New Mexico, from Tohatchi to Farmington; Prescott, Arizona (central); and Alpine, Arizona (east). Michael Landwehr, KE7T, 1006 Shelly Dr, Deming, NM 88030.

◊ any amateurs who were fighter pilots during the WWII/Korean War periods. Pete Hardiman, N7DUC, President, P-51 Mustang Pilots Association, 1040 SE 58th Ave, Hillsboro, OR 97123-6326.

QST congratulates...

◊ US Navy Chief Cryptologic Technician (Interpretive) Greg Altig, N5OKR/EA7HAL/ZB2JL, on his promotion to Chief Warrant Officer. Greg is serving at the Naval Station in Rota, Spain, with frequent temporary assignments to Gibraltar. He'll be sworn in on February 1 by his friend and "Elmer," Lt Cdr Mike Rioux, NW1J (USNR). Following his commissioning, Greg will attend school in Florida and then proceed to his new duty assignment in Maryland.—*Sue Altig, Paso Robles, California*

◊ Henry Borawski, KB2PFP, of Pearl River, New York, on being presented the World Trade Center Group Award for Acts of Valor at the 1993 Medal Awards Ceremony on December 10 at the New York Coliseum. Henry received the award from the Board of Commissioners and the Executive Director of the Port Authority of New York and New Jersey in recognition of his "outstanding response to the World Trade Center Disaster as a member of the Port Authority Police Force."

Silent Keys

Administered by Katherine Fay, N1GZO

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

WA1CUT, Andrew Barrett, Stratford, CT
WA1DFL, Steven J. Rich, Revere, MA
K1KQK, Paul W. Taylor, Harrison, ME
W1NBV, Maynard E. Wentzel, Medford, MA
KB1OL, Jerome Robinson, Danbury, CT
W1PHU, David W. Lloyd, East Longmeadow, MA
KA1PX, Fritz A. Gross, Westwood, MA
WA1RWP, Nathan H. Sanderson III, Francestown, NH
W1TIV, Frank Rose, West Yarmouth, MA
WA1UOP, Uno W. Penttila, Spencer, MA
K1ZFP, Elmer Barber, Jensen Beach, FL
W1ZQO, William M. Williams, Cummaquid, MA
W2BAI, Raymond T. Van Handle, Passaic, NJ
WB2CTL, Jerome R. Hyams, North Merrick LI, NY
KA2DDG, Floyd Harvey, New Providence, NJ
WB2ESW, William L. Watson, Otisville, NY
*W2JYF, Richard H. Lachenauer, Sun City Center, FL
KA2JZH, Margaret L. Grosselfinger, Shelter Island, NY
K2LHA, Richard Daley, Ridgefield, NJ
N2MNV, Richard F. Kline, Montvale, NJ
W2NMI, Jerry Sucher, West Hills, CA
WB2QAM, Henry G. Ferrust, Mahopac, NY
W2QHH, Howard S. Bradley, Hamilton, NY
KA2RED, H. Conaty, Lakehurst, NJ
N3AGK, Mark P. Williams, Johnstown, PA
W3AKG, N. M. Colen, Pittsburgh, PA
W3BRK, Howard G. Wacker, Pittsburgh, PA
W3DOG, T. A. Phillips, Laurel, DE
WA3JRE, Joseph J. Meyers, Baltimore, MD
N3JSF, Kennard L. Spiker, Broomall, PA
W3NMZ, William H. Sypher, Blue Bell, PA
W3RNG, Everett T. Ecklund, Rockville, MD
K3TPO, Richard W. Bennett, Newtown Square, PA
W3TZ, John W. Hamblen, Sedona, AZ
*W3VRZ, Robert R. McClain, Beaver Falls, PA
WD4AWD, Bernard McCormack, New Port Richey, FL
N4AW, Albert S. Williams Jr, La Belle, FL
WA4BSG, Harold H. Peck, Melbourne Vlge, FL
W4DDK, Otis W. Franklin, Kingsport, TN
*KJ4EK, John A. Anastas, Clear Brook, VA
WA4FGH, L. Green, Spring, TX
W4FPS, Rev James Leonard, Seminole, FL
K4IHX, Jack D. Ryder, Ocala, FL
W4IK, Roy M. Brougher, Montgomery, AL
K4JCC, James Oakley, Nashville, TN
W4LED, Luther L. Peterson, Winter Park, FL
N4MEK, Herbert E. Somerder, Ft Walton Bch, FL
W4MIP, Clifford E. Hicks, Thomasville, GA
WB4MMD, Jewel S. Harris, Attalla, AL
KE4MM, Clark A. Reeves, Virginia Beach, VA
W4NW, Kenneth H. Langenbeck, Vienna, VA
K4OJ, Ralph H. Preston, Marshall, NC
KB4QNB, Ralph H. Holmes, Midfield, AL
K4QU, Donald V. Goodin, Oak Ridge, TN
N4RQT, Joseph B. Mark, Palm Bch Garden, FL
KK4SE, Bob D. Compton, Richmond, VA
*WB4UZD, Hoyt K. Taylor Jr, Chattanooga, TN
W4WYZ, Anderson C. Capers Jr, Augusta, GA
WX4Y, Wesley E. Kidd, Ponte Vedra, FL
W4ZBD, Paul Van Bolhuis, Westminster, SC
WD5JHS, L. O. Nelson, Wichita Falls, TX
*K5JP, James M. Perry, Cape Coral, FL
W5JXL, Lloyd C. Gordon, Snyder, TX
WB5T, Herbert V. Jones, Hetlin, LA
K6CNB, R. E. Strack Jr, Covina, CA
WN6CND, Charles K. Faludi, Fallbrook, CA
KD6DAX, William A. Rankin Sr, Big Bear City, CA
WA6DHO, Stan Bond, Sun Valley, CA
WB6ENT, Robert V. Brass, Redding, CA
K6LNE, William E. Murry, Northridge, CA
KB6MLL, Andrew J. Osborne, Red Bluff, CA
WB6NNL, Ralph B. Ryan, Menlo Park, CA
WB6NWJ, Lewis W. Turner, Culver City, CA
NJ6O, George C. Byrne, Los Altos, CA
K6OZW, Thomas A. Meaney, Costa Mesa, CA
WB6QBZ, Frances L. Schultz, Newport Beach, CA
N6QJM, Thomas R. Hambrick, Imperial Bch, CA
W6RSS, John A. Mann, San Leandro, CA
W6RYG, Fred Lee, Los Angeles, CA
W6TZC, Harold K. Painter, Rialto, CA
W6VBB, Nelson J. Hayes, Garden Grove, CA
N6VEV, Lawrence E. Echelmeyer, Seal Beach, CA
KI6XN, Emmett E. Butler, Lakewood, CA
N6XWA, Don Cavanaugh, Tustin, CA
W6YWD, Forrest A. Nelson, Los Altos, CA
W7BRM, Theo C. Roake Jr, Salem, OR
WL7BU, Glenn W. Stinson, Wasilla, AK
W7CUG, Harry H. McFarland, Salem, OR
WB7CXP, Margaret R. Miller, Belen, NM
*W7FCK, Victor R. Cass, Seattle, WA
W7GBU, Dean Bula, Spokane, WA
W7HJ, Frank A. Wilson, Las Vegas, NV
W7JSX, John M. Fischer, Olympia, WA
N7NIE, Robert D. Cashin, Colstrip, MT
*KB7PZ, Stanley R. Wallace, McCall, ID
WB7RAN, Charles L. Poetz, Portland, OR
W7TCQ, Jim Caldwell, Tucson, AZ
W7UKS, Clifford K. Scheppler, Tacoma, WA
WA7WKE, Reginald A. Gates, Tucson, AZ
W8CBL, William E. McFadden, Columbus, OH
K8DPK, Wendell B. Boggs, Xenia, OH
KB8EIQ, Robert L. Wyatt Jr, Elkins, WV
WA8JJI, Theodore J. Beck, Clinton Township, MI
K8JON, Wayne Lewis, Columbus, OH
NB8N, Harry B. Steinhauer, Detroit, MI
WA8ODZ, Dennis C. Rockensuess, Mt Clemens, MI
W8PKP, Robert H. Sterrett, Cincinnati, OH
W8PZQ, Howard J. Klinger, Farwell, MI
K8QCY, Troy A. Gibson, Goshen, OH
K8QWG, Mike Nakoneczny, Warren, MI
WB8TVE, Miles E. Ptacek, Winter Park, FL
W8UAD, Harold H. Wright, Grand Rapids, MI
N9DCL, Frank E. McGuire, Columbus, IN
W9IBM, Thomas J. Reibold, Superior, WI
*WN9IHT, William C. Smith, Moline, IL
WT9I, Arthur J. Brence, Waukegan, IL
K9IXU, Wayne E. Werts, South Bend, IN
W9LSZ, Charlie O. Becht, Marion, IN
KD9PB, John H. Kollmeyer, Oak Brook, IL
W9VCV, John A. McCombs, Granger, IN
W9YFI, David A. Langston, Decatur, IN
W9ZBY, Sherwin R. Palmer, Cumberland, WI
W9ZPV, Richard H. Oberholtzer, Elm Grove, WI
NØAR, Henry E. Boughan, Lake Winnebago, MO
WAØAYL, David E. Beach, Grand Forks, ND
NØDJF, Ivan W. Holmes, Independence, MO
AAØGX, Kevin L. Connell, Leavenworth, KS
*WAØGZA, Richard Werth, Moorehead, MN
WØKBS, Gordon L. Trout Sr, Lincoln, NE
KØKYH, Raymond W. Daniels, Aitkin, MN
WØLYM, Sidney T. Kitrell, Sevierville, TN
WØRWC, Robert M. Fuller, Clinton, IA
WBØUGW, Henry M. McArthur, Sullivan, MO
VE1KY, Frank J. Higgins, Lower Sackville, NS, Canada

*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 sign 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.

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. QST

75, 50 and 25 Years Ago

January 1919

◊ Whew: The possible Congressional action reported in last month's column—dubbed the Alexander Bill, it would have granted the Navy absolute control over radio and possibly put the future of US hamdom in jeopardy—died in committee, thanks in part to the testimony of Hiram Percy Maxim (sent to Washington, DC, by the ARRL Board) and others on Amateur Radio's behalf. Sluggish progress at the Paris peace conference has been keeping us all guessing about when US hams may return to the air, but word has it that the ARRL Board of Directors will meet again soon to consider the present and future state of the League.

January 1944

◊ The cover: "A Signal Corps soldier demonstrates dual operation of the Army's new f.m. walkie-talkie." The lead editorial asks a contentious question: "What do you think the power limitation ought to be on amateur stations after the war?" Gold Stars reports the deaths in action of Peter D. Barnhart, W4EUN, and James W. Wright, W6SAP. Earl Teague, W4GXG; Albert C. Senter, W5GUZ; Edwin A. Noordwier, W9DTA; and Frank Goldstein, W9JKN, are reported to be prisoners of war. John N. Stewart Jr, W5KFV; Ley D. Winn, W7BDB; and T. R. Frew, GM8FR, are reported as missing in action.

Louis H. Roth, W2DKH, leads the issue's features with "A Simple War Emergency Radio Service Transceiver with Transformerless Power Supply." An eight-page Hams in Combat ("Italian Invasion," "Atlantic Convoy" and "La Fauconnerie by 1600") follows. James Perkins Saunders, W1BDV, offers suggestions for using "Cameras in Light-Beam Communication." Radio Instructor Willard R. Moody overviews "Logarithms" in radio-circuit calculations. Paul J. Palmer, W8UGR, builds "A Rotary Audio-Frequency Generator" using toothed steel wheels and home-made magnetic pickups. Charles M. Dean, ex-W1AMN, examines "Ignition Noise on the V.H.F. and U.H.F." in clinical detail, including oscillographs. Clinton B. (W1CBD) DeSoto's "'E' for Excellence" covers the festivities held when eleven manufacturers, all dear to hams for their activities in producing prewar Amateur Radio equipment, received the Army-Navy "E" award for outstanding war production. The unattributed "Signal Corps Troops in Italy" reports on "communications during the invasion of the Salerno sector."

January 1969

◊ The cover: Beginner and Novice Editor Lewis G. McCoy and ARRL Lab Assistant Gus Wilson, W1NPG, adjust a two-element beam based on the delta loop—a configuration seemingly new to *QST*, and described in this issue's "The HRH Delta-Loop Beam" (Harry R. Habig, K8ANV) and "The Delta Loop Beam on 15" (McCoy).

The lead feature article presents "A 1969 Model 50-Mc. Transistor Transceiver," by Thomas H. Campbell, WA7FJC. M. L. Peterson, W2FMX, and Francis K. Williams, WB4GTS, offer "Notes on the Heath SB-300/SB301 And SB401." Harold G. (W6JES) Collins's "Ordinary and Processed Speech in S.S.B. Application" examines what clipping and/or compression at AF and/or RF do to talk power. C. A. Stiles Jr, K5MRK, builds "A 10-Mc. WWV Receiver and Crystal Calibrator in One Box." John Harvey Chase, W4TG, shows us how to achieve "Simple Measurement of High Capacitances" by noting how long a capacitor under test takes to charge through an ohmmeter's internal resistance. Ed Tilton, W1HDQ, builds, from dimensions provided by Pitt Arnold, WØIPE, a "Slotted Line for U.H.F. S.W.R. Checks." James R. Andrews, WAØNHD, presents "Transistorized A.G.C. and Squelch Circuits." Henry A. Blodgett, W2UTH/W2FRL, presents tips on "Using the Heath SB-200 Linear on Six Meters." Charles L. Gardner, K6DY/WØZWK, builds a top-loaded 40-meter vertical he calls "The DX Gutter Getter." Recent Equipment builds a Heath HW-100 80- through 10-meter transceiver.

Albert Kahn, K4FW, pulls our leg with "C.W.—An Art Form." Jim Kirk's "The Good Old Wireless Days" entertainingly glosses its author's radio experiences from 1908 through World War I.—*David Newkirk, WJ1Z* QST

Results, 1993 ARRL September VHF QSO Party

The aurora Sunday evening made for an exciting finish
–Bill Murphy, WØRSJ

By Billy Lunt, KR1R Contest Manager and Warren C. Stankiewicz, NF1J Assistant Contest Manager

The 1993 September VHF QSO Party ended with a bang! We had the best aurora opening during a VHF contest in recent history. Aurora turned what would otherwise have been a run-of-the-mill operating event into a free-for-all during the last hours of the contest Sunday night. Anybody who didn't operate until the end of the contest must be kicking themselves by now. Aurora started as early as 2100Z Sunday night and ran for two to four hours. Gary, WA1YHO, happily reports, "I could only get on for a few hours, and luckily, the aurora coincided with my schedule!"

Not only was this year's aurora a good one, but it covered a wide area of the US and Canada. It was workable from Kansas to Maine, and people as far south as North Carolina and Tennessee were making aurora contacts, too. The paths didn't open very far or for very long on the 222- and 432-MHz bands, but the great time we had working new multipliers on 6 and 2 meters made up for it.

Aurora is one propagation mode where CW sure comes in handy. The raspy signals can make deciphering SSB signals an adventure. On the other hand, CW is tailor-made for this. Slower-speed CW works the best. The rapid flutters and hisses can easily mask a quickly sent string of code, while a more slowly sent message will get through with little or no problem. The next time you hear an aurora, but feel that your CW skills may not be up to the task, think again! It's not that hard to make contacts.

The aurora wasn't the only excitement in this contest. Several stations made scatter contacts on 6 meters Sunday night from New England into southern Texas, and WØUC/9 worked KD5M in EM60 at 0036Z and N4TWX in EL79 at 0105Z. Six meters opened Saturday from 2100Z to 2200Z from the Northeast down to Florida and Cuba. A couple of East Coast stations worked into Missouri and Iowa early Sunday morning at about 1150-1210Z. If you weren't on the band during these times, you may have missed a couple of good multipliers.

The aurora made a difference in this year's scores, too! Peter, K9PW, used the conditions to his advantage and finished first in the single-operator category—the first time someone from Illinois has won in the contest's history! Peter worked nearly 25% of his multipliers in the last five hours of the contest—good job! The crew at W2SZ/1 decimated the competition in the multioperator category, coming close to another million-point score. Con-

Top 10

Single Operator

Call Sign	Score
K9PW	222,292
WA2TEO	218,592
N2WK (KA2RDO,op)	210,910
VE3ASO	193,116
K1RZ	179,375
WA8WZG	126,800
K2UOP/8	113,386
WD8ISK/4	98,700
KE8FD	96,624
NN9K/Ø	95,400

Multioperator

Call Sign	Score
W2SZ/1	945,054
N8FMD	320,280
K3YTL	289,731
K1WHS	284,760
WØUC/9	264,934
N2WM	226,233
W4AQL	160,716
N2VRJ	147,028
WAØNTT	88,587
WR3I	75,203

Limited Multioperator

Call Sign	Score
K3MQH	271,488
W4IY	197,722
K5MA	174,584
N4EQT	130,479
WB1GQR	119,016
W1XX	87,612
N2DSY	83,556
N4HB	64,866
W1QK	61,568
N4YET	34,176

Single Operator, QRP-Portable

Call Sign	Score
WB2DNE/3	45,320
KH6CP/1	39,104
N8TLZ	29,468
W2XL	25,886
WB2ODH/6	12,768
NM1K	10,032
W2EA/3	8,319
WG2I	2,520
N8AXA	2,048
N1BWT	1,848

Rover

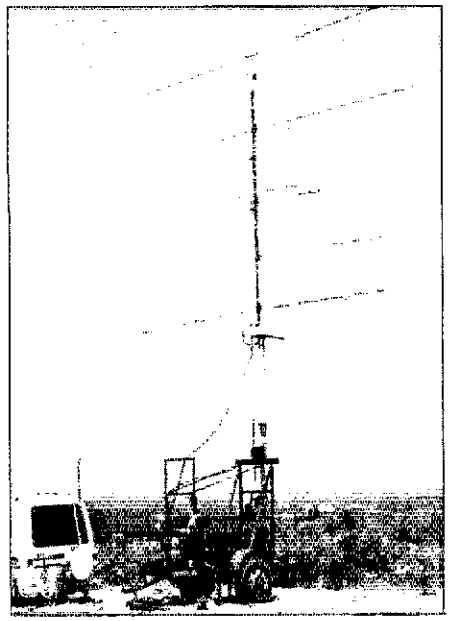
Call Sign	Score
KBØZQ	241,293
KE9QT	192,104
WA8NJR	116,501
N4YZJ	85,186
WB9EEA	85,064
NØKV	43,818
N1ISB	32,300
VE4AQ	30,988
KF2MR	28,203
AC4HG	26,818

Jan Carman, K5MA (l), had some friends over for a limited-multioperator effort (l-r): Richard King, K5NA; Susan King, KU2Q; and Shawn Reed, N1HOQ. They finished in third place overall.

The Goddard ARC, WA3NAN, made a grid expedition to Tangier Island, Virginia, in FM27. The crew included (rear, l-r) Stan Iarosis, N2US; John Stolarik, K3CLG; Roberto Aleman Jr, WP4DLX; and John Meushaw, N3KTU; (front) Alex Benitez, WX3Q, and Carolyn Keydash, N3DON.

Single Operator QSO Leaders by Band

50 MHz		432 MHz	
NY1E	193	K1FO	189
WA2TEO	170	WA2TEO	112
W3EP/1	142	K9PW	108
N2WK (KA2RDO,op)	142	K1RZ	99
K1RZ	122	WA8MZQ	99
K9PW	114	N2WK (KA2RDO,op)	76
WZ1V	105	NN9K/Ø	73
WD4MGB	105	K2UOP/8	71
WAØBWE	101	VE3ASO	70
NW3C	97	WA2BAH	69
VE3URS	94	WD8ISK/4	69
WB9WHQ	91	WA8WZG	69
K1EM	90	WZ1V	63
KU8P	90	WB3JYO	61
K2UOP/8	82	KE8FD	61
144 MHz		**902 MHz**	
WA2TEO	343	WA2TEO	32
W9IP	323	VE3ASO	26
VE3RKK	319	N2WK (KA2RDO,op)	25
K1RZ	303	WB2YEH	21
N9MKC	281	WA8WZG	20
N2WK (KA2RDO,op)	277	WA1MBA	19
WN8U	276	WZ1V	18
VE3KDH	271	N3CX	18
WB2QOQ	268	K1RZ	18
K9PW	266	WA8R/9	17
K3ZO	253	N2LIV	16
VE3ASO	244	WB3JYO	16
NN9K/Ø	243	WD8ISK/4	16
WA8MZQ	238	K2UOP/8	16
K1ZZ	230	K9PW	16
222 MHz		**1296 MHz**	
WA2TEO	68	WA2TEO	45
K9PW	60	WA4VHF	45
VE3ASO	57	K9PW	42
WA2BAH	54	K1RZ	34
N2WK (KA2RDO,op)	52	K2UOP/8	34
K1RZ	48	WA2LTM	33
KE8FD	48	N2WK (KA2RDO,op)	33
WD8ISK/4	44	WA8WZG	32
WB3JYO	40	N2GHR	31
WB2WIH	38	WA1OUB	29
W3KWH (WA3TTS,op)	38	N2LIV	29
KC6WLC	38	WØKRX	29
WA8WZG	38	WD8ISK/4	28
K2UOP/8	38	WA1MBA	27
K1EM	37	WB2YEH	27
		WB3JYO	27



Jerry Wheatcraft, WD5BKV, used the trailer to carry his tower and a 15-kW generator. He operated from Wildcat Point, Oklahoma, in EM26, to finish as the single-operator winner in the West Gulf Division.

VE2JWH makes a couple of cramped QSOs from this portable shack as part of the VE2GUQ operation on Shefford Mountain in Quebec.

Single Operator Multiplier Leaders by Band

50 MHz		432 MHz	
K9PW	60	K1FO	48
N2WK (KA2RDO,op)	56	WA8MZQ	43
NY1E	55	KE8FD	39
W3EP/1	51	NN9K/Ø	39
NW3C	51	VE3ASO	37
WB9WHQ	50	WA8WZG	36
WAØBWE	50	K9PW	36
K1RZ	49	K4QIF	33
WA2TEO	47	WD5BKV	33
K8MD	44	K1RZ	32
KU8U	43	NW3C	32
KU8P	43	K2UOP/8	32
K2UOP/8	43	N2WK (KA2RDO,op)	31
WA8TJL	42	WA2TEO	30
KBØIKP	41	NØLL	30
VE3URS	41	**902 MHz**	
144 MHz		WA2TEO	19
W9IP	85	VE3ASO	19
WA8MZQ	84	WA8WZG	15
NN9K/Ø	79	N2WK (KA2RDO,op)	14
KU8U	74	WA8R/9	14
K9PW	73	WA1MBA	12
K1RZ	72	N3CX	12
N2WK (KA2RDO,op)	71	K1RZ	12
WN8U	70	WZ1V	11
VE3KDH	69	WB3JYO	11
WA8WZG	68	WB2YEH	10
N9MKC	66	WA2ONK	10
VE3ASO	66	K2UOP/8	10
KE8FD	65	K9PW	10
VE3RKK	63	KB3IB	9
K3ZO	61	WD8ISK/4	9
222 MHz		KØHZ	9
VE3ASO	37	**1296 MHz**	
KE8FD	33	WD5BKV	23
W3KWH (WA3TTS,op)	30	K9PW	23
WA2TEO	29	WA8WZG	22
N2WK (KA2RDO,op)	29	WA4VHF	20
WD5BKV	28	VE3ASO	20
K9PW	28	N2WK (KA2RDO,op)	19
WA8WZG	27	K2UOP/8	18
K1RZ	25	WA2TEO	16
NW3C	25	WA2LTM	16
K2UOP/8	25	WA8R/9	16
NN9K/Ø	24	WA1OUB	15
WB9OJR	23	K1RZ	15
K1LPS	22	WAØBWE	15
WA2BAH	21	WØKRX	15
K8MD	21	WDØCJM	15
		NTØV	15

gratulations to the K3MQH crew, winners of the Limited Multioperator class; Ed, WB2DNE, the QRP-Portable winner; and Jon, KBØZQ, this year's top rover.

1993 marked the second offering of the September VHF QSO Party's Participation Pins. The pin program has certainly helped maintain interest in the contest: We received 621 logs and orders for 437 pins—it's an outstanding number and a vast improvement over years past.

What will next September's VHF QSO Party bring? Who can tell: VHF propagation is always difficult to predict—the only sure way to avoid missing an opening is to get on for the contest and stay in for the entire time! The next September VHF QSO Party is September 10-12, 1994; look in August *QST* for full details. Our thanks to Contest Assistant Anne Jaworski for her help in preparing the results.

SOAPBOX

I was pleasantly surprised when a sporadic-E opening to Florida took place for a half hour during the contest on Saturday. After four years of participation, this is the first time I've seen a sporadic-E opening during a September VHF contest (WB2AMU). The aurora put some life into the contest. I had a lot of fun! (WA2AEY). I found it amazing how Mother Nature came through with a fine aurora Sunday! (W2HAX). Working seven grids on 432 MHz is by far the best I've ever done on this band, largely because of the portables and luck and perseverance by the gang in Colorado (K5MAT). Having an aurora sure helps your multiplier count (K2YAZ). Sunday morning we had good tropo conditions into eastern North Dakota on 2 meters, and Sunday evening there was a nice aurora that produced many contacts on 50, 144 and 222 MHz. Many newer operators had never experienced aurora signals (KØDAS). We had a lot of fun in this contest! The competitive spirit and enjoyment of ham radio is in our blood and, I guess we'll be doing this for a long time to come (KC4AUF). This being my first VHF contest, I was surprised at how far I got on 2 meters with low power and low antennas (W8GBH). Because of cold and windy weather, it was tough to put and keep the antennas up this time—they just kept coming down! (KH6CP/1). The aurora was workable from here Sunday night, but the going was slow this far south (AB4CR). This was the best aurora I've been in on in a couple of years (K8UC). We didn't find out until the morning after the contest that those swishy sounding CW signals were aurora! Maybe next year we'll work a few (N2RDX). I was only able to participate for two hours, but I had fun (WB4DBB). Conditions were fair and I had a good opening to "5-land" late Sunday, but where was everyone? (KB4DFK). I was glad that there was an aurora, or this contest would have been a loser for me (K8MD). The aurora turned out to be a treat! (VE3DSQ). I had a great time! I only had my license one week prior to the contest (N2WDL). This was our first real contest as rovers! We learned a lot and had a great time (AD4DY). This was my first crack at a VHF contest, and I had a lot of fun. I'm looking forward to the next one (WB1E). I worked two new grids, FN02 and EM96, qualified for a Participation Pin, and had fun besides! (KO4ER). I heard stations 200 miles away that sounded as if they were 500-mile tropo signals! Even the locals were weak (KB4FAI/5). The aurora on 6 meters on the last day made a good ending for this contest (KB9FZQ). Propagation was a disappointment, compared to last year (WB4GCS). With a 1-watt, crystal-controlled, CW rig on 6 meters, I was happy to work anyone at all! (KN1H). This was the best September VHF contest for me! I worked an El Paso, Texas, station 290 miles away on 2 meters for the first time, and enjoyed contacts with several mountaintop portable stations with great signals (K5RHR). Participation was good this year, and there were more rovers. It would be nice to see more 222-MHz action! (KB6IGC). Conditions were average Saturday, but we had a great aurora opening Sunday (WB3IOU). I enjoyed contesting as a rover! (KD4IDK). Where was all the 222 activity? (WB3JYO). I had fun participating, but was dismayed at the lack of participation on FM! (N3MJQ). This was my first VHF contest where I operated from my home, which is surrounded by

Multioperator QSO Leaders by Band

50 MHz		432 MHz	
W2SZ/1	373	W2SZ/1	283
K5MA -L	288	N8FMD	167
W0UC/9	278	WB1GQR -L	144
K1WHS	264	K3MQH -L	142
W4IY -L	224	K5MA -L	121
N8FMD	224	N2WM	119
K3MQH -L	215	N2DSY -L	119
W4AQL	214	K3YTL	115
KA2VJV -L	211	K1WHS	114
N2WM	211	W4IY -L	101
WB1GQR -L	173	N4EQT -L	92
W1XX -L	164	K1TR	79
K3YTL	159	WA0NTT	79
K0VM	134	N2VRJ	76
N4EQT -L	133	N4HB -L	76
144 MHz		**902 MHz**	
K3MQH -L	697	W2SZ/1	59
W2SZ/1	567	N2WM	25
K3YTL	564	K3YTL	23
W4IY -L	444	K1WHS	22
K5MA -L	408	N8FMD	20
N2WM	400	N2VRJ	13
N8FMD	395	K1TR	8
WB1GQR -L	373	W0RSJ	8
K1WHS	372	K0VM	6
N2DSY -L	370	WB2PSI	4
W0UC/9	322	W0UC/9	2
N2VRJ	283	W0GR	2
W1QK -L	275	W4AQL	1
W4AQL	263	**1296 MHz**	
N4EQT -L	258	W2SZ/1	91
222 MHz		N2WM	35
W2SZ/1	133	K3YTL	35
WB1GQR -L	96	N8FMD	35
K5MA -L	87	W0UC/9	29
N2VRJ	83	K1WHS	28
K3YTL	74	N2VRJ	25
K3MQH -L	74	N3ADC	24
N2WM	70	WA0NTT	24
N4EQT -L	69	W0RSJ	23
N8FMD	69	W6TRW	18
K1WHS	63	K1TR	17
N4HB -L	59	WR3I	16
W0UC/9	55	N4HB -L	16
N2DSY -L	54	WB2PSI	12
W4IY -L	52		
N8HNS -L	49		

-L denotes Limited Multioperator

Division Leaders

Single Operator

Division	*Call*	*Score*
Atlantic	N2WK (KA2RDO,op)	210,910
Central	*K9PW	222,292
Dakota	*WA0BWE	69,678
Delta	KC4YO	35,504
Great Lakes	WA8WZG	126,800
Hudson	WA2BAH	55,076
Midwest	*NN9K/0	95,400
New England	*WA2TEO	218,592
Northwestern	W7ZSL	7,683
Pacific	KF6CU	14,322
Roanoke	*K2UOP/8	113,386
Rocky Mountain	K0HZ	13,420
Southeastern	KA2DRH	35,168
Southwestern	KC6WLC	14,766
West Gulf	WD5BKV	64,152
Canada	VE3ASO	193,116

Multioperator

Division	*Call*	*Score*
Atlantic	K3YTL	289,731
Central	W0UC/9	264,934
Dakota	*WA0NTT	88,587
Delta	—	—
Great Lakes	—	—
Hudson	N2WM	226,233
Midwest	K0VM	45,630
New England	W2SZ/1	945,054
Northwestern	—	—
Pacific	WA6YDI	28,428
Roanoke	N8FMD	320,280
Rocky Mountain	—	—
Southeastern	—	—
Southwestern	W6TRW	18,640
West Gulf	—	—
Canada	—	—

Limited Multioperator

Division	*Call*	*Score*
Atlantic	*K3MQH	271,488
Central	N9LAG	24,652
Dakota	—	—
Delta	N5KWB	8,174
Great Lakes	*N4EQT	130,479
Hudson	N2DSY	83,556
Midwest	N0OOC	15,123
New England	*K5MA	174,584
Northwestern	W7HAH	1,540
Pacific	WN6W	2,916
Rocky Mountain	N5EPA	1,166
Roanoke	W4IY	197,722
Southeastern	*W4CMA	14,640
Southwestern	*N6RMJ	19,220
West Gulf	K5LLL	4,592
Canada	VE3SAU	20,516

* denotes new Division record

Multioperator Multiplier Leaders by Band

50 MHz		432 MHz	
W0UC/9	108	N8FMD	43
W4AQL	91	W2SZ/1	41
W2SZ/1	82	N4EQT -L	39
K1WHS	74	K3YTL	36
W4IY -L	69	W4IY -L	35
N8FMD	69	WR3I	33
K0VM	67	W0UC/9	33
K3MQH -L	66	K3MQH -L	30
K5MA -L	62	W4AQL	30
W1XX -L	54	WA0NTT	29
N4EQT -L	48	K1WHS	25
K3YTL	47	N2WM	23
N2WM	45	N2VRJ	23
N2HLT -L	43	N4HB -L	22
N2VRJ	39	W1XX -L	21
WB2PSI	39	WB1GQR -L	21
144 MHz		**902 MHz**	
W0UC/9	94	W2SZ/1	22
W4AQL	75	N2WM	16
N8FMD	74	K3YTL	15
K3MQH -L	73	N8FMD	14
W2SZ/1	69	K1WHS	11
K3YTL	69	W0RSJ	7
W4IY -L	67	K1TR	5
K1WHS	66	N2VRJ	5
N2VRJ	65	K0VM	4
N2WM	60	W0UC/9	2
K3UZY -L	59	W0GR	2
WA0NTT	59	WB2PSI	1
N4EQT -L	57	W4AQL	1
N4HB -L	55	**1296 MHz**	
W0GR	51	W2SZ/1	24
222 MHz		N8FMD	17
N4EQT -L	39	W0UC/9	17
W2SZ/1	38	N2WM	16
N8FMD	38	K3YTL	16
N2VRJ	35	K1WHS	12
K3MQH -L	33	W0RSJ	12
W4IY -L	32	WR3I	12
K3YTL	31	WA0NTT	12
WR3I	31	N3ADC	11
N8HNS -L	30	N2VRJ	10
K1WHS	29	K1TR	9
N4HB -L	29	N4HB -L	8
K5MA -L	25	W4AQL	7
N2WM	25	W0GR	7
W1XX -L	24		
W0UC/9	24		

-L denotes Limited Multioperator

Becky Holberg, KD4VOZ, and Tony Day, KC4AUF, went roving from four grids in Virginia on 2 meters and 432 MHz.

mountains. I was surprised to work CM87 and CM98 over the 5000-foot mountains to my north (K1FJM/6). I didn't make many contacts, but I made some great new friends (N7GJD). I enjoyed the contest. The aurora activity added a great deal of fun! (W2GKR). I found single-operator contesting very challenging! (N2GKM). This is my first time in this contest. The VHF pin is a great idea! (W6TKV). QRP made for a challenging contest. Without the aurora on Sunday evening, the conditions could have been described as horrible! (WB8K). About the only redeeming value to us was the E-skip opening to the northeast late Sunday afternoon/evening (K5LLL). The weather was beautiful and the contest was fun. It's great to be a hot grid! (NI6L). The aurora Sunday brought me 23 grids on 6 meters (WA9LZM). Even though I found conditions to be flat, I had a lot of fun and I'm looking forward to this year's pin (KB4NT). Anyone who thinks CW is an anachronism obviously never worked aurora during a VHF contest (N1HO). The conditions were good, making it an enjoyable contest. I did better than I did in June (KD4OIG). I took a break and missed the first half hour of the aurora, but caught a short opening to Texas on 6 meters (K2UOP/8). It was slow at first, but I went out with a blast, thanks to the aurora! (K1LPS). This was my first VHF contest, and I managed a QSO with Vermont on 2-meter FM with only a vertical antenna! (WA2PJJ). The aurora, and making some EME QSOs made up for the flat tropo conditions (W9IP). Propagation wasn't as good as in the June contest, but there was a nice aurora opening Sunday that made things a bit more interesting (KU8P). Conditions were flat until the aurora excitement arrived Sunday evening. It helped my grid totals considerably (WA9PWP). Add a little aurora to the proliferation of rovers, and what would have otherwise been a dull contest became exciting! (N4FQT). I rovered in 10 grids using four bands. I found activity good, but conditions were only so-so Saturday (KE9QT). Conditions were average Saturday, then we had tropo Sunday morning and aurora in the evening. I found activity high on 2 meters here in the upper Midwest (KA0RYT). There didn't seem to be quite as much activity this year as last year until the aurora showed up (W1PSG). Contest conditions were poor at the start, but improved to fair. The aurora Sunday evening made for an exciting finish (W0RSJ). Many thanks to the rovers who kept me interested. (W4FSO). I found running only 2-meter FM a tough way to make points, especially from home without a beam! Despite that, it was a lot of fun (K4MSG). This was my first contest and I had a lot of fun. Operating portable put my equipment to the test (N7KSI). I was pleasantly surprised to find I could work out to 450 km on 5760 MHz under normal, if not poor, conditions in the flatlands of the Midwest (WB9SNR). I found conditions poor (WA2TIF). This was my first time in the September VHF contest. I took down my TV antennas to make room for my beams (KA3TCC). I wish more operators knew how useful 6-meter meteor scatter can be to increase scores in the September contest (AJ6T). The Sunday night aurora brought people out of the woodwork! (WA2UDT). An opening on 2 meters to the East Coast Saturday and the aurora Sunday night gave me 15 new grids on 6 and 2 meters! I worked 30 stations during the aurora (VE3USC). We had a nice aurora on 2 meters, enabling me to work a new state, Iowa (N4KWX). I had a great time and can't wait for the next one! (KD6WVL). The band conditions were flat until the aurora opening. Then 2 meters sounded like 20 meters during the CW DX contest—unbelievable signals! (WA8WZG). I knew I'd miss mountaintopping this time. Contesting from home made me a humble man! (N8FWL). This is my first contest and I'm surprised that I made any contacts at all, knowing my location was terrible. I eventually made 30 contacts before my rotator control broke. I was happy I made enough contacts to be eligible for a VHF pin (N3NXF). I could only get on for a few hours and luckily, the aurora coincided with my schedule! (WA1YHO). For me, the highlight of the contest was working more than 20 stations via aurora! (N1EYE). We had poor conditions, but great weather. The aurora Sunday saved the contest for us, with 74 contacts and 40 new grids in a 2½ hour period at the end of the contest (W4IY).

Scores

Scores are by ARRL Sections/Canadian Provinces. Within each Section, single-operator scores are listed first, followed by QRP-portable, multioperators and limited-multioperator scores. Rover scores are listed by Division. From left to right, each line lists call sign, score, QSOs, multipliers class (S = single operator, Q = QRP-portable, M = multioperator, L = limited multioperator) and bands worked (A = 50 MHz, B = 144 MHz, C = 222 MHz, D = 432 MHz, 9 = 902 MHz, E = 1296 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.7 GHz, I = 10 GHz, J = 24 GHz, K = 47 GHz, L = Light). Among single-operator stations, winners are noted with band letter(s) in **boldface** print indicating the band won.

1

Connecticut

WA2TEO	218,592	770	198	S	**ABCD9E**
WZ1V	57,200	386	110	S	ABD9E
W3EP/1	48,076	347	119	S	ABDE
K1EM	45,492	340	102	S	ABCD9
K1FO	26,334	209	63	S	CD
KD1DU	20,128	268	88	S	ABCD
K1ZZ	18,120	230	44	S	B
AA1AK	2,800	100	28	S	AB
K1OQG	2,520	90	28	S	B
N1FHR	2,100	71	28	S	ABC
K1WVX	1,260	52	21	S	ABD
WA1GTP	1,176	49	24	S	ABC
KA1SLG	1,088	64	17	S	B
K1JBS	880	40	17	S	A
N1KLB	403	28	13	S	ABD
W1EYF	374	34	11	S	B
WA1LOU	341	31	11	S	B
WS1O	286	26	11	S	ABD
NM1K	10,032	151	38	Q	ABCD9E
W1QK (+N1s NRP,OFZ,WB1CVW)					
	61,568	492	104	L	ABCD
W1GB (AA1BX,K1PVT,KA1BRO,N1JNI,ops)					
	13,181	240	49	L	ABCD
W1ORS (K1TEY,N1s NCU,ORW,WA1EHK, WD1X,WA2TJR,ops)					
	3,400	92	34	L	ABC

Eastern Massachusetts

WB1FKF	17,040	136	60	S	**ABCD9EFGHI**
KB1KM	*14,384*	*182*	*58*	S	***ABCDE***
KX1C	7,344	102	48	S	ABCDE
W1PSG	765	51	15	S	B
N1KQW	693	33	21	S	**A**
N1HKV	490	35	14	S	**AB**
WA1OFR	407	37	11	S	AB
KA1VY	315	35	9	S	B
K5MA (+N1HOQ,KU2Q,K5NA)					
	174,584	904	167	L	ABCD
WA1UDH (+KA1s CLV,EKR)					
	20,732	248	71	L	ABD
N1FDX (+N1FYZ)					
	720	60	12	L	B

Maine

NY1E	10,615	193	55	S	**A**
WB1E	602	43	14	S	**B**
W9KDR	390	24	15	S	BD
N1DGF	798	57	14	Q	B
K1WHS (+AF1T,K1s LL,MNS,KY1K,KV1S, N1LBI,NK1I,W1AIM,WA1NIE,W3HOT, NA5E,KX0O)					
	284,760	893	226	M	ABCD9EFGI
W1XX (+AA1AB,K1s GX,JX,XA)					
	67,612	476	149	L	ABCD
W1NPP (AA1EO,KA1YSN,KD1OW,N1s HWN,KAT,MPX,OXA,W1CUW,W9KLS,ops)					
	2,856	74	34	L	ABCD

New Hampshire

N1HO	14,260	190	62	S	**ABD**
AC1J	11,990	166	58	S	**ABCD**
WA1YHO	11,858	118	62	S	ABCD9EF
WA1T	1,330	55	19	S	ABD
WA1OUB	1,305	29	15	S	E
KA1LMR	1,020	46	17	Q	ABCD
K1TR (+AA1CW,AE1D,N1AFQ,WB1DSW)					
	56,674	453	86	M	ABCD9EFGHI
WA1ZYX (KA1s OFA,ZMX,KB1AXN,KD1GHJ, N1s BAC,KWF,KWM,NHL,WA1NHP,WK1P)					
	12,397	200	49	L	ABCD

Rhode Island

KM1X	13,720	231	56	S	**ABD**
WA1HYN	10,348	126	52	S	**BCDE**
K1DS	4,917	122	33	S	**ABCD9**
AI1K	4,640	142	29	S	BD
W1KCS	645	43	15	S	B
WX1M	144	16	6	S	B
KA1ZFO	135	27	5	S	B
N1EYE (+NO1F)					
	4,760	112	35	L	BD

Vermont

K1LPS	11,316	116	69	S	**ABCD9**
KH6CP/1	39,104	258	94	Q	ABCD9EFGHIL
KN1H	24	6	4	Q	A
WB1GQR (N1s JEZ,JOZ,MJD,WB2JSJ,ops)					
	119,016	*786*	*116*	*L*	*ABCD*

Western Massachusetts

WA1MBA	42,856	271	88	S	**BD9EFGI**
N1DPM	21,818	144	78	S	ABCD9EFG
WA2TIF	18,648	252	56	S	BCD
N1FUS	5,180	146	28	S	BCD
KC1OM	560	34	14	S	ABCD
K1JG	189	21	9	S	B
N1BWI	1,848	42	21	Q	BDHI
WP3ZI (K1s DH,NKR,KA1PAT,WA1s UGE,ZMS, AA2AM,K2s MM,TR,KE2TP,WA2FWN, N2s BNY,GXH,HPA,IKZ,WA2s AAU,SCA,SPL, WB2KMY,WS2B,AK4L,WA8USA,ops)					
	945,054	1660	333	M	ABCD9EFGHIJ
N1QCH (+KD1LH)					
	594	33	18	L	AB
KA1PHA (KA1BA,KB1AAT,NC1M,ops)					
	380	29	10	L	ABCD
K1FWF (+NET)	96	12	8	L	AB

2

Eastern New York

WA2BAH	55,076	362	98	S	**ABCD9EFGHI**
WB2WHD	14,586	189	51	S	ABCDEI
KC2QF	*8,550*	*145*	*50*	S	*ABCD*
KB2KTZ	6,902	153	34	S	ABCD
W2GKR	5,246	122	43	S	AB
KA2ZIK	3,572	77	38	S	ABCD
N2IGX	3,416	122	28	S	B
WY2H	3,159	83	27	S	ABCD
N2OGU	2,726	87	29	S	ABCD
N2QIP	2,180	96	20	S	ABCDE
W2KHQ	2,080	61	26	S	*BDE*
N2DVQ	2,016	66	28	S	ABCD
N2TMT	1,848	77	24	S	**A**
WB2OEE	1,458	81	18	S	B
WB2MRX	1,323	63	21	S	AB
N2PEQ	936	86	9	S	BC
WB2BEJ	492	29	12	S	BCD
KB2HPX	336	34	8	S	BC
N2TPF	261	25	9	S	ABD
K2RI	260	17	10	S	BCD
WA2IWW	240	23	6	S	BD
KD2IX	208	13	8	S	D
KF2PJ	144	16	9	S	A
WB2ECL	90	11	6	S	ABCI
N2QFH	15	4	3	S	ABC
N2QII	1	1	1	S	A
W2XL	25,886	202	86	Q	ABCD9E
KE2XB	700	36	14	Q	ABCD
N2GKM	320	32	10	Q	AB
KA2VIV (+KB2HZI,N2s IWE,OAM,OHH,PLO, QLB,QLD,QVW,SKH,SKP,TFO,UWJ,UZW, VAH,WA2s JOK,UKP)					
	33,795	430	71	L	ABCD
N2EK (+N2s AJZ,GQS,MCI,OFZ,OGB, *WB2EQD*)					
	19,008	223	72	L	ABCD
KC2GE (+WB2PSD)					
	5,152	111	32	L	BDE
N2MSS (+N2RDN)					
	624	44	13	L	BCD

NYC-Long Island

N2LIV	*45,136*	*273*	*104*	S	***ABCD9E***
N2BFJ	30,086	202	98	S	ABCD9E
N2GHR	13,356	143	53	S	**ABDE**
WA2SLY	4,590	135	34	S	**AB**
WA2EIO	1,856	46	29	S	BDE
N2NSY	1,660	83	20	S	B
N2QHS	1,472	58	23	S	ABD
WB2AMU	416	32	13	S	A
WA2PJI	280	28	8	S	BC
WV2C	70	14	5	S	B
WG2I	2,520	90	28	Q	B
K2OVS	200	20	10	Q	A

Northern New Jersey

WB2WIH	16,524	221	54	S	BCD
WB2QOQ	11,256	268	42	S	**B**
WB2CUT	6,072	184	33	S	B
AA2EM	5,742	174	33	S	B
WB2VVV	3,366	58	35	S	ABCD9E
N2LMU	1,819	100	17	S	BD
WA2UDT	1,736	52	28	S	ABCD
WA2LTM	1,584	33	16	S	**E**
N2OAC	1,425	75	19	S	**A**
N2TNN	1,342	54	22	S	BD
N2UAH	780	52	15	S	A
KA2SSX	*630*	*42*	*15*	S	*B*
AA2U	629	33	17	S	ABCD
N2TDT	351	27	13	S	A
N2KJM	192	21	8	S	BD
N2WM (+K2BJG,KB2LHH,KX2O,N2s AAZ,A1E, BIM,HMM,WB2UFF,WD3R)					
	226,233	867	189	M	ABCD9EF
N2DSY (+KB2LCA,KF2NS,N2s PMD,RBJ,NO2T)					
	89,556	*671*	*99*	*L*	*ABCD*
NU2Y (+N2RDX,WA2JHN)					
	680	40	17	L	AB
N2RDX (+WA2JHN)					
	420	35	12	L	B

Southern New Jersey

WB2YEH	60,264	333	108	S	ABCD9EFG
WB3JYO	53,833	319	101	S	**BCD9EF**
KB2AYU	16,056	167	65	S	BDE
WA2ONK	14,355	164	55	S	BD9E
KA2WKA	11,970	122	63	S	ABD9E
N2BYE	8,274	176	42	S	BD
W2EIF	4,840	81	40	S	ABCD9EF
K2GAL	4,375	125	35	S	B
KA2KFO	3,286	106	31	S	B
N2JVQ	680	40	17	S	B
KB2EGI	260	26	10	S	B
N2UNH	147	20	7	S	BD
KS2D	189	27	7	Q	B

Western New York

N2WK (KA2RDO,op)					
	210,910	622	230	S	**ABCD9EFGI**
W9IP	27,455	323	85	S	**B**
N2LBE	*25,180*	*236*	*76*	S	***ABCD9E***
AA2MZ	21,672	215	72	S	ABCDEIL
NS9E	21,120	**244**	66	S	ABCD
NO2O	14,626	146	71	S	ABCD9E
N2NEP	12,060	146	67	S	ABCD9
AA2IO	6,178	113	66	S	ABCD9
WA2AEY	7,155	135	53	S	B
WI2P	5,880	95	56	S	ABD
KU2A	*5,152*	*61*	*48*	S	***ABCD9E***
N2ULL	3,700	71	37	S	ABCD9E
W2UAD	2,700	75	36	S	B
W2HAX	1,456	39	28	S	BD
KB2NFS	264	33	6	S	BD
N2PSH	116	29	4	S	B
N2VBK	54	27	2	S	B
N2VRJ (+KE2DI,WB2ELB)					
	147,028	588	178	M	ABCD9EF
WB2PSI (AA2JN,KE2OP,N2s UDE WHT, WA2ZKD,WB2s BYP,QCJ,ops)					
	40,002	267	113	M	ABD9EF
N2HLI (+KB2DMK,N2s CEH,QFF,RQV,TPR)					
	28,224	249	96	L	ABCD
KE2PM (KB2JAG,N2s PBU,PBV,PBX,QYN, SCM,VBM,ops)					
	19,500	227	75	L	ABCD
WB2RRK (+KE2DN)					
	8,576	116	67	L	ABD

3

Delaware

KB3PD	8,460	126	50	S	**BCD**
WA3BZT	2,162	94	23	S	**B**
K3CNH	2,100	70	30	S	**AB**
W3BDP	780	52	15	S	B
KA3KHZ	390	26	15	S	B

Eastern Pennsylvania

KB3IB	35,520	242	96	S	ABCD9E
N3EYD	33,600	249	105	S	**ABCD**
N3GX	25,058	147	67	S	**BCD9EFGH**
N3ITT	*14,152*	*194*	*58*	S	*ABDE*
KB3ZS	5,576	136	34	S	BDE
WB3LNZ	3,441	76	37	S	ABCD
WA3PER	3,432	83	33	S	BD
WA3CSP	2,812	76	37	S	**A**
N3OGF	1,344	56	24	S	B
WA3AQA	1,134	44	21	S	ABCD
K7YHA	860	30	20	S	**BD**
N3NVA	*819*	*85*	*9*	S	***BD***
NK3O	798	38	21	S	**AB**
W3JS	624	48	13	S	B
KD3AO	480	40	12	S	B
W3UOC	171	19	9	S	B
N3NXF	128	30	4	S	BD
WB2DNE/3	45,320	292	110	Q	ABCDE
W2EA/3	8,319	177	47	Q	AB
K3YTI (WA1MKE,K3MKZ,KA3s EEO,GKI,ZHT, N3s LYX,OCG,W3DZH,WA3s JWP,NYS,YON, WB3s FAA,FKQ,FYT,ops)					
	289,731	979	221	M	ABCD9EFGI
W3PSJ (+W1PV)					
	57,072	335	116	M	ABCD9EF
N3ADC (+N2SFY,KA3ZXA,N3MQP,N3NFB, WB3IYP,KØLSE)					
	34,932	290	82	M	ABCDE
K3MQH (+K3s IXD,LYW,KF3P,N3EYB,W3EKT)					
	271,488	1128	202	L	ABCD
K3UZY (+N3AHF)					
	10,797	183	59	L	B
W3ZGD (AD3E,KE3HD,N3s JDQ,NRN, N6PHW,ops)					
	10,314	176	54	L	ABD
N3FJA (+N3ORF)					
	2,997	*90*	*27*	L	BD
N3MYM (+K3YWV)					
	2,376	*108*	*22*	L	B
W3HZU (KA3LJL,N3s LPE,LTZ,W3UQJ, WB3CQN,ops)					
	2,212	66	38	L	ABD
WG3E (+KC3ZT)					
	496	29	16	L	ABD

Maryland-DC

K1RZ	179,375	624	205	S	**ABCD9E**
K3ZO	35,368	302	84	S	AB
WA4VHF	11,309	96	43	S	DEF
N3LDF	3,432	104	33	S	B
W8AXX	2,652	102	26	S	B WA3EOQ
2,624	47	32	SBUDE		
KA3TCC	*828*	*69*	*14*	S	*BC*
WA3GYW	630	35	18	S	AB
W3MSN	319	23	11	S	ABD

Western Pennsylvania

NW3C	67,459	332	161	S	**ABCD**
W3KWH (WA3TTS,op)					
	14,490	90	70	S	**CD9EF**
KA3JWJ	5,807	91	47	S	B
WB2LOU	1,140	38	30	S	AB
W3KJM	888	37	24	S	A
AA3FI	240	31	6	S	BD
N3MJQ	204	37	4	S	BD
W3VEA	136	25	4	S	BD
N3NGA	124	31	2	S	D
KA3AVB	52	13	4	S	B
K3UA	15	5	3	S	A
WB0IWG	9	3	3	S	AB

4

Alabama

KA2DRH	35,168	232	112	S	**ABCDE**
KB4PBM	3,008	75	32	S	BD
KD4FMN	795	53	15	S	B
N4OKF	528	33	16	S	AB
KD4OIG	518	37	11	S	BD
N4JAG	224	27	7	S	BD
KE4AHR	216	24	9	S	B
KD4NTW	189	19	7	S	BD
KD4VDR	70	14	5	S	B
KE4BM	882	49	18	Q	B

Georgia

WS4F	4,128	71	43	S	**ABCDEFG**
W4WDH	1,620	60	27	S	**AB**
W4CMA (K4AEK,KC4ZUA,KD4s HLG,VHG, W4NZJ,WB4LRA,KA5WZY,WB8YSE,ops)					
	14,640	206	61	L	ABD
WA4IOB (+K4KAZ)					
	3,038	88	31	L	ABD

Kentucky

AB4CR	32,340	282	105	S	**ABCDE**
K4TO	26,029	202	103	S	**ABD**
N4STK	561	25	17	S	ABCD
N4EQT (+KA8SSB,W8ULC,WF8Z)					
	130,479	552	183	L	ABCD

North Carolina

W4FSO	7,176	98	52	S	**ABCDE**
NK4Q	5,650	91	50	S	**ABD**
K4SAN	1,056	48	22	S	B
W4HVU	3	3	1	S	B
W4AQL (AA4ZZ,AB4RU,WD4s DWN,JQV, MBK,AE8E,K4DI,WØMHS,ops)					
	160,716	584	227	M	ABCD9EFGH
KD4BFJ (+KD4TCS,KE4FCJ,N4YTO)					
	1,620	59	27	L	ABD

Northern Florida

KQ4PI	1,035	41	23	S	**ABDE**
N4TWX (+WB4s JEM,COJ)					
	5,600	90	50	L	ABDE

South Carolina

WA4MJD	1,007	40	19	S	**BD**
KD4FRY	600	31	15	S	BD
KD4SFF	444	27	12	S	BD
KK4SO (+KB4WCR,KC4YQS,KD4UEO)					
	5,162	98	31	L	ABD

Southern Florida

WD4MGB	7,335	150	45	S	**ABD**
WB0MGS	792	44	18	S	A

Tennessee

KC4YO	35,604	225	112	S	**ABD9E**
AA4H	7,315	100	56	S	ABCD
N4OYS	5,735	124	37	S	ABDE
KA4CHT	3,182	70	37	S	ABDE
N4VC	2,925	65	45	S	AB
N4MW	*2,015*	*79*	*41*	S	***ABCD9E***
N3IWJ	1,770	59	30	S	AB
KC4BWG	1,392	48	24	S	ABD
WB4OAH	1,040	40	20	S	ABDE
N4USG	936	41	18	S	AB
AD4F	510	34	15	S	AB
KB4UG	476	28	17	S	A
W4TRC (KC4s MAI,TCM,VSN,KD4ZVM,N4s RNL,TOA,ops)					
	955	57	15	L	AB

Virginia

WD8ISK/4	98,700	442	150	S	**ABCD9EF**
N4KWX	31,080	186	85	S	ABCDE
K8OYD/4	16,790	134	73	S	BCD9E
W8CM	14,520	172	66	S	ABCD9E
K4QIF	13,348	109	71	S	BDE
KN4SM	9,899	129	61	S	ABD
KO4U/4	8,880	135	60	S	ABD
W4DO	8,211	108	51	S	ABCDE
K4FTO	4,120	87	40	S	ABD
N4MM	3,696	74	36	S	ABD
WB4DBB	2,550	57	30	S	ABCD9E
WA4OVW	1,740	51	29	S	ABD
KB4DFK	1,428	47	28	S	ABCD
KO4ER	*1,140*	*60*	*19*	S	*B*
WD4O	784	28	18	S	ABCD9E
K4MSG	264	44	6	S	B
WR3I (+K4JOU)					
	75,203	333	157	M	ABCDE
W4IY (+AC4XT,K4HWG,KA4s CKI,RRU,KD4s BHR,VSK,KJ4VG,KO4FM,WB4s EIY,NFS, RMJ,WD4KXB,K8MLM,WA8DYJ)					
	197,722	*921*	*203*	*L*	*ABCD*
N4HB (+AB4SF,KD4LUS,N4URM,WB4BVY)					
	64,866	402	114	L	BCDE
N4YET (+KB4OLM,KD4s DALFKT,OXU,SYW, UPF,ZOQ,KE4CAY,N4ZKH,WB4PJV)					
	34,176	287	96	L	ABCD
WB4GCS (+KM4EM,WH9AAF)					
	5,568	94	48	L	ABD
KC4YHI (+AD4BD,KC4s WQC,YMB,KD4WMT)					
	2,950	89	25	L	BD
KB4NT (+KC4WIC)					
	2,886	81	34	L	BCD
WA3NAN/4 (N2US,K3CLG,N3s DON,KTU, WX3O,WP4DLX,ops)					
	612	36	17	L	B

5

Arkansas

K5YY	1,530	51	30	S	**B**

Louisiana

N5TQB	6,726	110	57	S	**ABD**
K5CZD	580	26	20	S	ABD
N5KWB (+N5JBZ)					
	6,174	109	61	L	ABCD
N5MYH (+N5HLG)					
	1,484	53	28	L	AB

Mississippi

KG5MZ	176	16	11	S	**B**
KB4FAB/5	30	6	5	S	B

New Mexico

K5MAT	2,175	58	25	S	**ABCDE**
N5JHV	1,887	45	37	S	**ABD**
K5RHR	986	39	17	S	BCDE
W5DO	320	27	8	S	BC
W5WOX	308	19	14	S	ABD
KD4JDT	144	27	4	S	ABD
KB5ZSK	76	28	2	S	BD
KB5TTS	12	6	2	S	AB
N5EPA (+N7KA)					
	1,166	43	22	L	ABD

NK5F (+KE5TJ,WZ8Y)
1,122 43 22 L ABD

North Texas
K9MK/5 36,524 289 92 S **ABCD9EF**
KB5VQI 5 5 1 S B
WA5VJB 4 1 1 S I
KF5DD (+KC5ANDJ
779 41 19 L B

Oklahoma
WD5BKV 64,152 258 162 S **ABCDEF**
K5SW 7,616 80 64 S ABCDE
WM4Z 3,280 64 41 S BD
W5NZS 1,830 45 30 S ABCD

South Texas
KB5IUA 16,478 168 77 S **ABCDE**
W3XQ/5 4,136 94 44 S AB
W5QZI 850 34 25 S AB
AJ4F 403 31 13 S B
KC5FP 91 11 7 S ABD
K5LLL (+KB5NFN)
4,592 86 41 L ABDE

West Texas
W5AL 5,723 75 59 S **ABCDE**
N5XYO 350 25 14 S B

6

Los Angeles
WA6BIL 1,512 108 14 S **B**
N6BF 518 28 14 S **ABCDE**
KD6PIT 350 35 10 S AB
N6RVC 240 30 8 S B
NA2D 180 36 5 S B
WB2ODH/6 12,768 154 57 Q ABCD9FGI
KI7NG 470 40 10 Q BD
K9AKS/6 225 25 9 Q B
N6TCZ 48 14 3 Q BC
W6TRW (AB6UP,KB6TVJ,KD6s HBK,IGH,IGI, PRO,WYQ,ZJZ,KN6OW,N6ZAY,WA6MPF,ops)
18,640 316 40 M ABCDE
N6RMJ (+K2LCT)
19,220 235 62 L ABCD
KØBGL/6 (+KD6QBT)
6,250 192 33 L ABCD

Orange
WB6FCS 9,072 131 54 S **ABCD**
KD6DCW 504 72 7 S B
N6DZS 234 39 6 S B
W6TKV 186 31 6 S B
KD6PRJ (+KC6HAT,WA6KZB)
1,122 47 17 L BCD

Santa Barbara
KC6WLC 14,766 240 46 S **ABCD**
N6OOA 1,638 61 18 S **ABCDE**
N2OOB 1,065 56 15 S ABD
KC6TJV 805 51 13 S ABCDE
K1PJM/6 720 60 12 S B

Santa Clara Valley
KF6CU 14,322 151 66 S **ABCD9EH**
AJ6T 6,450 115 43 S ABCDE
KD6UY 2,394 80 21 S BDE
N7STU 1,095 47 15 S BD
W6YLL 45 9 5 S A

San Diego
K1CT 2,750 99 22 S **ABCDI**
W6PFE 936 72 13 S **AB**
W6RDF (KA3IZE,KA5GNN,KC6VNA, N6XJV,WA6TBO,N7GZA,ops)
3,312 116 23 L ABCD
WB6AXW (+K6OBS)
960 48 16 L ABDE

San Francisco
AB6QW 90 15 6 Q B
WN6W (+AA6CC)
2,916 77 27 L ABCD

San Joaquin Valley
WB4AYE 1,554 53 21 S **ABCD**
KB6IGC 1,100 44 20 S ABCD
KD6YWO 560 40 14 S **B**
KD6WVL 559 43 13 S B
WA6YDI (+AA6AH,N6GAI,WB6ITM)
28,428 298 69 M ABCDE

Sacramento Valley
NI6L 3,150 87 30 S **BD**
N6KBX 2,730 91 30 S **AB**
W6RCW 207 23 9 S **A**
KC6TEU (+WA5YWC,WA6TMJ)
14,800 239 50 M ABCDE
KD6PUD (KC6SBJ,KD6CTZ,ops)
2,121 82 21 L BD

7

Arizona
N7GJD 68 17 4 S **AB**
WB7OHF (+KB7CRT)
290 26 10 L ABD

Eastern Washington
N7VMV 612 31 17 S **ABD**
W3JPT/7 374 30 11 S **ABD**

Idaho
KA7GUX 578 29 17 S **ABD**

Montana
W7HAH (+WA7KHO)
1,540 42 36 L ABD

Nevada
K7ICW 688 35 16 S **ABD**
NC7K (+NR6E)
10,010 140 55 M ABCDE

Oregon
KG7FV 3,937 109 31 S **ABD**
N7YAG 1,580 67 20 S **ABD**
WD4ECK 931 39 19 S BD
K7HSJ 372 23 12 S **ABCDE**

Utah
WA7PIB 2,592 70 24 S **ABCDE**
WB7QBC 1,003 59 17 S **AB**
NJ7A 559 29 13 S **ABD9**
KE7NS 275 19 11 S ABD

Western Washington
W7ZSL 7,683 159 39 S **ABCD**
KE7SW 7,134 134 41 S **ABCDE**
K7VNU 3,720 107 30 S ABCD
KH6JJK 1,072 48 16 S ABCD
KD7TS 832 52 16 S B
N7RZA 616 55 11 S BD
W7FKI 270 30 9 S B
N7KSI 585 45 13 Q A
N7TCD 217 31 7 Q A
W7FHI (+KB7UWC,WB7FHH)
819 36 21 L ABD

Wyoming
WØSII/7 1,380 28 23 S **BDE**

8

Michigan
K8MD 52,895 277 149 S **ABCD9E**
KU8U 50,836 312 142 S ABD
KØBI 20,020 173 91 S ABD9
WN8U 19,320 276 70 S **B**
KU8P 16,932 180 83 S **ABCDE**
WZ8T 10,595 134 66 S ABD
WB8TGY 9,853 112 59 S **ABDEF**
K2YAZ 7,260 121 60 S B
N8PVT 4,263 77 49 S ABD
N8IVW 1,608 67 24 S B
N8HNS (+N8s IMQ,VWD,WVO,WA8TDN)
27,610 192 105 L ABCD
KB8JI (+N8YCS)
11,700 129 78 L ABDE

Ohio
WA8WZG 126,800 402 200 S **ABCD9EF**
KE8FD 96,624 389 183 S **ABCDE**
WA8MZQ 55,372 337 127 S **BD**
WA8TJI 41,402 243 127 S **ABCD9E**
WB8K 17,520 178 80 S ABD
WA8QNR 5,250 105 50 S AB
NI8T 4,356 121 36 S B
N8IAO 3,610 95 38 S AB
K8MR 3,560 89 40 S AB
WA8RCN 2,627 71 37 S AB
N8LGP 2,232 72 31 S B
N8VKE 1,968 72 24 S ABD
WA4GPM 1,725 75 23 S B
W1FEZ 1,638 63 26 S B
K8NIA 1,242 49 23 S ABCD
W8GBH 1,075 43 25 S B
WB8PHI 945 35 27 S B
N8VEA 902 41 22 S B
N8ACP 897 39 23 S AB
N8OBD 736 39 16 S ABD
N8TRL 510 30 17 S B
N8QXC 392 28 14 S ABC
NX8M 384 30 12 S BC
N8PZD 380 33 10 S BCD
N8AXA 2,048 60 32 O ABD
W8BI (AA8JK,KA8FGE,KB8s HFR,LBQ, KF8HM,ops) 610 34 18 L ABCD

West Virginia
K2UOP/8 113,388 408 182 S **ABCD9EFI**
K8UC 6,783 105 57 S ABD
N8PEK 6,936 90 64 S ABD
K3JT 4,418 80 47 S ABD
N8ODF 3,444 82 42 S AB
WN3C 2,349 71 33 S B
N8FWL 1,947 49 33 S ABCD
W8TN 280 15 14 S ABD
N8TLZ 29,488 211 106 Q ABCDE
W8JI 77 11 7 Q AB
N8FMD (+AA8LC,KD8KDS,KV8S,N8s KYV,OJK, UBI,VCF,ZQD,WJ8G)
320,280 910 255 M ABCD9E

9

Illinois
K9PW 222,292 617 238 S **ABCD9EFGHJ**
WB8OJR 28,938 151 106 S BCD9E**F**
KA9LDS 18,094 182 83 S ABD
N9AQ 10,863 131 71 S ABD
W9JGV 9,734 142 62 S BD
N2BJ 9,360 139 48 S ABCD9E
WB8GKA 6,840 88 60 S ABCD
WD8KHE 1,768 60 26 S BD
N9KUW 1,258 59 17 S ABCD
WB9FWC 1,225 29 25 S BCDE
KA9YZP 697 31 23 S BD
N9SOR 736 32 16 S BCDE
WB9MXX 648 36 18 S AB
N8KWX 585 33 15 S ABC
KB9II 532 33 14 S ABC
N8LAG (+N9s BJG,KJE,QKZ)
24,552 198 99 L ABCD
WD8EXD (+W8RVG)
880 36 20 L ABD

Indiana
WA8R/9 61,740 234 147 S **ABCD9EF**
N8MKC 18,546 281 66 S **B**
KB8FZO 11,005 128 71 S ABD
K9DZE 1,855 53 35 S B
WB8YFE 1,026 33 27 S ABD
WB8DRB 792 27 22 S ABCD
K9CUN 696 29 24 S AB
KB8GLS 450 25 18 S B
W9SU (+N9s KZJ,LRR,WB9CEP)
3,081 79 39 L AB

Wisconsin
WA9LZM 7,839 114 67 S ABD
WA9LWJ 5,472 96 57 S **AB**
WA9PWP 5,115 93 55 S AB
WB9WHO 4,692 92 51 S **AB**
N9LMU 4,224 78 44 S **BDE**
WA9HCZ 3,990 78 42 S ABD
W9YCV 1,736 47 28 S BD
WD9BGA 714 34 21 S AB
WD9IAB 612 29 17 S BD
W0UC/9 (+KA9FOX, WE9V,KØGJX,NØBSH)
264,934 751 278 M ABCD9E

Ø

Colorado
KØRZ 13,420 109 61 S ABCD9EFI
W2CRS 12,864 127 64 S ABCD9EFI
KDØDW 7,216 121 41 S **ABDE**
NØYGM 605 40 11 S ABDE
NØHAX 518 27 14 S ABD
W8OAL/Ø 396 27 9 S ABDE
NØPOH 150 25 6 Q B

Iowa
NNØK/Ø 95,400 423 180 S **ABCD**
WBØCQO 11,288 137 68 S ABD
WØYPT 7,497 88 51 S BCDE
WØRAP 3,224 43 31 S **D9E**
KØJQA 1,431 53 27 S B
KØVM (+KA7QEN,KD9KX,KØHWE,NØs CIH, LNO,MMA,UTP,XPP,WAØRJT)
45,630 265 135 M ABCD9E
NØOQC (+NØQFK)
15,123 184 71 L ABC

Kansas
NØLL 48,851 233 141 S **ABCDE**
NØIGZ 925 37 25 S AB
KBØEEB (+NØOVT,WVØs R,S)
396 27 12 L BD

Minnesota
WAØBWE 69,678 310 147 S **ABCD9EF**
WØKRX 43,680 228 112 S ABCD**EF**
KØFQA 20,952 187 72 S ABDEF
WDØCJM 19,866 150 86 S BDE
WA2HFV/Ø 14,060 155 76 S ABD
KBØIKP 11,736 157 72 S ABD
KAØRYT 7,800 150 52 S **B**
WDØGNK 5,166 90 41 S ABCDE
WØPHD 2,618 51 34 S BDE
WØAUS 2,604 72 28 S ABCDE
NØKBD 966 46 21 S B
NØVWG 900 50 18 S B
WØOHU 532 27 14 S BD
WAØSWD 128 27 4 S BD
NØVYY 72 24 3 S B
KBØJGA 30 15 2 S B
WAØNTT (+NØTRB,WBØHLL)
88,587 418 159 M ABCDE

Missouri
WØJHP 2,040 49 34 S **ABCD**
WØPLW 740 37 20 S **B**
NØOFX 684 36 19 S B
AAØFN 578 34 17 S AB
K4VX (KBØLCV,op)
81 9 9 S **A**
WØGR (+AJØE,KØTLM)
29,760 185 120 M ABCD9E

North Dakota
NTØV 23,226 148 98 S **ABCDEF**

Nebraska
KDØHE 1,180 41 20 S **BD**
WDØBQM 722 27 19 S ABD
WØBJ 459 22 17 S **ABDE**

South Dakota
NØKRX 8,308 108 62 S **BD**
WBØHHM 7,598 98 58 S **ABCD**

VE

Maritime-Newfoundland
VE1BVL 1,690 44 35 S **ABD**

Quebec
VE2NRN 2,052 57 36 S **AB**
VE2LC 940 38 20 S **ABD**
VE2PIJ 204 36 4 S BD
VE2GUQ (+VE2s JWH,YCA)
1,394 68 17 L BD

Ontario
VE3ASO 193,116 527 231 S **ABCD9EFGI**
VE3RKK 20,097 319 63 S **B**
VE3KDH 18,699 271 69 S B
VE3DSQ 13,524 153 69 S BD
VE3URS 13,024 155 74 S **ABD9E**
VE3WCB 7,488 103 48 S ABDEF
VE3USC 7,260 125 58 S AB
VE3SXE 5,000 94 50 S ABD
VE3EGO 1,248 52 24 S B
VE3PWJ 1,144 42 22 S BD
VE3LI 1,081 47 23 S B
VE3DJ 705 37 15 S BDE
VE3FVW 616 33 14 S ABDE
VE3SAU (VE3s FHU,GOG,IGM,NPB,OJN, XJX,ZPZ,ops)
20,516 202 92 L ABCD
KO4OE/VE3 (+VE3s KOI,SWS)
798 42 19 L B

Manitoba
VE4ZK 160 16 10 S **AB**

Alberta
VE6HDO 25 5 5 S **AB**

British Columbia
VE7XF 3,564 86 33 S **ABDE**
VE7KPB 9 3 3 S B
VE7PRC (+ops) 931 46 19 L ABD

DX

XE
XE2/NH6ZF 294 42 7 S **B**
XE2LQB 2 2 1 S **A**

Rovers

Atlantic
WB3IGU 11,934 153 78 R B 4
WD5BRP 4,170 121 30 R BD 2

Central
WB9EEA (+N9KC)
85,064 280 196 R ABCD9EFHJ 10
K9JK 6,102 75 54 R ABCD9E 6
WF9X (+WW1M)
5,762 75 67 R ABCD 4
N9KS 1,872 52 36 R B 2

Dakota
KBØZQ (+NØHJZ)
241,293 496 299 R ABCDEF 9
VE4AQ (+VE4KQI
30,988 154 127 R ABDEG 7
WA2VOI 861 28 21 R ABDE 1
NØUZA 105 21 5 R B 2
NØMSB 55 10 5 R BD 2

Great Lakes
WA8NJR (+W9VNE)
116,501 376 187 R ABCD9EF 14
WB9SNR/8 8,084 56 47 R DEFGH 3
AA8MC 6,500 95 50 R ABCD 13
AA8HH 5,950 83 50 R ABCD 13
WX3N/8 (+WX9E)
4,452 82 53 R BD 2
N4STK 192 12 12 R ABD 4

Hudson
KF2MR 28,203 194 79 R ABCD9EFGI 5
N3BXH 11,077 87 53 R ABD9EFGI 5
KA2MCU (+W2ARQ)
4,002 51 29 R ABCD9EFGHIJ 3
W2JVF (+WA2IWW)
3,441 42 31 R BCD9FGHIJ 3
N2WDL 1,292 54 17 R ABDI 2
N2UID 1,155 35 21 R ABDI 4
KF2AB 1,012 34 22 R BD 4
W3HHN 440 32 11 R BD 3
K2BST 120 8 8 R ABCDEI 2
W2ARQ 60 6 6 R BCD 2

Midwest
KE9QT 192,104 444 286 R ABDE 10
WV0C (+WBØYFL)
21,840 156 104 R ABCD9E 6
KAØOGU (+NØXPI)
3,404 74 46 R B 6
AJØE (+KØTLM)
1,196 46 26 R AB 4

New England
N1ISB (+N2RKC)
32,300 230 85 R BCD9EFGHIJ 6
N1NCI (+WA1LNP)
1,680 105 16 R B 3

Northwestern
WA7OEU 24,156 208 99 R ABCD 10
N6LQP 2,700 75 36 R AB 6

Pacific
K6AAW 1,856 58 32 R B 6

Roanoke
N4YZJ (+WA1EHL)
85,186 316 191 R ABCDE 6
KC4AUF (+KD4VOZ)
1,432 133 8 R BD 4
WB8BEL 748 34 22 R AB 2

Rocky Mountain
NØKV (+KØRI)
43,818 181 134 R ABCD9EFI 8
NØLRJ 16,745 152 85 R ABD 6
NJ7A 1,007 32 19 R BDE 2
N7MLD 759 51 11 R BD 3
KE7NS 286 20 13 R ABD 2

Southeastern
AC4HG (+AC4HH)
26,818 183 106 R ABCD9E 4
KD4IOK 4,560 87 40 R BD 6
KD4IDG 3,876 77 38 R BD 6
AD4DY (+KD4BHH)
717 37 21 R AB 2
KD4RTY 385 28 11 R BD 2
KD4NTW 75 11 5 R BD 2

Southwestern
WA6FIT 16,464 213 56 R BCDE 3
K6LMN 15,848 210 56 R ABCDEL 3
N7TTO (+KD6EFO)
3,228 219 12 R ABD 5
WA6RAY (+K6AWO)
2,688 79 28 R ABCD 3
KD6YYW 528 26 16 R BCD 2
KD6PHJ (KC6HAT,WA6KZB,op)
396 30 9 R BC 1

West Gulf
WS5R 341 26 11 R BD 5

Canada
VE3NJK 9,060 67 60 R ABCD9EFGI 7
VE3GPF 1,250 50 25 R B 2
VE3OIL 1,150 39 25 R BCD 4

Marine Mobile
N1KTM 3,874 149 26 R B 4
KB7QOZ 210 30 7 R B 2

Checklogs
KA2VJV, WA2TWW, KD6RMS, VE7XO.

Club Competition Rules and Contest Disqualification Criteria

The 1994 contest season is upon us. Four ARRL-sponsored contests in 1994 include ARRL-affiliated club competition categories: January VHF Sweepstakes, February/March International DX Contest, November Sweepstakes and December 160-Meter Contest. There are a few ground rules to follow to ensure that your club's scores are properly credited (and to ease the log checker's burden). These are detailed below.

From time to time it becomes necessary to consider disqualifying an entrant in an ARRL contest. The particulars are listed below. Most of the time, the reason is simply that the person submitting the entry wasn't accurate in copying call signs or contest exchanges. As long as you're careful only to log QSOs when you're sure of the information, you should have nothing to worry about. (The use of standard ARRL contest forms, computer disk and electronic entries will help ensure that your score is figured properly and speed the publication of contest results in *QST*.)

Don't hesitate to call or write if you have a question about the rules listed here or the rules for any contest. The time to ask is before the contest, not afterward.

Club Competition

Only active ARRL-affiliated clubs may participate in the club competition. A member must be listed in the regular score listings to be counted for a club.

For a club to be listed, two conditions must be met:

1) At least *three different entries* from members of the club must be submitted.

2) All members wanting to be included in the club score *must indicate the club name on their summary sheet and the club secretary must send a list of all club members eligible to compete for the club and which level (unlimited, medium, local) they wish to enter for each competition.* Remember to meet the mailing deadline!

There are three levels of club competition:

1) **Unlimited:** Any club submitting *51 or more entries*. (One station can submit two entries—one on CW and one on phone in the November Sweepstakes and the DX Contest.) All stations and all operators must reside within 175 miles of the club's center. All members must attend at least two club meetings per year to be eligible to submit an entry. If, however, they have not been a member for a year's time, they must have attended a meeting as a member prior to the contest. Club members who are disabled in such a way that they are unable to travel are exempt from the two meetings per year rule, but they must be regularly active in club affairs. To be considered *bona fide*, a member must be active in club affairs. Members living outside of 175 miles and/or members operating stations outside of 175 miles may not compete in the club competition.

2) **Medium:** Any club submitting *50 or fewer entries*, except as noted in local club criteria below. The same mileage and attendance requirements apply as the unlimited class club.

3) **Local:** Any club submitting *10 or fewer entries*. All members must reside and operate within 20 miles of the club's center. There is no attendance requirement.

Single-operator and multioperator station scores may be counted. At a guest-operated single-operator station, *both* the guest operator and the station licensee must be members of the same club to count the score for that club. At multioperator stations, at least *66%* of the operators must be members of the same club for the score to count for that club. *A multioperator entry may (optional) utilize nonmember operators licensed one year or less without including such operators in the above 66% calculation. The intent is to encourage clubs to recruit newcomers without adversely affecting the club's aggregate score.*

In conjunction with the two meetings per year rule, the club must hold *at least four* in-person meetings per year. A club's entry classification may be changed if, in the opinion of the ARRL Awards Committee, the club has manipulated its number of entries to fall into a lower classification (eg, if a club with 100 members submits only the 10 highest scores, even if more than 10 of its members want to compete.)

It is not within the intent of these rules that a club should vote out a member or that a member resign and then be voted back into the club later so the member-attendance rule can be met.

The highest scoring active affiliated club entry will be awarded a gavel in each category (unlimited, medium, local).

The highest single-operator CW score and the highest single-operator phone score (ARRL International DX Contest and ARRL November Sweepstakes) in any active affiliated club entry will be awarded with a club certificate when at least three single-operator CW and/or three single-operator phone scores are submitted.

Disqualification

If the claimed score of a participant is reduced by 2% or more, the entry may be disqualified. Score reduction does not include correction of arithmetic errors.

Score reduction may be made for taking credit for unconfirmed QSOs and/or multipliers, duplicate contacts and/or other scoring discrepancies.

An entry with more than 2% duplicate contacts left in the log or an entry in which more than 2% "rubber clocking" (altering the actual time to increase the operating time so that it's greater than the allowable limit) is detected will be automatically disqualified.

If a participant is disqualified, he or she will be barred from submitting an entry in the next annual running of that specific contest, eg, disqualification from the 1994 phone SS prohibits submission of an entry for the 1995 phone SS, but 1995 CW SS participation is okay.

The call signs of all disqualified participants will be listed in the *QST* contest report.

Any participant on the borderline of disqualification, but not actually disqualified, may receive a warning letter.

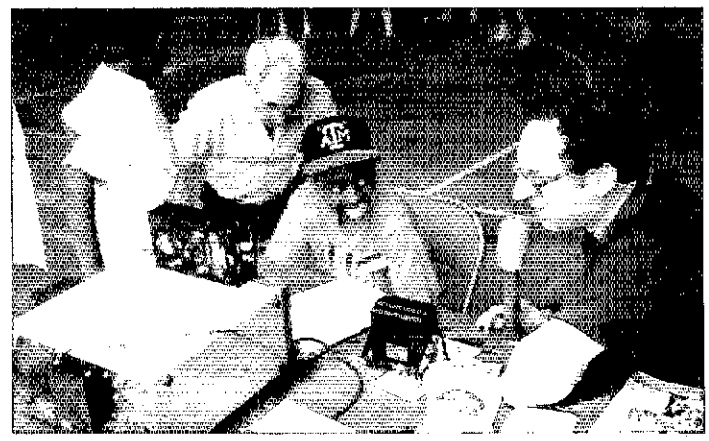
For each duplicate contact or miscopied call sign removed from the log by HQ, three additional contacts will be deleted as a penalty. The penalty will not be considered part of the 2% disqualification criteria.

In all cases of question, the decisions of the ARRL Awards Committee are final. QST

Strays

For the second year, QCWA Chapter 49 of Atlanta coordinated an Amateur Radio demonstration in August for the Kidney Foundation of Georgia-Camp Independence, held annually for children aged 5-15 who are kidney recipients or soon-to-be-kidney recipients.

Using HF and VHF, members of the Atlanta RC, Metro-Atlanta Telephone Pioneers RC and the Gwinnett ARS helped kids speak to hams locally and around the US. The youngsters had their pictures taken at the operating position, located the stations they contacted on a map, and were given souvenir special-event QSL cards and ARRL materials. QCWA Chapter 49 President Bill Plage, W4DQT, said, "You'd be amazed at the happy smiles and looks on their faces when talking to other hams. I think we've got some future operators." *(thanks, QCWA Chapter 49 Secretary Jud Whatley, W4NZJ, Snellville, Georgia)*



Rules, 1994 Novice Roundup

1) **Object:** For Novice and Technician operators in the US (and its possessions and territories) to contact and exchange QSO information with as many stations as possible in the Novice bands. All authorized emissions modes may be used (see scoring information). Higher-class licensees work Novices and Technicians only.

2) **Contest Period:** The week that spans the end of January and the beginning of February, including both weekends. Begins 0000 UTC Saturday, January 29, 1994, and ends 2400 UTC Sunday, February 6. Operate no more than 30 hours during this nine-day period. Non-operating periods must be at least 15 minutes; listening time counts as operating time. Times on and off must be indicated in your log.

3) **Entry categories:**

A) *Single Operator*: One person performs all transmitting, receiving and logging functions during the contest period.

B) *Multioperator*: Single transmitter only. This category includes stations using any form of assistance, such as help with logging or relief operator(s), during the contest period. All operators must be Novice or Technicians and listed on the summary sheet.

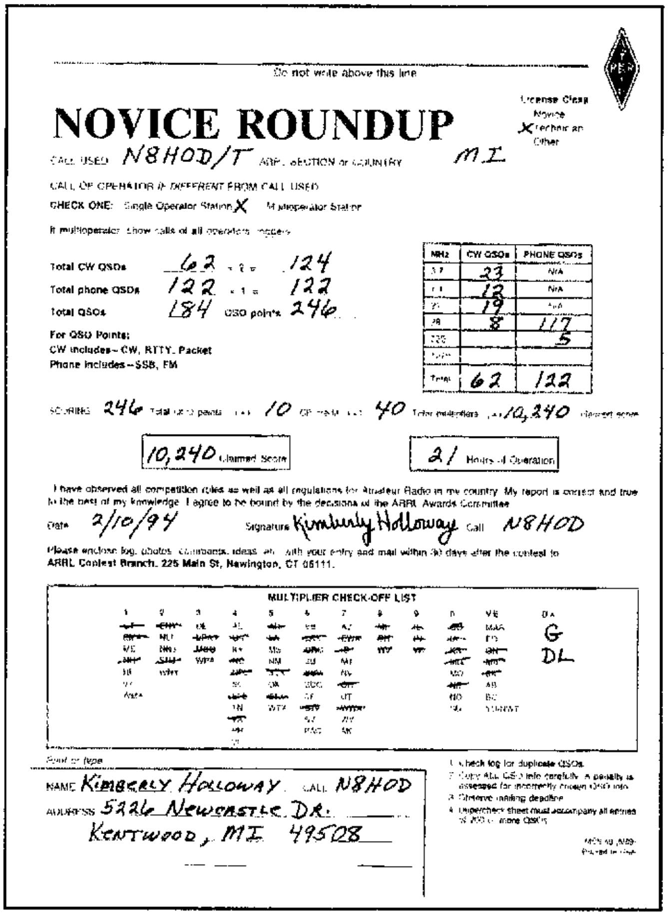
4) **Exchange:** Signal report and ARRL/RAC Section (country for DX stations). Both stations must receive and acknowledge the complete exchange for the contact to count. Novices should send /N and Technicians /T after their call sign so others will know their license class.

5) **Scoring:**

A) *QSO Points*: Count one point for each complete voice QSO and two points for each complete CW QSO. Voice modes include SSB and FM; CW includes all authorized digital modes, such as RTTY and packet radio. You may work stations only once on a voice mode and once on a digital mode, regardless of frequency band.

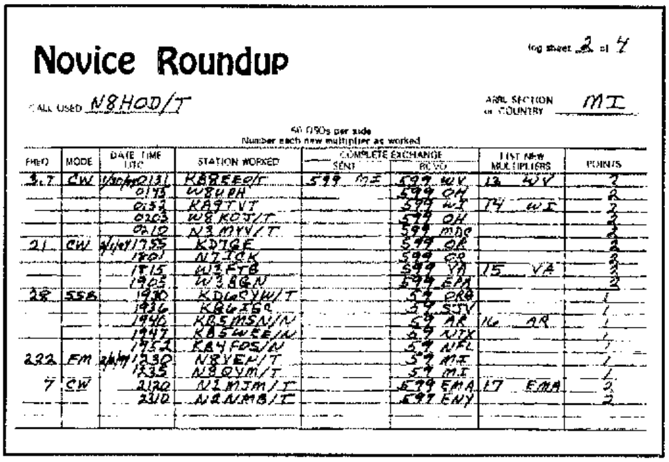
B) *Multiplier*: Each ARRL/RAC Section (see page 8 of *QST*), plus VE8/VY1, plus each DXCC country.

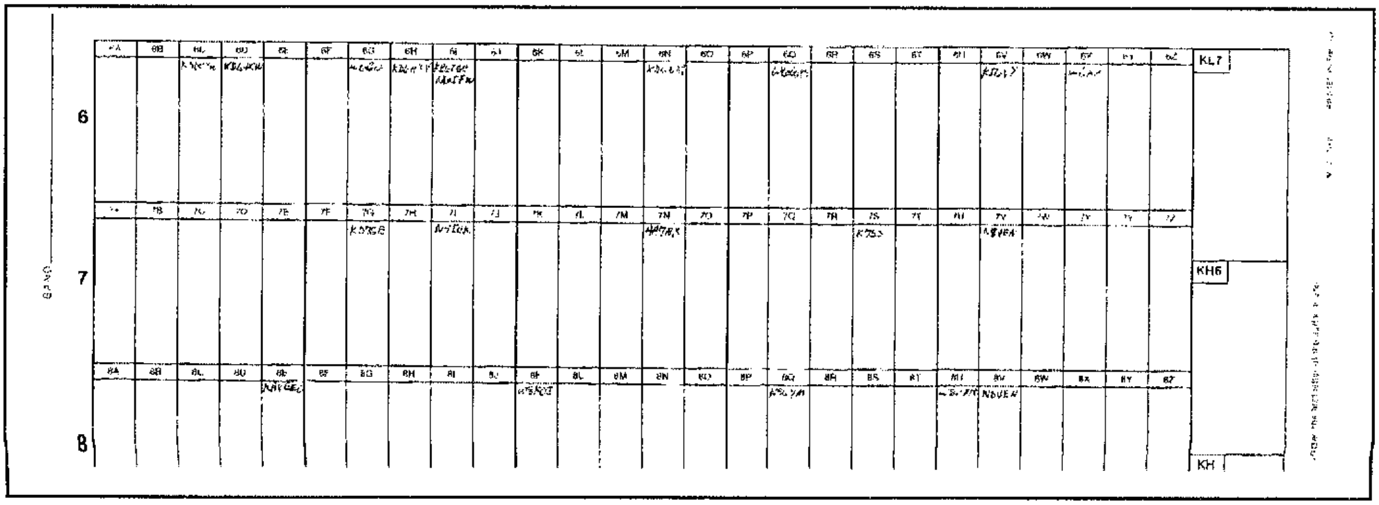
C) *Code Proficiency*: Additional points can be earned if you've qualified for an ARRL (not FCC) Code Proficiency certificate. CP credit equals the speed in words per minute indicated on the latest certificate or sticker held by the entrant. For details on the Code Proficiency program, see Contest



A properly filled out summary sheet (cover sheet, left), required for submission of contest entries.

An accurate, carefully filled out log sheet makes scoring easier.





A dupe sheet helps identify stations already worked in the contest.

Corral on page 127.

D) *Final Score:* Add your Code Proficiency credit to your total number of QSO points. Multiply that total by your ARRL/RAC Section/DXCC country total for your final score.

6) **Miscellaneous:** Crossband and crossmode contacts are not permitted. Novices and Technicians work any amateur stations; others work Novices and Technicians only. Contacts made through repeaters (or locally used repeater output frequencies) are not permitted. Packet radio contacts made through digipeaters are not permitted.

7) **Reporting:**

A) Entries must be postmarked no later than 30 days after the end of the contest (March 8, 1994). No late entries can be accepted. Use ARRL Novice Roundup forms, a reasonable facsimile, submit your entry on diskette, upload your entry to the ARRL BBS, or send your entry to ARRL HQ via Internet.

1) Official entry forms are available from HQ for a self-addressed, stamped envelope (SASE) with two units of First-Class postage or four International Reply Coupons (IRCs).

2) You may submit your contest entry on diskette in lieu of paper logs. Floppy diskettes must be IBM compatible, MS-DOS formatted, 3½- or 5¼-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, exchange sent, exchange received, multipliers [marked the first time worked] and QSO points). One entry per diskette. An official summary sheet or reasonable facsimile with signed contest participation disclaimer is required with all entries.

3) You may submit your contest entry via the ARRL HQ BBS (203-665-0090) or via Internet to contest@arrl.org. Send your summary sheet file (Make sure it includes all the pertinent information outlined in the official ARRL summary sheet.) and your log file following the ARRL Suggested Standard File Format.

B) Logs must indicate band, mode, date, time in UTC, call signs and complete exchanges (sent and received), multipliers and QSO points. Multipliers should be marked clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include duplicate-check sheets (an alphabetical listing of stations worked). Send entries to ARRL Contest Branch, 225 Main St, Newington, CT 06111.

8) **Awards:** Certificates to every Novice and Technician entrant who submits a valid entry. Endorsements for top Novice and Technician entrant in each ARRL Section/Division. Non-Novice/Technician entries are not eligible for awards.

9) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions and the intent of this announcement, the regulations of his/her licensing authority, and the decisions of the ARRL Awards Committee.

10) **Disqualifications:** See page 124 of this issue. QST

Eighth Annual School Club Roundup

The Annual School Club Roundup (SCR) is sponsored by the Council for the Advancement of Amateur Radio in the New York City Schools (CAAR/NYCS) in association with the ARRL and its Hudson Division Education Task Force to foster contacts with and among school radio clubs.

Teachers and other participants have commented that the SCR is a great way to get young operators on the air. New operators are often intimidated by the fear of not knowing what to say to the stranger on the other side of the radio. The exchange info helps to overcome this fear in a low-pressure contest format. All operators are encouraged to take some time to chat.

The SCR continues to grow in popularity. 1993 saw a 23% increase in entries. In 1994 we hope to hear from more school groups, clubs and individuals. At the request of several operators, we are adding a new entry category for colleges and universities.

There are some changes in the operating rules. The school award categories are expanded to include colleges and universities. Awards will now be issued for separate elementary, middle school, high school and college/university levels for the US and DX. — *Lew Malchick, N2RQ, Chairman, CAAR/NYCS*

Rules:

1) **Object:** All stations to exchange QSO information as below with as many other stations as possible, especially school clubs.

2) **Contest Period:** Monday through Friday, February 14-18, 1994, the second full week in February, 1300-0100 UTC each day. Operate no more than 24 of the 60 hours. Logs must clearly show on and off dates and times. Off periods must be at least 30 minutes.

3) **Classes:** Single transmitter only:

(I) *Individual* or *Single Operator* (nonclub)

(C) *Club* or *Multioperator Group* (nonschool)

(S) *School Club* or *Group* (grades K-12, colleges and universities). (Any station operated at a school for the contest period.)

4) **Exchange:** Your call sign, RS(T), class (I, C or S), US state or DX country. For example, W2CNX answers N2RQ's call by sending **N2RQ DE W2CNX 57(9) S NY.**

5) **Scoring:** Stations may be contacted once each on phone and CW (packet and RTTY count as CW). No repeater contacts except satellite and "real-time" packet. One point for each phone QSO; two points for each CW QSO.

Multiplier: [number, states plus DXCC countries] plus 2 × [C class QSOs] plus 5 × [S class QSOs]. School stations get a multiplier of 5, which should make them the most desirable stations to work.

Final Score: Multiply QSO points by multiplier.

6) **Reporting:** Sample log and entry forms are available for an SASE. Entries should be mailed to School Club Roundup, c/o Lew Malchick, N2RQ, Brooklyn Technical HS, 29 Ft Greene Pl, Brooklyn, NY 11217. Logs must include exchange information, bands and signature of all operators (and authorized club official or trustee). Indicate the number of hours and operator/loggers and type of school. Dupe check sheets are required for entries with more than 100 QSOs. Computer entries on disk are appreciated. We can accept ASCII or test data files in IBM, Mac, Apple II, C-64 and Amiga disk formats. Please include a printed summary sheet and instructions as to the disk file names and formats. Postmark by 30 days after the end of the contest (March 21, 1994).

7) **Awards:** Certificates for top three entrants in each class. The school club class will be divided into elementary, middle, high school and college/university. DX will be listed separately at the end of US entries in each category. A special certificate will be awarded for any station contacting 10 or more school clubs. Send a large SASE or sufficient IRCs for complete results and more info about CAAR/NYCS. QST

Contest Corral

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

December 31-January 1

ARRL Straight Key Night, see Nov *QST*, p 127 for details.

JANUARY

1-2

AGCW-DL QRP Winter Contest, see Dec *QST*, p 129.

Michigan QRP Club CW Contest, see Dec *QST*, p 129 for details.

4

West Coast Qualifying Run, 10-40 WPM, 0500Z Jan 5 (9 PM PST Jan 4). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of 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.

8-9

ARRL RTTY Roundup, see Dec *QST*, p 127.

W1AW Qualifying Run, 35-10 WPM, 0300Z Jan 9 (9 PM EST Jan 8). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0675 28.0675 147.555 MHz. See Jan 4 listing for details.

Japan International DX Contest, CW, sponsored by *Five Nine* magazine, 2200Z Jan 7-2200Z Jan 9 and 2300Z Apr 9-2300Z Apr 10. Operate 160, 80 and 40 meters the first weekend; operate 20, 15 and 10 meters the second weekend. Entry classes: Single op, single band; Single op, multiband; Single op, multiband QRP; Multiop, multiband. No crossband QSOs. Single ops may have only one transmitted signal at any given time. Once operation begins on a band, the station must remain on that band for at least 10 minutes. Listening time counts as operating time. Multiops may have a maximum of one signal per band. JA stations send RS and prefecture number (01-50). Others send RST and *CQ* zone. Contacts among DX stations or among JA stations do not count. Count one point per QSO on 40, 20 and 15 meters. Count two points per QSO on 80 and 10 meters Count four points per QSO on 160 meters. Multiply by the number of different prefectures worked (max 50) per band for final score. Use separate logs for each band. Mark multipliers the first time worked. Awards. Provide a complete summary. Enclose SAE and IRC for results. Mail logs to arrive by Apr 30 to *Five Nine* Magazine, Japan International DX Contest, PO Box 59, Kamata, Tokyo 144, Japan.

Midwinter Contest, see Dec *QST*, p 129.

Minnesota Frostbite Falls Beach Party, see Dec *QST*, p 129.

North American QSO Party, CW, see Dec *QST*, p 129.

QRP ARCI Fireside Sprint, phone, sponsored by QRP ARC International, 2000Z-2400Z Jan 12. Phone only. Single band or all band. Work stations once per band. Exchange signal report, state/province/DXCC country and QRP ARCI number if member. Nonmembers send power output. 1.810 3.985 7.285 14.285 21.385 28.385 28.885 50.885. Count five points for QSO with ARCI member. Others count two points for same continent and four points for different continent. Final score is QSO points × states/provinces/DXCC countries worked per band × power multiplier (> 10 W × 1; 2-10 W output × 7; 0-2 W output × 10) power supply multiplier (If 100% solar, natural or battery power is used, multiply by 1.25, other × 1) + bonus points (2000 if a home-brew transmitter is used; 3000 if a home-brew receiver is used; 5000 if a home-brew transceiver is used). Include a description of home-brew equipment, commercial equipment and antennas used. Mail entries before 30 days after contest (SASE for results) to QRP ARCI Contest Chairman, Cam Hartford, N6GA, 1959 Bridgeport Ave, Claremont, CA 91711.

15-16

HA-DX Contest, see Dec *QST*, p 129.

Hunting Lions in the Air Contest, see Dec *QST*, p 129.

Meet the Novices and Technicians Day, see Dec *QST*, p 129.

North American QSO Party, phone, see Jan 8-9 listing for details.

Winter NWQRP Sprint, see Dec *QST*, p 129.

22-24

ARRL January VHF Sweepstakes, see Dec *QST*, p 128.

W1AW Qualifying Run, 10-35 WPM, 2400Z Jan 24 (7 PM EST). See Jan 8 listing for details.

29-February 6

ARRL Novice Roundup, see this issue, p 125.

29-30

CQ World Wide 160-Meter DX Contest, CW, see Dec *QST*, p 129.

REF French Contest, CW, see Dec *QST*, p 128.

FEBRUARY

2

West Coast Qualifying Run, 10-35 WPM, 0500Z Feb 3 (9 PM PST, Feb 2). See Jan 4 listing for details.

5-7

North American Sprint, CW, sponsored by the *National Contest Journal*, 0000Z-0400Z Feb 6 (local time Feb 5) (phone Sprint 0000Z-0400Z Feb 13, local time Feb 12). Sprints are separate: 80, 40, 20 meters only. CW—3.540 7.040 14.040; phone—3.900 7.225 14.280. Work stations once per band. A valid QSO is between an NA station and another station. You must send and receive all of the following information: Other station's call sign, your call sign, serial no. (consecutive starting with 001), your name and QTH (state/province/DXCC country). An operator may use only one call sign during the contest. Multiply valid QSOs by sum of states, provinces and North American countries (not W/VE). KH6 is not counted as a state or as an NA country. VE multipliers are Maritimes (VE1, VO1, VO2, VY2, VE9), VE2 through VE7 and VE8/VY1 (eight max). Non-NA countries do not count as multipliers, but are valid for QSO credit. Simultaneous transmission on more than one frequency is not allowed. All contacts must be sent and received using means requiring real-time human intervention, detection and initiation. Special QSY rule: Stations soliciting a call by sending CQ, QRZ, etc, are permitted to work only one station in response to that solicitation. They must thereafter move at least 1 kHz before working any other station, or at least 5 kHz before again soliciting calls. Once a participant is required to QSY, another QSO cannot be made on the vacated frequency until or unless at least one subsequent QSO is made on a new frequency at least 1 kHz or 5 kHz (as appropriate) from the vacated frequency. Team competition: Each team can have a maximum of 10 members as a single-entry unit. Clubs having more than 10 members may submit more than one team entry. To qualify for team competition, the name and call sign of each operator (and station operated if a guest op) must be registered with N6TR for CW (K7GM for phone). The team registration information must be in written or telegraphic form and received before the start of the Sprint. There are no distance or meeting requirements for a team entry. CW and phone teams are separate. Awards. Entries must be received no later than 30 days after the Sprint. Mail CW entries to Larry Tyree, N6TR, 15125 SE Bartell Rd, Boring, OR 97009. Phone entries go to Rick Niswander, K7GM, PO Box 3778, Greenville, NC 27836-1778.

1994 Classic Radio Exchange, 2000Z Feb 6-0400Z Feb 7. Object is to operate restored equipment at least 10 years old. Exchange name, RST, QTH, receiver and transmitter type (homebrew send amp tube or transistor). CW—60 kHz up from lower band edges; phone—3.880 7.290 14.280 21.380 28.320; Novice/Technician—20 kHz up from lower band edges. Final score is QSOs × number of different transmitters and receivers worked per band and mode, and the total number of states/provinces/DXCC countries worked per band/mode × total years old of all receivers and transmitters used that make at least three contacts (if transceiver, multiply by two). If homebrew, count as 25 years old, unless older. Send logs and comments to Jim Hanlon, W8KGI/5, PO Box 581, Sandia Park, NM 87047.

Vermont QSO Party, sponsored by the Central Vermont ARC, from 0000Z Feb 5 until 0500Z Feb 6. Work stations once per mode per band, a maximum of four times per band. 160-10 meters, excluding the 30, 17 and 12-meter bands. CW—40 kHz up from the bottom of the bands; phone—25 kHz up from the bottom of the General phone subbands and the entire Novice 10-meter subband; Novice—20 kHz up from the bottom of the bands; VHF—50.200 144.200. No repeater contacts. VT stations exchange RS(T) and county, others send RS(T) and state/province/DXCC country. VT counties: AD BN CL CH ES FR GI LM OG OL RT WA WM WR. Score 1 point per phone QSO; 2 points per CW/RTTY/digital QSO. VT stations multiply by VT counties, states/provinces/DXCC countries, W1BD and any other legitimate VT club station; others multiply by VT counties, W1BD and any other legitimate Vt club station. Awards. Send logs postmarked by March 1 to Vermont QSO Party, Central Vermont ARC, PO Box 674, Montpelier, VT 05602.

12-14

North American Sprint, phone, see Feb 5 listing.

EA RTTY Contest, sponsored by the Seccion Territorial Comarcal de URE de Aranda de Duero, 1600Z Feb 12-1600Z Feb 13. Exchange RST and *CQ* Zone (EA stations exchange RST, *CQ* zone and provincial prefix.) Entry classes: Single operator, all band; single operator, single band; multioperator, single transmitter. Score one/two points per contact in own continent/outside own continent on 20, 15 and 10-meter bands; score three/six points per contacts within/outside own continent on 40- and 80-meter bands. Contacts between stations in same country are valid for multiplier only. Multipliers are DXCC countries and Spanish provinces per band. Final score is QSO points × multipliers. Awards. Send logs by April 9 to EA RTTY Contest, Antonio Alcolado, EA1MV, PO Box 240, 09400 Aranda de Duero, Burgos, Spain.

New Hampshire QSO Party, sponsored by the NHARA, 1900Z Feb 12-0700Z Feb 13 and 1400Z Feb 13-0200Z Feb 14. Work stations once per band and mode. No repeater/digipeater QSOs. Exchange signal report and QTH (county for New Hampshire stations; state/province/country for others). CW—1.810 3.535 7.035 14.035 21.035 28.035; Phone—1.875 3.935 3.950 7.235 14.280 21.380 28.320 50.115 144.205 29.610 52.540 146.55 223.50 446.000 902.100 1296.100; Novice—35 kHz above Novice band edges. Count one point per phone QSO, two points per CW/RTTY QSO. NH stations multiply by total NH counties/states/provinces/countries worked. Others multiply by total number of NH counties worked (max 10). Count five points/phone 10 points/digital bonus for working club stations W1ET, WB1CAG, NØCUH, WB1HBB, K1RD, AA1EX, W1GUA, WB1ASL, WW1G, K1BKE, N1LT, KD1GJ, W1OC. Awards. Send logs postmarked by Mar 31 (include SASE for results) to GEARS, Conrad Ekstrom, WB1GXM, PO Box 1076, Claremont, NH 03743-1076.

YL-OM Contest, phone, sponsored by YLRL, 1400Z Feb 12-0200Z Feb 14 (CW is 1400Z Feb 26-0200Z Feb 28). Phone and CW are separate contests. Work only 24 hours, operating time must be indicated in the log. YLs work OMs, OMs work YLs only. Use all bands; no crossband operation. No net contacts or repeater contacts. Work stations

only once per band. Exchange QSO number, signal report and state/province/DXCC country. Count one point for each station worked and multiply by the total number of states/provinces/countries worked. Stations running 100 W CW or 200 W PEP SSB or less multiply final score by 1.5. Stations may not use more than 750 W on CW and 1500 W PEP on phone. Entries with more than 200 QSOs must submit dupe sheets and must score each band separately. Phone—3.940-3.970 7.240-7.270 14.175-14.280 21.380-21.410 28.380-28.610; CW—3.540-3.725 7.040-7.070 14.040-14.070 21.120-21.150 28.150-28.200. Awards. Send logs postmarked by 30 days after the end of the contest to Carla Watson, WO6X, 473 Palo Verde Dr, Sunnyvale, CA 94086.

13

W1AW Qualifying Run, 10-40 WPM, 0300Z Feb 14 (10 PM EST, Feb 13). See Jan 8 listing for further details.

14-18

School Club Roundup, see this issue, p 126.

19-20

ARRL International DX Contest, CW, see Dec *QST*, p 125.

22

W1AW Qualifying Run, 10-35 WPM, 2100Z Feb 22 (4 PM EST). See Jan 8 listing for details.

25-28

CQ World Wide 160-Meter DX Contest, phone, see Dec *QST*, p 129-130.

RSGB 7-MHz Contest, sponsored by the RSGB, 1500Z Feb 26-0900Z Feb 27. CW only. 7.000-7.030. Single operator and multioperator. Exchange RST and serial no. UK stations also exchange three-letter county code. Non-UK stations work only UK stations, and vice versa. North American stations score 15 points/QSO. Multipliers are UK counties. Final score is QSO points × multipliers. Awards. Send logs by April 19 to RSGB HF Contest Committee, c/o S. V. Knowles, G3UFY, 77 Bensham Manor Rd, Thornton Heath, CR7 7AF, Surrey, England.

REF French Contest, phone, see Dec *QST*, p 130.

YL-OM Contest, CW, see Feb 12 listing.

Contest Announcements: Items for this column can be sent on a 5¼- or 3½-inch MS-DOS floppy diskette in ASCII format to ARRL HQ, fax at 203-665-7531, via modem (ARRL HQ BBS, 203-665-0090), via Internet (to contest@arrl.org) 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 February 1 to make the April issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received, for each QSO claimed for contest credit.
2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.
3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.
4) Your log should be checked carefully for duplicate QSOs, and if more than 200 QSOs are made, dupe sheets should be included with your entry.
5) Your log may be considered a checklog or disqualified if it's incomplete or if too many errors are detected by the contest committee.
6) Avoid standard net frequencies.
7) International contests generally offer awards to top scorers from each US call area and each country, state QSO parties to each state/province.
8) Your summary sheet should include the following statement: "I have observed all competition rules and all regulations established for Amateur Radio in my country." The declaration should be signed and dated. QST

Special Events

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

Chile, Argentina, Guatemala and United States: The Spanish International Western ARC will operate 2000Z-2300Z **December 31** and 1700Z-2000Z **January 1** to celebrate "Happy New Year Americas." 7.264 14.305 21.305 28.340. For certificate, send QSL to SIWARC, PO Box 16458, Encino, CA 91416.

Bristol, Connecticut: Members of the Connecticut DX Assn will operate 0400Z **January 1**-0400Z **January 2** to celebrate the New Year. The use of straight keys is encouraged. For certificate, send QSL and a 9- × 12-inch SASE to Richard Morris, KB1LE, 46 Collins Rd, Bristol, CT 06010.

San Antonio, Texas: The Independent Fundamental Baptist Network will operate 1800Z **January 1**-0300Z **January 2** to commemorate its first year of operation. 14.333 21.333 28.333. For certificate, send QSL to IFBN, 7421 Marbach Rd, San Antonio, TX 78227.

California: Nicaraguan hams residing in California will operate 1500Z-2400Z **January 16** to commemorate the birth of the Nicaraguan poet Ruben Dario. 14.345 21.345 28.345. For certificate, send QSL and a 9 × 12-in. SASE to Radio Aficionados Nicaraguenses California, PO Box 25, Bell, CA 90201.

Upland, California: The Sunset Group ARC will operate W6KAT 1700Z-2300Z **January 8-9** to celebrate the 19th annual Air Fair. Operation will be in the General phone subbands and in the Novice 10-meter subband. For certificate, send QSL and SASE to Sunset Group ARC, PO Box 181, Montclair, CA 91763.

Windsor Locks, Connecticut: Explorer Post 73 will operate K1DFS 1500Z-2100Z **January 16** and **February 20** to coincide with the Bradley Air Museum's Open Cockpit Days. Operation will be in the lower 50 kHz of the 80, 40, 20, and 15-meter CW and phone subbands. For certificate send QSL and a 9- × 12-inch SASE to Chuck Motes, K1DFS, 22 Woodside Ln, Plainville, CT 06062.

Momence, Illinois: The Kankakee ARS will operate W9AZ 0000Z-0600Z and 1400Z-2400Z **January 17** to honor Sir Thomas Crapper. Operation will be near the bottom of the General subbands. For certificate, send QSL and SASE to Willis Bowser, 1210 N Riverside Dr, Momence, IL 60954.

Coloma, California: The El Dorado County ARC will operate WA6LYE 1600Z **January 22**-0200Z **January 23** to commemorate the discovery of gold in California in 1848. CW—14.050; phone—lower 25 kHz of the General 40, 20 and 15-meter subbands and the Novice 10-meter subband. For QSL, send QSL and SASE to El Dorado County ARC, PO Box 451, Placerville, CA 95667.

Storrs, Connecticut: The University of Connecticut ARC will operate KA1WFK and NF9K **January 22-31** to celebrate the return to school after winter vacation. For QSL, send QSL and SASE to UConn ARC, U-8, UConn, Storrs, CT 06269.

Ft Collins, Colorado: Webber Aerospace Ventures in Education (WAVE) will operate NØBIB 1700Z **January 27**-0300Z **January 28** during a space shuttle flight simulation from Webber JHS. Operation will be in the lower portion of the General 40, 20 and 15-meter subbands, the Novice 10-meter subband and on ATV. For QSL, send SASE to WAVE, 4201 Seneca, Ft Collins, CO 80526.

San Diego, California: The Challenger JHS ARC will operate KI6YG 1400Z-2400Z **January 28** to commemorate the eighth anniversary of the *Challenger* space shuttle tragedy. 14.280 21.280 28.380. For QSL, send QSL and SASE to Challenger JHS ARC, 10810 Parkdale Ave, San Diego, CA 92126.

Paola, Kansas: The Wheat State Wireless Assn will operate NUØO **January 29** to celebrate Kansas Day. Operation will be on phone and CW in the lower portion of the General and Novice subbands. For certificate, send QSL and 8½- × 11-inch SASE to Mike Foster, NUØO, RR 5, Paola, KS 66071.

Kwajalein Atoll, Marshall Islands: The Kwajalein ARC will operate V73AX 1745Z **January 31**-1920Z **February 5** to commemorate the 50th anniversary of Operation Flintlock, the battle for Kwajalein Atoll. Operation will be phone, CW and RTTY on the 160-6 meter bands. For QSL, send QSL and SASE or IRC to KARC, PO Box 444, APO AP 96555.

Special Event Announcements: Items for this column can be sent on an MS-DOS floppy disk in ASCII format to ARRL HQ, fax at 203-665-7531, via modem at 203-666-0578, via Internet (to contest@arrl.org) 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 **February 1** to make the **April** 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. QST

New Products

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The ARRL Field Organization Forum

Field Organization Abbreviations	
ACC	Affiliated Club Coordinator
ARES	Amateur Radio Emergency Service
ASM	Assistant Section Manager
BM	Bulletin Manager
BPL	Brass Pounders League
DEC	District Emergency Coordinator
EC	Emergency Coordinator
LGL	Local Government Liaison
NCS	Net Control Station
NM	Net Manager
NTS	National Traffic System
OBS	Official Bulletin Station
OES	Official Emergency Station
ORS	Official Relay Station
OO	Official Observer
OOC	Official Observer Coordinator
PBBS	Packet Bulletin Board Station
PIC	Public Information Coordinator
PIO	Public Information Officer
PSHR	Public Service Honor Roll
SGL	State Government Liaison
SEC	Section Emergency Coordinator
SM	Section Manager
STM	Section Traffic Manager
TCC	Transcontinental Corps
TA	Technical Advisor
TC	Technical Coordinator
TS	Technical Specialist
VC	Volunteer Counsel
VCE	Volunteer Consulting Engineer
VE	Volunteer Examiner

ATLANTIC DIVISION

DELAWARE: SM, Randall K. Carlson, WB0JJX @ WB0JJX—The Delaware Repeater Assn is now an ARRL affiliated club—welcome aboard. The First State ARC has voted to sponsor a Boy Scout Explorer Post in Communications. Post 73 pretty much exists only on paper at the time of this writing, but the first-nighter outing is tentatively scheduled for Dec 2. I'll be passing on more details as this program develops. I'd like to remind all affiliated clubs to fill out your 1994 annual club report as soon as you receive it from Headquarters. Many clubs have elections at this time of the year, so in addition, please notify me and the Division Director of changes so that we can keep our mailing lists up to date. On behalf of the Section staff and me, I'd like to wish you a happy and safe holiday season and all the best in the New Year. Traffic (Oct): DEPN QNI 29, QTC 2 in 5 sess. K3JL 24, KD3OJ 13, KA3GRQ 13, WB0JJX 7, W3FEG 5. APLINK: W3GL 160. 73, Randall.

EASTERN PENNSYLVANIA: SM, Bob Stanhope, KB3YS @ N3KDS—ASMs: W3ZXV @ N3ACL, WB3FPL @ WB3FYL, K3DCU @ N3KDS, WA3PZO @ WB3JOE, N3ECL. ACC: N3HMD @ WB3FYL. BM: KD3OA @ KD3OA. OOC: W3IS. PIC: W3ZVX @ N3ACL. SGL: WA3IAO @ WA3TSW. SEC: KB3QW @ KB3QW. STM: W3KOD @ KB3QW. TC: WB2LGJ @ WB3JOE. Happy New Year! Think about it: Often, amateurs and amateur clubs are faced with some type of interference, either unintentional or malicious in nature. This is usually the case of repeater clubs and groups. The 1st action is usually overreaction: "Let's contact the FCC!" Well, only 2 things can happen when you contact the FCC, and one of them is bad—very bad. Ever since the inception of the amateur service, we've been a "self-policing" service. Part 97 of the Rules and Regulations states this, and we've devised ways through technology and good amateur practice to follow through in this aspect. The rules give us guidelines to follow in the event of interference. Become familiar with them and give yourself a test. Also, look into the rules as far as spectral purity is concerned. Is the configuration of *your* equipment up to these standards? Is the construction and installation of this equipment up to "technical standard and good amateur practice?" If you have the equipment to check your station, and you can answer Yes to these questions, then don't contact the FCC! Try to work out the problem with the interfering party. Don't point fingers, just calmly and rationally attempt to resolve the problem. If any party has difficulty locating and correcting a problem, contact the Section Technical Coordinator, Dennis Silage, WB2LGJ, or me. There's plenty of impartial help in this field to assist both parties resolve the problem. From my observations in the past, of these and similar problems being blown out of proportion and reported to the FCC, we've seen the FCC likewise overreact, and it's usually overkill. The FCC doesn't want to resolve Amateur Radio-related problems, it wants us to work and live in harmony with each other. It's overworked and understaffed, and often makes a hasty decision, and people become very unhappy. Please contact me in these matters so that we can follow the prescribed procedure to alleviate conflicts without the involvement of Big Brother. I hope everyone had an enjoyable holiday season. 73 de Bob, KB3YS. Welcome to new ORS Michael Wacker, WA3WQP. Oct traffic: ORS, W3KOD 443, N3DRM 414, N3EFW 106, W3DP 88, W3JKX 76, N3DEJ 70, N3CSE 66, W3ADE 53, W3IPX 50, WA3WQP 31, AA3CN 30, N3AT 21, N3FLE 19, K3ARR & W3KAG 16, WA3CKA & WC3F 14, KA3LVP 11, W3NNL 8, N3DCG & KA3TOV 7, W3BNR 6, WB3EVL 4, W3TWV 3. @ PBBS: WA3TSW 19/14. PSHR: AA3CN 1/50 2/21 4/1 6/10 total 82. Section nets: D6ARES 108/25, EPA 364/217, EPAEPTN 404/143, LHCARES 132/6, NLCARES 69/9, PFN 261/119, PTTN 176/67, SCESN 90/8, SEPTN 114/3 and WCARES 30/1. Thank you for a terrific traffic year! 73 de Harry, W3KOD.

MARYLAND/DC: SM: Bill Howard, WB3V—ACC: WA3YLO. ASM: NU3D, W3YVQ, KA3ZNQ. BM: WA3SCW. PIC: N3EKZ. SEC: WA1QAA. SGL: KW3X. STM: N3EFG. TC: WB4APR. DEC PG, Mont, DC: Hani Raad 202-223-3925. DEC at Large: Ross Merlin 301-983-2842. EC Allegheny County: David Penrod 301-759-6627. EC Anne Arundel County: Nancy Alley 410-761-7115. EC Baltimore County: Jim Schmidt 410-893-8302. EC Calvert County: Dwayne Kincaid 410-586-2177. EC Carroll County: Douglass Bumstead 410-239-2088. EC Cecil County: Bill Doss 410-287-5897. EC Charles County: Bill Rogers 410-287-5897. EC DC: Plater Campbell 202-544-7810. EC Frederick County: Rick Ogden 301-845-2670. EC Garrett County: Ken Kenner 301-334-9105. EC Howard County: Ed Wallace 410-465-0042. EC Kent County: James Bortner 410-778-0589. EC Montgomery County: Sterling Smith 301-340-3002. EC Washington County: Arthur Snowberger 301-733-7454. If you don't know your EC, give him/her a call! If your county isn't listed, call Mike Carr at 410-799-0403. Operating W1AW is always a thrill. NU3D, W3GOU, N3AHK, N3BTM, N3BWF and I visited HQ, had a wonderful tour and we spent the afternoon using the guest operator positions at W1AW. Montgomery Co EC reports that 24 ops assisted at the county fair, a hospital disaster net exercise was conducted and a weekly net is used for traffic handling tutorials. An ARES member roster is being produced, too. Allegany Co EC reports a successful search for 2 missing girls. They were found and taken to the hospital. W3DFW WB3AXV N8YIB K3OMN WA3SYE KB8JTQ participated. Great job! Welcome to new PIOs KA3ZZK and W9IQ, new ORS N3PDK, new ECs N3ISA and KA3BOT, and new OES NF3X. Thanks to those who responded regarding 2-meter traffic nets. 136 letters were sent to new hams. The classes and testing sessions pay off. 73, Bill. Nets *(NM/QND/QTC/QNI)*: MSN /KC3Y 31/55/374, PON /W3DFW 26/12/290, MDD /K3GHH 60/181/384. (MDD Top Brass KC3Y/151 W3YVQ/112 KK3F/98) MEPN /KK3F 30/133/549, MPTN / K2EB 31/147/703, Tfc: KK3F 806, K3NNI 312, WB3V 296, KJ3E 209, WA3UMY 180, K3GHH 170, KC3Y 151, W3YVQ 135, K3USO 108, N3LDY 85, W3UT 73, WB3LTA 70, K2EB 54, WI3A 50, N3EGF 42, N3PDK 38,WJ3K 33,KX3U 24, N3DE 20, WA1QAA 20, KA3ZCI 7, KD3JK 6, NU3N 5, W3SWD 4, KC3ME 3, W3ZNW 3, KE3FL 1. PSHR: W3YVQ 168, KC3Y 161, N3LDY 149, K3GHH 138, N3PDK 126, KK3F 118, K2EB 115, KD3JK 111, KJ3E 106, KA3ZCI 103, WJ3K 92, WB3LTA 88, WB3V 82.

SOUTHERN NEW JERSEY: SM, Bruce Eichmann, KE2OP (@ K2AA)—ASM: W2OB, KA2YKN, WB2LOO, KB2ADL. SEC: W2HOB STM: WB2UVB. ACC: K2IXE. TC: W2EKB. SGL: K2GA. BM: N2LCR. OOC: K2RCG. PIC: WA2ABF. TSs: K2JF, W2PAU, AB2Y, WB2MNF. Here it is, the start of a new year again. I'd like to wish you best wishes for a happy and prosperous new year. Things have been quiet in the SNJ Section over the past month. This column may be short this month. If you have any news that you would like me to add to this column, please drop me a line. Please keep in mind that I prepare this column 2 months before publication. I'd like to welcome the New Lisbon Developmental Center ARC to the ARRL family of affiliated clubs. It's holding a charter party Jan 7, 1994, at the Pemberton Country Inn. I look forward to attending that function with Jim Eckersley, K2IXE, SNJ Affil Club Coordinator. I am sorry to report the passing of Burrill Warnock, W2BV. Merrill was a true pioneer and good friend to Amateur Radio. His presence will be missed. Tfc: WB2UVB 220, W2HOB-4 36, N2FET 35, WA2CUW 22, W2AZ 18, KB2CDB 18, N2SXO 12, N2FHJ 12, N2MSM 12, KB2HJJ 8, KA2ANJ 8, K4FFM 8, KD3HN 8, KA2CQX 7, N2WFN 6, WA4JRP 6, N2SOE 4, N2EPH 4, N2AYK 2.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—A number of Simulated Emergency Test (SET) exercises were performed in WNY's 40 counties. ECs are encouraged to file SET and Annual Reports with Field Services Dept at Headquarters. ARES leadership met to outline plans for SKYWARN support with resiting of National Weather Service (NWS) regional centers. Voice repeater and packet-linking operations will support the increased coverage with the reduction in number of NWS offices. ECs need to get on board as plans develop. It was noted that a county NCS with packet linking is the preferred county solution for SKYWARN reporting to regional offices. WNY NWS centers will be at Binghamton, Buffalo, Albany and Burlington, VT. Several EPA counties will also report to Binghamton. Burlington, VT, NWS will receive SKYWARN reports from Clinton, Essex, Franklin and St Lawrence counties. Albany NWS will receive reports from Fulton, Hamilton, Herkimer, Montgomery, Northern Oneida and Schoharie counties. Binghamton (16) and Buffalo (15) will divvy up the remaining 31 counties. Potential remains for change in NWS plans. Club officers: Squaw Island AA2IZ, WB2JLR, N2RQO, K2BWK. SIARC notes that it's not on Staten Island! Field Day results (* = message received): 1A K2QR*119, KD2A, AA2KH, WA2IQJ, N2EBG, N2DM; 2AB W2LZ*6, W2FMM*22; 2A W2FR*3, W2TZ 10, W2CXM*33, W2SB*43, K2IQ*76, WF2L*, NR2B*, NN2H, W2RCX*, WA2NGX*. W2SAM*, N2PSL; 3AB W2SEX*1st of 12 nationally; 3A NX2I 12, WB2ELW, WW2J, N2TC*, WA2ZXS*, N2JOA, K2DN*, AA2IZ, WA2ISC, W2ZJ, N2DS; 4AC W2PE*1st nationally; 4A W2UXC 77, W2OFQ 93; 5A*N2CEH*31; 1B-2 AA2BA; 1D KE2XX, KB4CMF; 3E WA2AAZ. Messages received from KF2EZ, WI2G and WK2K, but not seen in *QST*. BPL (Oct) AA2CX, N2JAW, N2LTC. PSHR: K2BCL, AA2CX, KG2D, N2DLN, K2DN, KB2ETO, W2FR, WI2G, KA2GJV, N2GUN, WB2IJH, N2JAW, KA2JFU, N2JOA, KB2JRT, N8JSO, AF2K, KB2KOJ, N2LTC, KF2MH, W2MTA, WB2QIX, ND2S, N2SAA, N2SRE, N2SSS, N2TOY, NU2U, N2UIT, WA2UKX, N2ULY, NY2V, N2VDT, N2WKT, N2WPB, K2YAI, KA2ZNZ.

Net Name	Time	QNI	QSP	In	Net Name	Time	QNI	QSP	In
EBN FM	0530	358	000	21	Blueline	1900	471	081	31
NYSEMO	0900	125	008	05	NYS/E*CW	1900	440	220	31
NYSR CW	0930	025	005	05	Broome	1930	044	008	08
NYS/M*CW	1000	325	191	31	OCRAN FM	1930	033	009	09
CHN SB	1100	270	163	31	Style FM	1930	046	000	05
WDN/M*FM	1100	593	168	33	JCRACN	2000	499	048	31
NYP* SB	1300	333	428	31	TIGARD$	2000	029	005	05
NYPON*SB	1700	466	341	31	VHF THIN	2000	072	000	04
ESS CW	1800	430	111	31	BRVSN FM	2100	309	004	31
NYSPT&EN	1800	446	063	31	ORTN SB	2100	027	000	04
LCARES	1800	041	000	04	CNYTN*FM	2115	469	092	31
OCTEN/E*	1830	1259	144	31	OCTEN/L*	2130	386	070	31
Q Net FM	1830	535	000	31	WDN/L*FM	2130	683	281	33
STAR* FM	1830	490	040	31	NYS/L*CW	2200	304	203	31
WDN/E*FM	1830	703	336	31	*NTS Net.				

WINLink: N2JAW R = 361 S = 183. OARC Net (Sep) 69-01-04.Tfc: N2JAW 2020, AA2CX 574, N2LTC 532, KB2JRT 317, W2MTA 311, WB2IJH 310, K2BCL 235, W2FR 234, WI2G 233, AF2K 195, N2UIT 193, KA2GJV 191, ND2S 188, NY2V 178, N2ULY 174, K2YAI 167, KA2ZNZ 162, N2SAA 159, KG2D 83, WB2QIX 68, K2DN 64, N2VDT 64, N2WPB 63, WA2UKX 59, N2TOY 57, N2WKT 57, N8JSO 45, KF2MH 39, KB2ETO 34, N2SRE 34, N2GUN 31, N2JOA 29, KA2DBD 28, KA2SJG 25, N2DLN 22, NU2U 22, N2EVG 19, KB2KOJ 15, N2SSS 15, KA2ZKM 15, KA2JFU 9. Happy New Year!

WESTERN PENNSYLVANIA: SM, Bernie Fuller, N3EFN (@ WA3ZCA)—ASM: KA3OEM (@ WA3ZCA). ASM (East): NR3T (@ W3SYY). ASM (Pkt): KC3ET (@ KA3NVP). ASM (Youth): N3HPL. SEC: N3FQQ (@ W3SYY). STM: WN3F (@ KA3JSD). BM: KC3ET (@ KA3NVP). TC: K3LR (@ N8IZR). OOC: K3QMR (@ N8IZR). ACC: AK3J. Build something! Amazing as it may seem, there are still hams who

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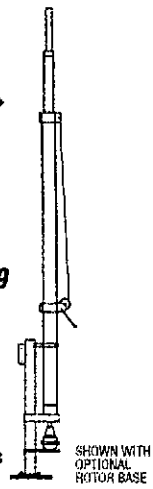

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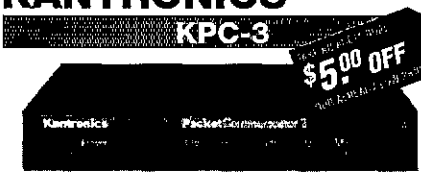

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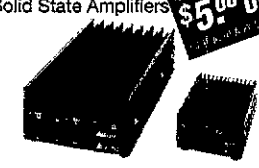

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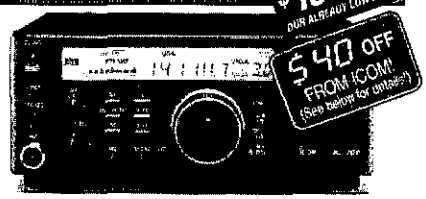

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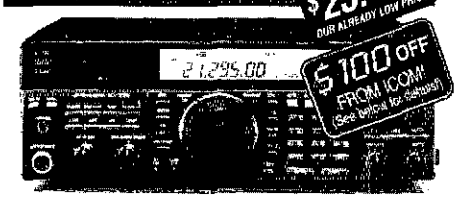

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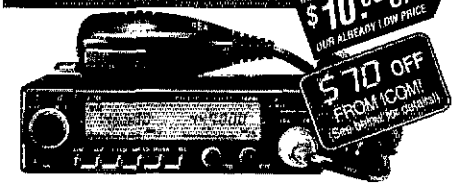

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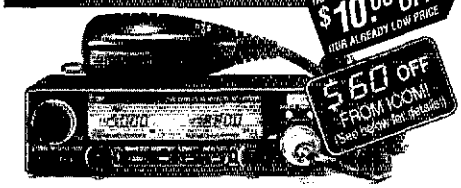

One of ICOM's "Remoteable Mobiles". The **IC-3230H** is great for mobile repeater operation. The 3230H has 45 W output power on 144 MHZ, and 35 W on 440 MHz. The 3230H can remotely "tell" you, by synthesized voice, which frequency it is tuned to (w/optional UT-55 & UT-66).

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Use these coupons instantly at the point of purchase just like cash, with no rebate and no fuss! See below for the unbelievable savings on select ICOM products.

~~Offer good until December 31, 1993.~~ **OFFER EXTENDED!** Call your H.R.O. store for details!

ICOM

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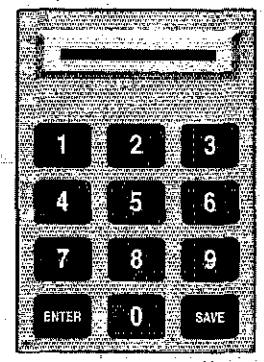
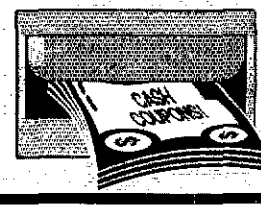
AVAILABLE AT ALL 11 H.R.O. LOCATIONS





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FREE SHIPMENT

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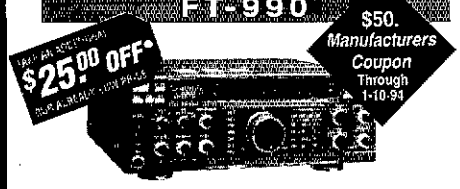
YAESU FT-990



100W HF Gen Cov Receiver
DDS, QSK • 500Hz CW Filter included
CALL FOR LOW PRICE

YAESU FT-890/FT-840

100w • Dual VFO's • QSK • DDS
IF notch filter, 12VDC
Optional built-in
auto antenna tuner

100W • 12V DC • DDS
Gen. Cov. Rx, 100 mem.
Optional Ext. Auto
Tuners Available

CALL FOR LOW PRICING!

YAESU FT-736R

The Ultimate Oscar Machine

$35. Manufacturers Coupon Through 1-10-94

VHF/UHF All Mode Transceiver
25W, Built-In Pwr Supply

YAESU FT-5100, FT-5200

2M/440 Mobile 2M/440 Mobile

Ultra compact 50W/35W
94 Memories • Non-remotable
Dual in-band receive
Built-In DTMF paging/Coded Sql.
CTCSS Encode built-in
Backlit DTMF mic included

Ultra Compact
50w/35w 2m/440
32 memories
Built-in duplexer
Backlit DTMF MIC included

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YAESU FT-1000

200W, DUAL RX,
GEN COV RX, QSK, TCXO
CALL FOR LOW PRICE

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2 Mtr. 2 Mtr.

2M 50W Mobile + Aircraft RX
50 Mem. CTCSS Encode +
Paging Built-In. MW-2 Optional
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50W 31 memories
2 meter mobile
Large alpha- numeric LED
Backlit DTMF mi
Mil-spec design

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FT-416
Black Shown
Gray Available

FT-416/FT-816
2 Mtr 440 Mhz
2W 2M/2W 440
5W optional
Direct DC input
Built-in VOX, 41 Mem.
DTMF paging, CTCSS built-in

FT-411
2M HT
Standard 2.5W; 49 Mem
2m/140 to 174 MHz
EXTENDED RECEIVE

YAESU DUAL-BAND HANDHELDS

FT-530
2M/440mHz
2W standard, 5W opt.
82 Mems, Dual In-band Rx
DTMF paging + coded Sql. stan.
Built-in VOX & CTCSS
Auto tone search
Built-in clock • Backlit keyboard

FT-470
2M/440mHz
10 Mems
DTMF autodialer

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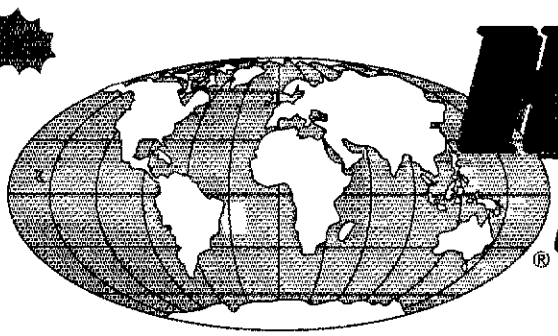

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TM-742A/TM-641A/TM-732A

2 M/440Mhz 2M/220Mhz Transceiver 2M/440Mhz

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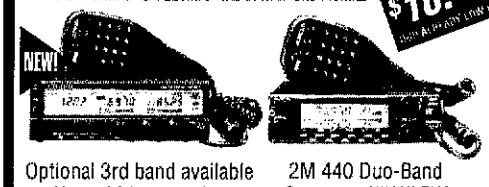

Optional 3rd band available
Up to 303 memories
101 per band
PL Encode Built in
Detachable front panel

2M 440 Duo-Band
Compact 45W/35W
Remotable Front Panel

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TS-450S

HF Transceiver

TAKE AN ADDITIONAL $50.00 OFF* OUR ALREADY LOW PRICE

12v 100W, Gen. Cov. Receiver
100 mems. • 108DB Dynamic Range
DDS • DSP Optional • Dual VFO
Optional Built-in Auto Antenna Tuner

KENWOOD
TS-850S

HF Transceiver

TAKE AN ADDITIONAL $25.00 OFF* OUR ALREADY LOW PRICE

Advanced Technology Performance
108 db Dynamic Range, Optional DSP
CALL FOR LOW PRICE

KENWOOD
TS-950SDX

RM-1 Included

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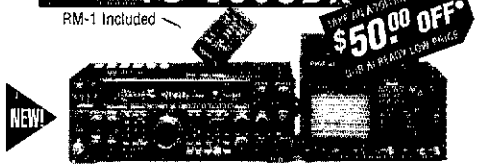

(Shown with optional SM-230 & SW-2100)
NEW 150W MOSFET Finals • Voice Keyer Optional
NEW DSP on RX + TX • **NEW** CW Memory Keyer
NEW CW Filter in Sub-Band Receiver
NEW RM-1 Included • **NEW** S Meter for Sub-Band
General Coverage RX • Built-In AC Supply

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World's smallest HF transceiver
100W out, SSB, CW, AM, FM, 12V
Gen. Cov. RX, 6.4 lbs., 7.16 x 2.4 x 9.32"
105 db dynamic range, 100 Mems.
Optional external ant. tuners available
CALL FOR SPECIAL LOW PRICE!

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TM-241/331A/441A/541A

2 Mtr 220Mhz 70cm 1200Mhz
Aircraft RX

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Compact FM Mobile Transceivers
LOW PRICES, CALL

KENWOOD
TH-78A

2M 440 w/Extended RX

TAKE AN ADDITIONAL $5.00 OFF* OUR ALREADY LOW PRICE

Dual Receive
Dual Display
Alpha-Numeric Display, Too!
NEW!
DTSS & Message Paging
250 Mem. w/optional memory unit
CALL FOR LOW PRICE

KENWOOD
HANDHELDS

TH-28A
2M/2.5W DTSS
240 Mem.
w/optional mem. unit
UHF RX

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TH-22AT
Ultra Compact
2M HT, 5W optional
40 memories
Encode Built-In

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STANDARD

C228A
2M & 220MHz

- World's Only HT with 2M & 220Mhz (C228A)

NEW!

- Super compact twin bander
- Dual Rx, Dual Display
- Built-in DTMF Paging
- 200 Mem chan. optional
- 5W optional

CALL FOR SPECIAL PRICE!

C558A
2M & 440MHz

- Compact, Full keyboard HT
- 2.5W STD, 5W optional
- 200 Mem chan. optional
- 7 types of scanning!
- 10 DTMF Memories

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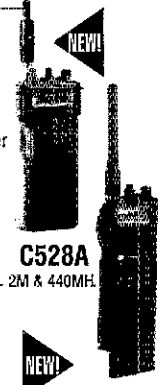

C528A
2M & 440MHz

C188A
2 Meters

CALL FOR SPECIALS ON C168A & C528A HT'S!

C5608DA

- 2M/440 Twin Band Mobile
- 40 Mem. channels
- Remote control mic w/LCD display
- Now w/CTCSS included

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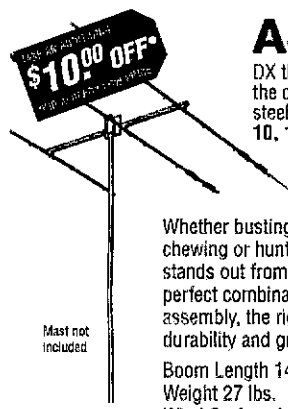


A3S

DX that stands out from the crowd. With stainless steel hardware
10, 15, 20 METERS

Mast not included

Whether busting pile-ups, rag chewing or hunting rare DX, the A3S 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.

REG. $445.00 ***SALE $329.95***

A3WS

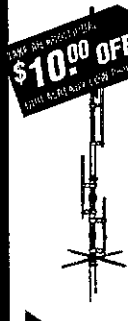
New 12 & 17 meters
DUO-BANDER

*Optional A103 30 Meter Add-on
REG. $140.00
SALE $109.95

Enjoy 12 & 17 meter bands with full performance beam. Easy-to-use kit adds 30 meters. Mount on lightweight tower/rotator or use with existing tribander. A3WS has all aluminum construction w/stainless hardware.

REG. $360.00 ***SALE $279.95***

Boom Length: 14 feet • Weight: 22 lbs.
Turning Radius: 14.4 ft. • Wind Area: 4.1 sq.ft.



R5

14, 18, 21,24,28 MHz Half Wave Vertical

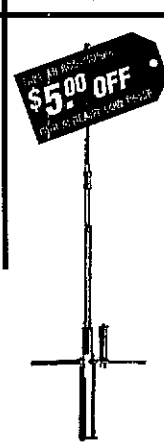
Broadband impedance matching network/ all 5 bands
Fully automatic frequency selection
Four 48" long counterpoise rods/ excellent isolation
No radials required

REG. $370.00 ***SALE $279.95***

NEW! **R7**

7,10,14,18, 21,24,28 MHz
7 Band Half Wave Vertical

Fully automatic frequency selection, complete with stainless counterpoise. No radials required. ***CALL, SALE!***



AR-270

New Dual Band Ringo

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. $83.00 ***SALE $69.95***

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ALINCO DR-1200T

(Packet Only)

NEW DR-1200TH 9600 Baud Ready! Call For Price!

NEW!

2M Packet Only Transceiver, 25W
REG. $399.
SPECIAL $279.95
(DR-1200T)

TAKE AN ADDITIONAL $10.00 OFF* OUR ALREADY LOW PRICE

ALINCO DR-570T / DR-592T

2M/440 2M/440

TAKE AN ADDITIONAL $10.00 OFF* OUR ALREADY LOW PRICE

NEW!

2M/440 TX
45W, 35W
Full Duplex Crossband
20 Mem. Channels
CTCSS Enc./Decode

2M/440 TX
45W, 35W
Detachable Front Panel
And Remote Control
User Friendly

Call For Special Low HRO Pricing!

ALINCO DR-119T

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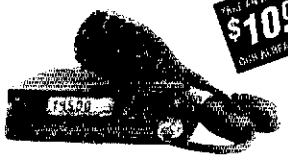

2M 45W Mobile
Backlit LCD, Wide Range RX

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ALINCO DJ-F1T/DJ-F1T-HP

TAKE AN ADDITIONAL $10.00 OFF* OUR ALREADY LOW PRICE

NEW!

2w 2 meter compact HT
8 scan modes • 40 memories
Now 5W Version Available, Too!

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$20. Factory Direct Rebate F1T-HP Through 1-15-94

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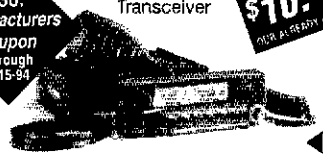

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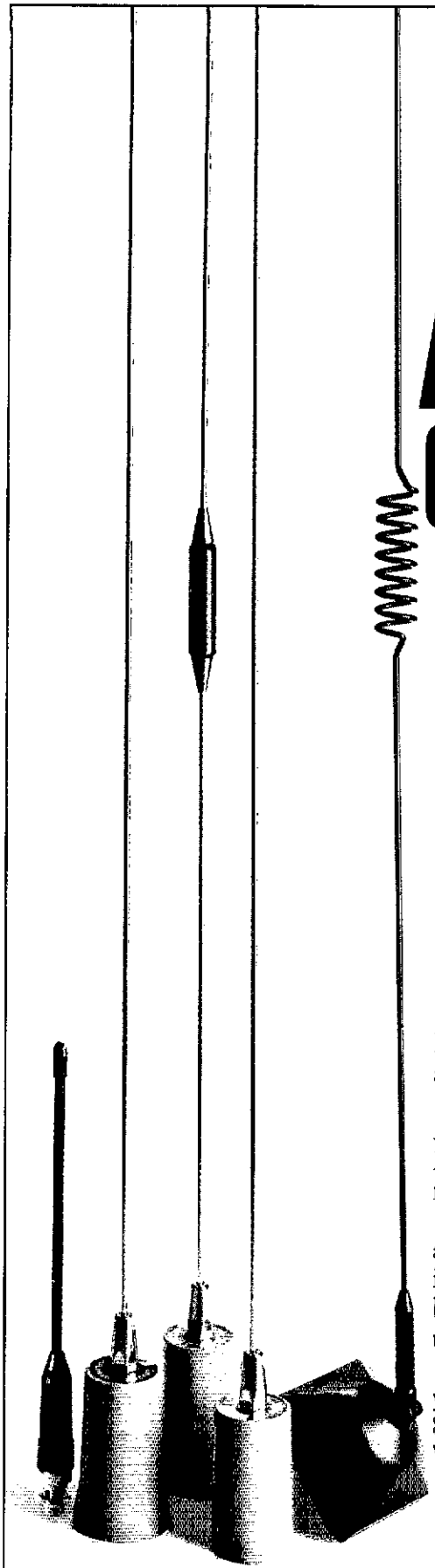

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know which end of the soldering iron is hot. Unfortunately, the number in this group is getting smaller with each passing year. Today's scenario goes something like this: The new rig arrives via the speedy parcel truck; it's opened, connected to the power supply and antenna, and is on the air in a matter of minutes...sometime later a malfunction crops up, and the unit is boxed and sent back to the factory for repair. We've become a fraternity of appliance operators. Granted, the equipment today is complex, tightly jammed into its case and delicate when approached by a 200-watt soldering gun. Nevertheless, it's still possible to homebrew "stuff" to enhance our operating ability, assist in efficient equipment operation and just plain make the shack look great. You might want to sponsor a home-brew night contest at your local RC. You'll be amazed at the expertise that will be displayed. Build something—make it a New Year's resolution. SET: I was especially delighted to read the results of the RA of Erie's SET participation: A full-blown airport disaster drill involving more than a dozen served agencies. Silent Key, W3SIK, RIP. Field Day '93: 32 stations/clubs in WPA participated and submitted reports—you're to be congratulated for actively enhancing your emergency capabilities (and knowing how to have *fun*). Election results: BCARA: pres N3MSE, vp K3LL, vp WA3BVQ, secy N3LEJ, treas N3GXQ, dir W3WXZ, NG3A. Quad Co ARC: pres K3MD, vp KA3W8X, secy KA3FHV, treas WA3BUX, dirs WA3DWR, N3HAO, KA3UVC, N3IES, KB3JE. WPA Hilltoppers: pres N3IXR, vp N3KEX, secy/treas KA3WZO. Hamfest: Monroeville Mar 20. WPA tfc report for Sep: W3OKN 232, KA3LTN 97, WA3UNX 96, KD3SF 59, WN3F 33, WA3QNT 25, KA3VRY 20, K3HWJ 11, KA3EGE 7. NETS: WPAPTN: QNI 425, QTC 58, SSN 30; WPACW: QNI 259, QTC 96, SSN 30; NWPA2MTN: QNI 788, QTC 36, SSN 28; WPA2MTN: QNI 282, QTC 16, SSN 30. Attn: club program chairmen: Requests for a Section Mgr visit in 1994 should be to N3EFN no later than Jan 10. 73, Happy New Year, Bernie Fuller, N3EFN, SM/WPA.

CENTRAL DIVISION

ILLINOIS: SM, Sharon Harlan, WB9SFT—SEC: W9QBH, STM: K9CNP. OOC: KD9UL. BM: K9EUI. SGL: K9IDQ. PIO: N9EWA. ACC: KI9G. TC: N9RF. DEC: WD9EBQ.

Net	*Freq*	*Time*
ISN	3905	1800 Dy
ILN	3665	1830 & 2200 Dy
ITN	3680	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

The new officers and board of directors for the Rockford ARA: pres N9LMF, vp N9MXQ, secy N9OTC, treas WA9FFL, dirs WB9TFX, KA9OYR, WB9VLK, N9KIR and KB9CDD. The new officers of the Blackhawk DXCC: pres W9KIA, vp WE0B, secy N9EYA, treas N9JRT, contest coord, KB9BIB, board members K9LJN and W4JR. Members of the Six-Meter Club of Chicago assisted at the centennial celebration in Brookfield; these 18 hams put in an amazing 309 hours assisting with communications for the 5-day event Aug 18-22. The SMC held its annual election of officers at the Oct meeting: pres K9ENZ, vp WA9FIH, secy WA9RIJ, treas WA9CJZ, recording secy KA9UMG, sgt at arms WA0NBD, delegates WA9CCQ, WB9IFM. Hamfesters RC of Chicago, to help celebrate its 60th anniversary, set up and operated Amateur Radio station W9AA during the 36th JOTA. 18 members of the club participated in the event. They set this up for Troop 596 of Oak Lawn, IL, in the Chicago Area Council. 3 positions were set up for the operation and it was done in a manner similar to an amateur Field Day operation. This was a 1st-time event for the club and word has it that it will become an annual event. Next year they hope it doesn't rain! The March of Dimes held its 2nd annual Glenview Walkathon Sun, Oct 3, and 4 members of the N Shore RC assisted with communications. 12 walkers participated in the 8-mi walk. The Oct 1993 W9VEY Memorial Net reports: check-ins 177; msgs passed 13. NCS WA9RUM assisted by N9MGP. Tfc: KA9IMX 297, W9HLX 236, K9CNP 231, NS9F 182, W9HOT 65, WB9TVD 38, K9WMP 29, WA9RUM 8, KA9EGW 2.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: K9ZBM. ASEC: WA9ZCE. STM: KJ9J. OOC: KA9RNY SGL: WA9VQO. PIC: KK9G. TC: KF9IQ. BM: WB9AHJ. Sympathy extended to the family and friends of Silent Key Oct 26 Schuyler Seavey, WB9VES, Angola. He will be greatly missed. Michiana ARC furnished communications on a rainy day for the Princess City Classic in the Edison Lake area. Helping W9EPT was NC with AA9AM, KD9QM, N9VBG, N9KAR, W9DGP, WS9O, WA9YMT, KB9IIU, K9FIV, N9SPQ, N9KBV, WB9SGC and N9MRZ. Ripley Co Repeater Assn ARC furnished communications for the Cropwalk. Helping with WA9LRG NC were KE9DJ, WA9JNC, KA9WRA, N9JUW, WB9OTX, KA9PTM, KA9IRF, KB9INY, KB9INX, N9PSG, KB9CIC, N9SFW, N9URJ, KA9QNW and KA9PTK. Tri State AHS was busy with communications for the Great Pumpkin Metric Bike Ride, which covered 57 mi with 900 riders and the American Diabetes Assn Walktoberfest, helping were KB9HOW, KB9GNI, N9RAE, N9RTB, KB9BPJ, N9FMO, N9IWC, W9CVN, N9DEO, N9GWS, N9OVB, WY9O, N9LDW, KB9GNL, N9DEQ, WA9BYZ, WD9FHA, N9RAH and WA9IVE. There are reportedly 855 ARES members in the state. DECs reporting: N9DTG, N9GSX, WB9VOK, KA9DZM and W9KGE, who also reported 24 active emergency nets conducting a total of 127 net sessions, drills or tests during the month. NMs: ITN/W9UMH, QIN/NR9K, ICN/AA9HN, WN/WA9OHX, VHF/KJ9J, PBBS/WJ9U.

Net	*Freq*	*Time Dy UTC*	*QNI*	*QTC*	*QTR*	*Sess*
ITN	3910	1330/2130/2300	2548	435	1693	93
QIN	3656	1430/0000	324	218	778	59
ICN	3705	2315	157	151	691	31
IWN	3910	1310	1993	-	310	31
IWN VHF Bloomington			575	-	465	31
IWN VHF Kokomo			688	-	155	31
IWN VHF Northeast			786	-	620	31

9RN QTC 339 in 62 sessions, represented 100% by K9PUI, NR9K, KJ9J, WA9QCF, WB9UYU, AA9HN, W9FC and N9HZ. Packet BBS reports: N5AAA 17,716 and WD9FVX 2973. Tfc: NR9K 384, K9PUI 144, W9UMH 140, W9FC

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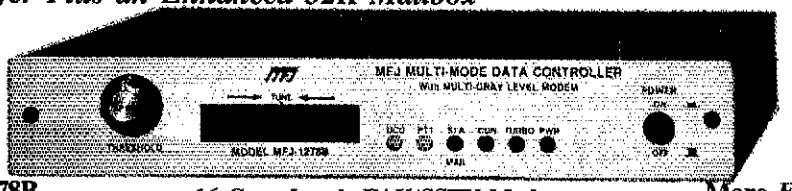
New enhanced MFJ-1278B



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- 64K bytes battery backup RAM
- European RTTY tones selectable
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- Selectable 19,200 baud terminal operation

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- Robot Color: 36, 72 Seconds
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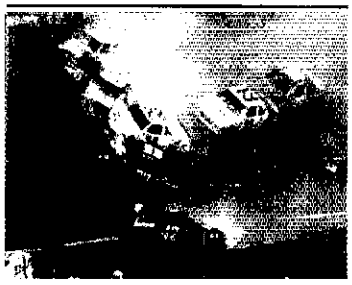
6 Gray Levels WeFax map received on 5.410 MHz. MFJ-1278B & MultiCom™ ransmit and receive 16 Gray Levels FAX.



16 Gray Levels AP Wire Photo FAX received on 20.738 MHz. See tomorrow's news today.

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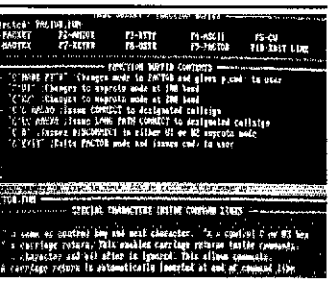
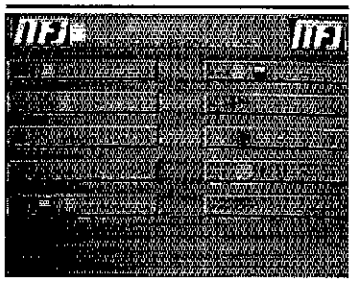
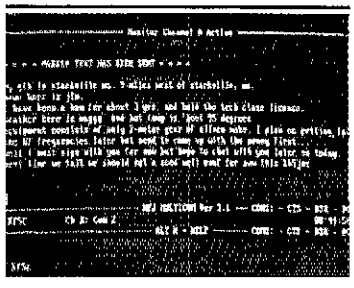


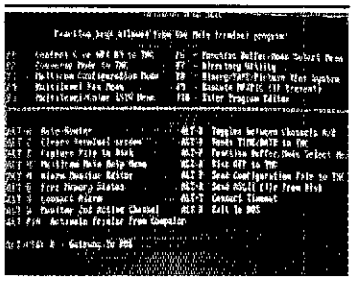
asy and simple . . . MultiCom™ perating menu--each mode gives you 10 rogrammable function buffers.



Dedicated MultiCom™ FAX menu. Getting on FAX and SSTV is as simple as pressing one or two keys.



MultiCom™ lets you carry on two digital QSO's *simultaneously* using two multi-modes or TNC's and two comm ports.



Need help? *Alt-H* brings up the on-line Help Menu that makes the MFJ-1278B very easy to use.

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129, W9EHY 87, AA9HN 76, K9GBR 54, W9JUJ 52, WA9OCF 47, KJ9J 45, WA9OHX 44, W9ZSK 24, WB9AHJ 24, N9PSG 16, WB9IHR 12, W9EPT 11, N9FOZ 11, WA6OIZ 11, K9OUP 10, AB9A 9, K9KAL 8, N9JAI 6, WD9CIV 6, W9EDE 5, W9XD 4, KA9QME 4, KB9WI 3, WB9NCE 3, W9KT 1.

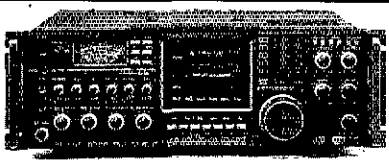
WISCONSIN: SM, Richard R. Regent, K9GDF—Happy New Year. On Jan 9, the W Allis RAC will hold its Midwinter Swapfest in the Waukesha County Expo Center Forum. W Allis RAC presented W9NAW with Ham of the Year plaque at its annual awards dinner and presented WA9POV with club life membership. Washington County EC N9LZW got a ham radio station installed in emergency government bldg. N9GHZ has created a thorough listing of Clark and Taylor County ham operators. WA9PWP needs WY, MT and ND QSL cards to complete his QRP WAS in less than a year. W/K Club has new officers: pres NK9G and treas/secy AE9K. Fox Cities ARC is busy; Jan 11 starts its 8-week Novice and Tech classes at Madison JHS; N9NVP is on club's QRP committee; and Jan 17 meeting program is Paper Chasing. Ozaukee director of emergency government is now N9VBJ. Sheboygan County ARC has qualified as an ARRL Special Service Club. Arrowhead ARC has 151 members. WB9YPY continues to achieve highest WI traffic points, even when gone for 10 days and hampered by 75-meter QRN the remainder of the month. Green Lake County area will soon have its own VE team, according to KB9WC. Exams: Jan 8 Madison and Oak Creek; Jan 9 Waukesha; Jan 15 Milwaukee; Jan 19 W Allis; Jan 22 Appleton; Jan 29 Wauwatosa and Tomahawk. Sorry to report Silent Key N9DBR (K9VGE's dad) of Milwaukee. Thought for the month: Error is often more earnest than truth. Tfc: WB9YPY 2510, W9IHW 929, W9CBE 420, K9DHR 241, W9AYK 213, W9UDX 157, N9BDL 114, W9YCV 104, K9KSA 102, KA9BHL 75, KE9VU 74, K9HDF 69, KA9FVX 64, K9AKG 61, AG9G 55, KA9KLZ 53, N9BCX 46, N9NGP 45, N9KHD 42, K9FHI 39, WB9ICH 37, WB9JSW 35, NS9Q 35, W9UCL 33, KB9ENO 31, KG9B 30, K9GU 28, K9UTQ 25, W9ODV 22, K9JPS 17, N9JIY 12, W9UW 4, W9PVD 4. (Sep) KE9VU 67, WB9ICH 33.

DAKOTA DIVISION

MINNESOTA: SM, Randy Wendel, NØFKU—This past year has been full of Amateur Radio events, not to mention the flood-related events that had a major impact on life and property. This past year I had the chance to meet ARRL HQ Field Services Dept Mgr Rick Palm, K1CE, and Deputy Mgr Luck Hurder, KY1T. We in the MN Section Field Org (FO) have been busy drumming up activities and awareness in the FO. We visited clubs and hamfests, getting to know one another. We waved goodbye to Howard Mark, WØOZC, who moved to Las Vegas, as we welcomed back Tod Olson, KØTO, as Dakota Div Director beginning his term Jan 1. We saw new digital modes PacTOR and Clover, make their growing debuts. We've seen growing activities in amateur satellite operations. Now where does that leave you? Perhaps in 1994, you'll play an active role in your Amateur Radio community. Maybe you'll take a leadership role in a club project. Let's put aside all thoughts that "someone else will do it!" Perhaps you'll take what you've learned and share it with a prospective new ham. Whatever the case, there's plenty of opportunity for you to dig in 1994. You've watched other people lead, now it's your turn. Your New Year's resolution should be: "I will be an active participant in 1994." Give something back to Amateur Radio. If you had an Elmer help you get your license, show your appreciation by giving him or her an ARRL Elmer Certificate (free from HQ). We can't forget our Volunteer Examiners! Our VEs put much time into organizing license exams, and the past few years have, without doubt, been a busy time for them. For our VEs, we salute you! We welcome the Boundry Waters ARC aboard as an ARRL club! My thanks to the efforts of the FO appointees who have helped make all FO activities work this past year. I hope 1993 was good to you as it was for me. Let's hope for a new year of peace in the world and as radio amateurs, promote social goodwill with our amateur friends across town or across the globe. Let's give more in '94. Happy New Year! Randy "Max" Wendel, NØFKU @ WAØCQG.MN. Tfc: WBØWNJ 2503, WAØTFC 333, WBØLES 178, KBØBXE 175, KAØARP 132, KFØFI 114, KAØPDM 93, WDØGUF 51, AAØLN 33, WBØDFF 24, NØTNK 20, WØKYG 15, AAØEV 12, KN9U 12, WBØRMK 12, KØERP 10, NØJP 8, KØWPK 6, KØOGI 5, WØNO 4.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—Our Section conducted our 1st SET in several years, with several ECs getting on HF and passing information. The ARES net is held every Thu at 7:15 PM. All hams interested in emergency communications are invited to take part. The Dakota Division held a Leadership Conference for the Section Emergency & Traffic Leadership. We expect that improvements to the emergency and traffic system in our Division will result. I attended the FORX Hamfest, with more than 170 attending. It was considered a success: flea market was the best they've had. In Dickinson, WDØEMY invited a bunch of Boy Scouts to take part in the Jamboree On The Air (JOTA). The Scouts were thrilled to hear that their station was being heard in Zimbabwe, but they were unable to make direct contact with them. If your club isn't an ARRL affiliated club, contact WDØDAI & he'll help you work out the details. HF nets *(sess/ON/QTC NM):* Goose River 5/67/1 KEØXT; DATA 26/644/22 NØIJR. VHF nets: North 40 5/40/0 NØELA; MON-DAK 4/7/0 NØSIZ.

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—A weather net has been started on the Garden City super repeater (146.07/.67) that meets M-F at 7 PM local time. It requires a CTCSS subaudible tone of 203.5 Hz. Anyone in the repeater's coverage area is asked to check in. 2 people from MN, KØLAV and WGØG, and 1 from ND, WDØDAJ, have been appointed by interim Director Whiting to the Spectrum Mgmt Committee. No one was appointed from SD, however, several names were submitted. WØCQN is still working on a packet path to Terry Peak. The Black Hills autopatch repeater has been moved to Skyline Dr in Rapid City. It's on 147.24/.84. It has emergency power, and tests show hand-held transceiver coverage throughout the Rapid City area. Black Hills ARC will hold its fundraiser auction Sat, Feb 19, 1994. Work is underway to link across the state with controllers to be installed at Turkey Ridge.



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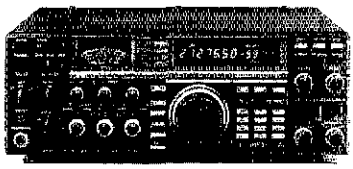

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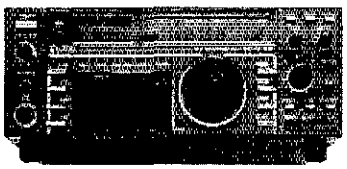

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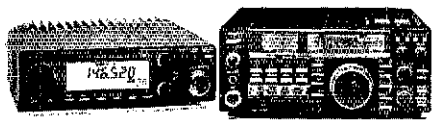

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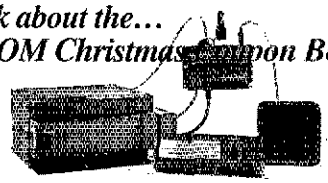

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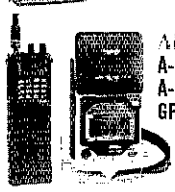

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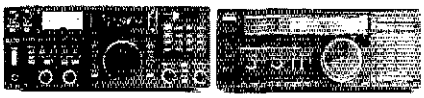

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Wessington Springs, Humboldt, Medicine Butte and Garden City this winter; then Murdo and Phillip or Kadoka. Cost to link the Far West estimated to be $3650. Donations may be sent to Don Schwemle, AAØF; Brian Kelly, NØLCL; or John Miedema, NØMYE. A new repeater at Aberdeen, input on 448.40, output on 443.40. Total tfc for Oct: 362.

DELTA DIVISION

ARKANSAS: SM, Bob Ideker, WB5VUH—ASMs: AF5M, N5KKD, N5DSY, AA5MC, KF5TK, AB5HS. SEC: W5RZ. ACC: NI5D. BM: AA5LT. PIC: K5SGG. SGL: KD5IB. STM: W5QFU. TC: KB8DM. *Together Everyone Achieves More*, or *TEAM*, will be our Section goal for 1994. The Friendship Award (*QST* Nov '93) is an excellent way of making new friends and get you in the spirit for other awards available through the ARRL. You can send me an SASE for the application or photocopy the one in *QST*. The Clinton ARC had a good hamfest in Oct. It was nice visiting with everyone, and I hope you'll start making plans for '94 hamfests and swapfests. A calendar of events is discussed on our Section net (15th of each month on 3.987.5) with other events happening in our Section. Thanks to all who mailed back opinion survey sheets from the Section newsletter. Results will be announced soon at club meetings and through other communications. A club presidents' meeting will be conducted again this year and each club is invited to send a representative. Meetings will be conducted during '94 by the Section leadership, involving Section appointees. '93 was a good year in our Section and I hope you'll help make '94 even better through your participation at club meetings and special events that are scheduled. Your club president has been furnished a special form to mail to me if you want your club events mentioned in this column in '94. I look forward to your input. Tfc: WØQIZ 145, W5QFU 110, WSIGM 104, N5KKD 81, N5EL 38, WA5QMQ 22, KI5FY 21, K7ZQR 14, WB5GWU 11, KI5FY 10, KO5E 6, WD9FDX 3.

LOUISIANA: SM, Lionel A."Al" Oubre, K5DPG—ASM: KB5CX. ACC: KA5IJU. STM: WB4FDT. BM: K5ARH. TC: KE5FZ. SEC: KA5YDJ. SGL: KD5SL. OOC: WB9VTN. NM LTN: KG5GE. To borrow a phrase from Howard, K5BLV, let me wish all "health, happiness and cheer" for the New Year. Thanks to all who contributed to the advancement of our hobby in 1993. It's the individual efforts that make for the success of the whole. The LTN continues to grow in participation, but there are still areas that aren't represented. A reminder to all affiliated and ARRL Special Service Clubs to complete and send your 1994 Annual Report Forms. If your club didn't receive the forms or they can't be located, contact the ACC or HQ for replacement forms. Upcoming hamfests: Hammond Jan 15 and Lafayette Mar 11-13. Congrats to Rudy, WA5QNH, on being appointed LA AFMARS Director. LA Section Net Schedule:

LTN 6:30 PM Local 3910 kHz Nightly KG5GE NM
LEN 7:30 PM Local 3915 kHz Mon KI5TI NM

Net reports for Oct 1993: LTN QNI 461 QTC 136 in 31 sessions. LEN QNI 67 in 4 sessions. DRN5 for Oct 1993: 741 messages in 62 sessions, LA represented 100% by K5WOD, KG5GE, KI5TI, N5YZM, WB4FDT, KD5UY, KG5ZZ, and K5DPG. PSHR: K5DPG 176, KI5TI 139, KG5GE 123, KI5TI 121, K5WOD 111, KD5UY 111, KA5YDJ 94, TFC: KG5GE 287, KD5UY 84, K5DPG 159, WB4FDT 92, K5WOD 31 KI5TI 18, KA5YDJ 10.

MISSISSIPPI: SM, Richard L. Redd, KA5WRX—The ARRL International Humanitarian Award is given annually to outstanding Amateur Radio operators in areas of international humanitarianism and the furtherance of peace. Any licensed amateur who, by use of his skill of Amateur Radio, has provided extraordinary service to the benefit of others in time of crisis or disaster is qualified to receive the award. Nominations must be received by Dec 31. If you have someone you wish to nominate, please get in touch with me for information. 97 members of the US House of Representatives and 15 US Senators have become cosponsors of the Amateur Radio Service Joint Resolution (S. J. Res 90 and H. J. Res 199). None of our MS representatives in the Congress or the Senate are listed as cosponsors. Please write your senators and representative and encourage them to become cosponsors. The MS Coast ARC continues to hold classes in basic electronics to assist people to become hams. A new basic class will be started soon. This is the way to keep the interest in Amateur Radio at a high level. The Jackson County ARC is moving its 145.11-MHz machine to a 650-ft tower in Jackson County. This will greatly expand the coverage of this repeater.

TENNESSEE: SM, O. D. Keaton, WA4GLS—On Oct 28, KA4MNH, EC for Gibson Co, coordinated an 80-mi tour involving 19 buses, 2 cars and his mobile home carrying the emergency communication equipment; this tour involved about 225 people. Now that the '93 hamfests are over, the report was that all had increased attendance and looking forward to 1994. BARC recognizes the following for their extra efforts in making the Gray Hamfest successful: KC4FXO, KB4EX, WA4RAV, KD4JYR, KB4ZVA, KC4CLW, WD4EKA, KC4GMC, KC4WIY, N4PQM, Carla, Mary and John. The following UCARS members spent 55 hours of competition at David Crockett and Science Hill High Schools: AC4RV, KE4ABV, KD4EDL, AC4LS, KD4YWW, KB4NVD & K4SE. 93-94 officers were elected: pres KB4NVD, vp KD4YWW, secy/treas KE4ABV. The 1st meeting of the newly organized WTARS was concerned with offering VE examinations. W2GLJ, VP of WCARS/VEC, presented the program; as a result of his presentation, the club voted to work with WCARS in its VEC program. WTARS received thanks from Ron Collins of TEMA for the club's participation in the Sep 10-11 simulated earthquake drill; Mr Collins stated that Amateur Radio would be his mainstay in a real emergency. Present at the Oct meeting of the TCARC: KB4CJS, WA4HZP, N4PIK, W4RMJ, W9FZW, N4ZPD, KB4VAL, NA4T, W4COY, KD4KPV, K4ACM & W4FLW. RACK members have been busy handling communications for the Century Bike Tour, MS 150 Bike Tour, Wears Valley 15 k Race and the Lenoir City Fall Spectacular—congratulations! Congratulations to DARC for its persistence in training at all levels of amateur licenses. Thanks to the following JCARS members for helping with the Gray Hamfest: W4NHT, KA4USJ, KO4DT, KD4KPT, AC4QF, N4OFA, K4DME, KA8CCB, N4AMR, KA2NMH, KD4JYT,

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KD4QLK, WX4S, KE4BFE, KC4OVG, N5YDC, NN4O, & KD4YVE. UCARS has new logo and name for its newsletter, the *UCARS Connection*; thanks to all members who assisted in making communications a total success for the Apple Festival, the number of participants is too lengthy to publish. NARC ARES group again performed well in the American Heart Assn Walkathon and the Middle TN Multiple Sclerosis Society 150-mi bicycle marathon. DRN-5 rpt 741 msgs, 62 sess, TN represented 95% by K4WWQ, WI3B & N4RES. *Net Sess/QNI/QTC :* TMPN 31/2053/59 TCWN 19/201/3 TEMPN 21/659/23 TEPN 29/2484/58.Tfc: WA4FMR 131, WI3B 72, WA4HKU 68, K4WWQ 52, WA4GZZ 17, WB4DYJ 16, WA4GLS 15, KI4V 12, WD4EKA 10, W4PSN 2, K4UMW 2.

GREAT LAKES DIVISION

KENTUCKY: SM, Steve Morgan, WB4NHO @ KK4XE—SEC: Bill Uschan, KC4MIS @ K4KJQ. ASM: Tom Lykins, WD4RWU. ACC: Bob Hardin, N4PNG. STM: John Farler, K4AVX @ KC4PHR. SGL: Ron Landrum, KM4DX. ASM: Rusty Smith, KD4GLC. As mentioned last month, KY had its 1st statewide SET exercise in a few years this past month. Had good participation throughout the state. I appreciate the Frankfort club in helping man the EOC in Frankfort. My thanks to KC4VE in helping man the MARS station at the EOC. A lot of areas were highlighted that we need practice in. 4ARES had a wide-area drill that proved successful and had good cooperation with DES. Muhlenberg ARC had a good turnout for its SET. ARES net was called into action with a derailing of a freight train carrying hazardous chemicals in the Louisville area. There was good cooperation with DES/ARES. KY clubs were represented in 1A-4A in Field Day with great respect. As with the SET, it's a great training tool for ARES. I appreciate several new ECs coming online. As we start a new year, let's improve our communications skills for the coming year.

Section Net	*Frequency*	*Time/UTC*	*QNI*	*QTC*	*Sess*	*NM*
KRN	3.980 MHz	1230Z	770	24	31	N4AFP
MKPN	3.960 MHz	1930Z	1683	109	31	WD4RWU
KTN	3.980 MHz	0000Z	1523	129	31	WD4RWU
KYN-E.L	3.690 MHz	0100Z	289	83	31	K4AVX/KZ8Q
KSN	3.690 MHz	0000Z	112	25	26	KD4GLC
4ARES			481	69	32	KN4TP

Tfc: K4VHF 97, WD4RWU 90, KD4NYC 74, K4AVX 58, N4PEK 55, WB4NHO 50, WB4AUN 28, WA4HLW 23, KC4ZSV 23, KB4UJA 20, N4GD 14, WB4ZDU 14.

MICHIGAN: SM, Dale R. Williams, WA8EFK—ASMs: Skip Wallace, WD8KQC; Larry Camp, WB8R; and Keith Allen, N8QNA. STM: Jeff Breitner, KA8NCR. SEC: Dick Mondro, WA4FQT. SGL: Dave Wise, N8CNY. TC: Dave Smith, W8YZ. BM: Dale Konyha, N8IWS. ACC: Mike Pearsall, KA8YNJ. OOC: Joe Haefner, WD8PSX. PIC: Greg Ozimek, WB8FNQ. VHF NM: Mike Karmol, N8KUF. Resolutions, goals and objectives are always the talk around this time of year, and the Section News column this month is no different. It's time for us to look at the accomplishments of the past few months and see if we made the best use of our resources. This includes time, people, frequencies, equipment; all the things upon which we draw during the process of working with the ARRL Field Organization. The question is, "Did we make the best use of these resources or did we get stuck with a paradigm and do it the 'old way' without regard for the examination of a new method or technique?" I find myself in this mode and later wonder why I didn't consider an alternate. True, not all of the new ideas work, and most of the tried/tested methods of the past (that didn't work) still won't work. Still, a new refreshing look at the way we do our jobs may be just the thing to help our new and budding amateurs off to a great start in the hobby, or perhaps examining and revising policies in the local organization to improve methods and communications (verbal) may just be the ticket. Special congratulations to the members of the Genesee County RC as they celebrate their 60th anniversary.

Net	*Freq*	*Time/Day*	*QNI*	*Tfc*	*Sess*	*NM*
QMN*	3663	6 PM Dy	781	208	93	WB8SYA
MITN	3953	7 PM Dy	475	215	33	WD8EIB
UPN*	3921	6 PM Dy	1332	70	37	WA8DHB
GLETN	3932	9 PM Dy	1037	58	30	WD8BSE
MACS*	3953	11 AM M-Sat	398	63	31	K8OCP
SEMTN	145.33	1015 PM Dy	445	257	35	WI8K
WSSN	3935	7 PM Dy	791	42	31	K8GOU
VHF	-	-	1096	26	63	N8KUF
WSSN (Sep)	-	-	770	49	30	K8GOU

*QMN Early-6 PM Dy; QMN Late-10 PM Dy; MACS 1 PM Sun. UPN 12 PM Sun.

Tfc: N8FPN 397, WD8NIK 349, KA8CPS 176, WB8SYA 173, KA9EIZ 158, W7LVB 119, N8HSC 99, K3UWO 80, K8GXV 78, W8YIQ 72, WI8K 58, W8EOI 49, WA8DHB 45, WA8EFK 45, N8CNY 38, NY8W 35, K8UPE 34, AA8EQ 33, K8ZJU 31, K8OCP 23, WD8EIB 20, AA8JN 14, W8RNQ 11, W8BEZ 8, N8KUF 6, WT8J 6, N8OSC 5, WB8BGY 5.

OHIO: SM, David Kersten, N8AUH @ NO8M (see p 8)—ASM: John Haungs, WA8STX @ KC8TW, 513-563-7373. ASM (packet): Steve Wolf, NO8M @ NO8M. SEC: Larry Solak, WD8MPV @ WB8BII, 216-274-8240. STM: Joyce Judy, KD8HB @ W8CQK. ACC: JoAnne Solak, KJ3O/8 @ WB8BII. BM: Doug Horner, W8PH @ N8ACV. TC: John Fakan, KB8MU. SGL: Bill Butler, N8CVK. PIC: Joe Phillips, K8OOE. OOC: Paul LaFollette Jr, WB8ONA. The Greater Cincinnati ARA inducted Herman Turner, KW8X, into the GCARA Hall of Fame for 1993, and Glenn Kirby Jr, N8PDA, was recipient of a $1000 scholarship to Univ of Cincinnati College of Applied Science. New GCARA officers for 1994: pres John Dine, WA8DFD, 1st vp Herm Turner, KW8X, 2nd vp James Weaver, K8JE, rec secy Carol Hugentober, K8DHK, corr secy Carl Barth, W8MFT, treas John Haungs, WA8STX. Dave Beltz, WD8AYE, and Chuck Henley, N8LIV, were reelected as trustees for 3 yrs for Canton ARC. Mike Mettler, WB8MZZ, in Toledo, has served OSSBN 21 yrs as NCS—that's real devotion. Congratulations to all. With club elections coming up, make sure that JoAnne, KJ3O, is aware of the new officers and their addresses. Cincinnati Red Cross, Queen City Emergency Net, W8VND, celebrated the dedication of the new remote-site trailer Oct 15. New FCC Part 97.113 relaxes public service use of Amateur Radio. Get an *FCC Rule Book* for the details. Scott Foschke, N8OND, has agreed to be the school edu-

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cation chairperson for N Coast ARC, filling the position vacated by Ray Maskow, WD8MHL. Good luck, Scott. Cincinnati Syrian Shrine Temple ARC beat the winter snow and got its tower & beam up at the Cinti Shrine Burns Hospital. Don't forget the ARRL Great Lakes Division Convention at Cincinnati Garden Expo Center Feb 26-27.

Net	QNI	QTC	QTR	Sess	Freq	NM
BN (E)	211	158	430	31	3.577	WD8KFN
BN (L)	266	102	444	31	3.577	NY8V
OSN	183	76	726	31	3.708	W8NO
OSSN	1886	747	3879	96	3.9725	WB8MZZ
OSSN	272	69	870	31	3.577	WB8FSV
BNR	173	58	-	31	3.605	W8EK
OH Section ARES Net Sun 1700					3.875	WD8MPV
Totals	2991	1208	5349	251		

Tfc (Oct): N8POV 771, KD8HB 311, W8BO 288, WD8KFN 240, WA8HED 213, KF8DO 204, N2NS 180, N8XCT 165, KA8HBN 147, N8IIP 145, N8RBE 134, WB8FAI 128, W8QZK 127, W8LDU 124, WA8SSI 121, N8WCT 117, W8EK 102, K8JDI 101, W8NO 99, KB8HJJ 83, K8DHD 81, WD8IKC 79, WB8FSV 77, N8TPW 77, K8OUA 75, N8EFB 73, WB8YTQ 73, KB8DJE 71, N8LSG 71, W8PBX 69, N8FWA 61, N8RRB 55, K8IOW 53, W8RRB 47, N8OKI 45, N8TNV 43, WB5ZJN 42, AA8DK 42, N8MJY 41, KB8DUX 40, N8HJB 39, KG8AH 37, N8GOB 37, KE8CV 36, K8WOQ 31, N8UAN 26, W8ZOL 24, W8RG 23, KD9KCW 22, W8LDO 21, WD8KBW 21, NS8C 21, WA8STX 20, W8KB 19, WD8JYE 19, N8VRR 19, W8JLW 18, KA8SON 17, W8GDQ 17, KE8NB 16, N8JRV 14, KB8GJV 12, N8AJU 12, WB8KQJ 12, WB8KWC 12, K8ES 10, NW8E 9, K8NZZ 6, N8CJS 6, N8WRG 5, KD8XL 4, KA8OQF 1, WB8NHV 1.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul Vydareny, WB2VUK—STM: WE2G. SEC: WB2BEJ. ACC: KV2A. SGL: KB2HQ. BM: WB2IXR. OOC: N2DVQ. PIC: WA3RKB. ATC: WA2VGM. ASM/Public Info: N2FTR. ASM/Education: WK6R. ASM/Interclub Relations: WB2NHC. Net reports (Oct) *QNI/QSP*: AESN 47/0, CDN 620/51, CESN 43/1, ESS 430/111, HVN 520/81, NYP 333/428, NYPON 466/341, NYSE 440/220, NYSL 304/203, NYSM 325/191, SDN 485/82. Club news: Dr Harold Story described radio astronomy at the Nov Albany ARA meeting. It also reports W2ZPO a Silent Key. Crystal RC held a vote to name its newsletter, and heard from 60-year club member W2IRA on history of ham radio in Rockland Cty. KA2AXN, at the Rensselaer County RACES meeting, discussed the 911 system being installed in the county. Saratoga RACES operated a special-event station Nov 13 in honor of the 40th anniversary of RACES in the county. K2VV shared some secrets on successful DXing at the Schenectady ARA Nov 1 meeting. KF2LW & N2PEN discussed slow-scan TV at the Troy ARA Oct 19 meeting. W2WQK detailed the mysteries of the VCR at Westchester ARA meeting Nov 4. Westchester ECA ran a construction project during its Nov 8 meeting: Building a J-pole antenna. Yonkers ARC welcomes new members N2s UWU JMW UZB WAN, W2NEE and KA2VBE. Columbia County EC KE2WO reported Columbia County ARES activated for evacuation simulation for SET. N2FTR reported that Mt Beacon ARC was activated by NYS police to assist with bridge patrol for Halloween. A number of clubs in the Albany area and elsewhere did likewise. AARA and SARA provided communications for the Schenectady-to-Albany Marathon. Oct PSHR: KB2EPU WA2YBM WB2VUK WE2G N2JBA WB2IIV NM2M. Oct tfc: WB2VUK 185, KB2EPU 164, K2LYE 94, N2JBA 71, WE2G 65, N2UGZ 56, WB2IIV 46, WA2YBM 45, N2JNG 41, N2VAA 32, NM2M 31, W2CJO 15, N2LCD 14, KB2NBN 14, K2HNW 13, N2CJN 12, N2AWI 8, WF2M 7, N2FTR 6, KE2WO 5, WA2IWW 1.

NEW YORK CITY/LONG ISLAND: SM: Rick Ramhap, N2GQR (CIS 75570,2557, Internet rick.ramhap@som.flinet.org)—ASM/Emerg Svcs: WF2T, ASM/Technical: WB2WAK. ACC: N2IMF. SEC: KA2RGI. STM: KA2VZX. OOC: NB2T. PIC: KA2JMA. TC: W2QUV. BM: KC2FD. LGL: N2FF. VE sess: Grumman ARC (W5YI) 2nd Tue 5 PM, Grumman Rec Ctr, Plant 28, 950 S Oyster Bay Rd, Hicksville, Bob Wexelbaum, W2ILP, 516-499-2214; LIMARC, 2nd Sat 9 AM, NY Inst of Tech, 300 Bldg, Rm 308-310, Northern Blvd, Old Westbury, Al Bender, W2QZ, 516-623-6449; Suffolk Co VE Team, 2nd Sat 9 AM, Suffolk Co Comm College, Islip Arts Bldg, Rm 104, Selden, George Sintchak, WA2VNV, 516-751-0265; Ebonaire ARC, 3rd Sun 11 AM, Rec Ctr, Roy Wilkens Park, 2nd Fl, Merrick Blvd & 119th Ave, St Albans, Gwen (Vikki) Neal, KA2VKW, 718-981-8876; Great South Bay ARC, 4th Sun, 12 noon, Babylon Town Hall, ARES/RACES Rm, 200 E Sunrise Hwy, N Lindenhurst, Tom Tiniski, KA2CIW, 516-888-5576 or Walter Wenzel, 516-957-5726; Staten Is ARA, 4th Sun 12 noon, College of SI, Sunnyside Campus, Rm B144, 715 Ocean Terr, Staten Is, Richard Dyrack, 718-351-5764; Suffolk Co VHF/UHF Assn, 4th Sat 10 AM, H. Acampora Rec Ctr, 39 Montauk Hwy, Blue Point, Leonard Buonauito, KE2LE, 516-581-4595. Report changes to testing schedules to N2GQR. The following are traffic nets in and around the Section:

Net	Freq	Time	Day	NM
Big Apple VHF	BAVHF	146.43/R	2000 Dy	KB2KLH
Empire Slow-Speed	ESS	3.590	1600 Dy	W2WSS
Nassau Co VHF	NCVHF	147.33/R	1930 M-F	KA2VZX
Nassau Co VHF	NCVHF	146.805/R	1930 Sat-Sun	KA2VZX
NYS Phone & Emerg	NYP	3.925	1300 Dy	N2LTC
NYS Phone, Tfc & Emerg	NYSPTEN	3.925	1800 Dy	WB2IIV
NYS Public Ops	NYPON	3.913	1700 Dy	K2LYE
NYS CW/Morning	NYS/M	3.677	1000 Dy	KA2GJV
NYS CW/Early	NYS/E	3.677	1900 Dy	WI2G
NYS CW/Late	NYS/L	3.677	2200 Dy	W2YGW
Suffolk Co VHF	SCVHF	145.21/R	2000 Dy	KA2JMA
Southern District	SDN	147.06/R	2130 Dy	KB2EPU

Happy New Year! Special thanks to the Radio Central ARC for its sponsorship of the 1993 Section Convention last Nov. Pres Neil Heft, KC2KY, and Hamexpo Chairman John Mark, KB2QQ, and their various committees coordinated the event in fine fashion. Thanks to members of the Suffolk Police ARC for their assistance. Look for another Section Convention sometime in 1995. Special thanks to ARRL HQ Field Services Mgr Rick Palm, K1CE, and Hudson Div Director Steve Mendelsohn, WA2DHF, for their participation in the event. Recent club presentations: ACC N2IMF at

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Rockaway ARC; SM N2GQR at QCWA...thanks for your hospitality. Oct traffic: KA2VZX 291, KB2KLH 191, N2PIF 173, WB2ZIE 158, KB2GEK 107, N2AKZ 97 (Sep '93 116), KF2ER 82, KA2JMA 70. PSHR: KA2VZX, KB2KLH, WB2ZIE, N2PIF, KF2ER, KB2GEK, KA2JMA, N2AKZ (Sep/Oct). NTS stats for Oct (net, sessions, QTC): NCVHF, 31, 207/198; SCVHF, 31, 48/48; BAVHF, 31, 176/115.

NORTHERN NEW JERSEY: SM Richard S. Moseson, NW2L (@WA2JVM)—Ham Radio Into Line 201-680-1585. Happy New Year to all. May it be healthy and prosperous for each of us and our families. For the past few months, this column has been offering a "guided tour" of the ARRL volunteer Field Organization in NNJ. This month, the tour continues. But first, I'd like to provide special recognition to one of our long-time Field Organization volunteers who is stepping down due to ill health. Charlie Gspann, W2ZEE, has been District Emergency Coordinator (DEC) for Monmouth County for as long as I can remember. He has guided ARES there through storms of nature and politics—and done both equally well. Today, ARES/RACES cooperation in Monmouth County is a model for the rest of the state, due to Charlie's efforts. When the "storm of the century" lashed into Monmouth County just over a year ago, Charlie's ARES organization was on the front line. Charlie—all of us salute you & thank you, and we'll miss you as part of our NNJ leadership team. Returning to our tour, we begin the 1st of 2 installments on technical and legal help provided by our local Field Organization volunteers. If you send a technical question to ARRL HQ, it'll probably be referred to someone close to home—our Section Technical Coordinator (TC) and volunteer Technical Specialists (TSs). TSs are people with specialized knowledge in a particular area, such as antennas, packet, circuit design, etc, or those with a broader, more general, base of technical knowledge. They've all expressed willingness to share their expertise with their fellow hams. If you have a technical question, contact our TC, Chris Peckham, WG2W, and he'll refer you to a TS who may be able to help. Now, if you have a technical *problem*, but don't know it, you might hear from another one of our League volunteers, an Official Observer (OO). OOs issue friendly notices to people whose signals appear to have run afoul of FCC technical or operating standards. They are *not* the "ham police." The idea is for a fellow ham to alert you to a problem and give you the chance to fix it before the FCC tells you about it. OOs are part of the FCC's Amateur Auxiliary and may, with special training, help gather evidence against persistent rules violators to support FCC enforcement actions. OOs are appointed by and report to the Section OO Coordinator (OOC), who in NNJ, is Ron Loneker Sr, KA2BZS. To be an OO, you must be a League Member and have held a Technician or higher-class license for at least 4 years. If you're interested, contact KA2BZS. If you have technical knowledge to share, contact TC WG2W. Next month: Government Liaisons, Volunteer Counsel & Volunteer Consulting Engineers. Oct traffic de WB2FTX: A busy month on the nets (sess = sessions NM = Net Manager, QNI = check-ins, QTC = messages passed):

Net	*NM*	*Freq*	*Time*	*Sess*	*QNI*	*QTC*
NJM	W2RRX	3.695	1000	31	189	90
NJPN	W2CC	3.950	1800	36	454	151
NJSN	AA2HJ	3.715	1830	28	139	39
NJN/E	N2GJ	3.695	1900	31	271	88
NJN/L	WA2PCS	3.695	2200	31	146	41
OBTTN	W2OD	147.12	2000	31	713	109
NJTTTN	N2DXP	223.88	2100	31	307	50
NJVN/E	WB2FTX	146.895	1930	31	508	117
NJVN/L	W2PTZ	146.49	2230	31	176	35

Oct ltc *(call sign, message pts, PSHR pts)*: W2QNL/433/135, KE2JX/190/143, N2XJ/164/134, W2RRX/133/161, W2MTO/126/111, K2VX/119/128, K2PBP/85/154, WB2FTX/77/132, W2DMM/74/133, N2DXP/69/173, WA2PCS/68/111, N2OWN/65/197, N2GJ/53/105, W2OD/48/86, W2PTZ/40/138, N2UHD/33/56, N2OPJ/26/120, KB2GXR/24/45 W2CC/20/82 N2QQK/20/68 N2SU/15/86 WB2CZW/8/41. 73 de NW2L.

MIDWEST DIVISION

IOWA: SM, Jack Duncan, KØCNM @ KØCNM—ASM: NØJL @ KEØBX. SEC: KAØLZU @ KØCNM. STM: WØCON @ KØCNM. ACC: WØFZO @ NFØN. BM: KØIIR @ WAØRJT. SGL: WRØG. PIC: WØZPM. Scoland ARA held its flea market Oct 24, in Hinton and attendance was reported above average. They'd like to thank everyone who came and helped support it. Many clubs held elections for new officers, including Eastern IA DX Assn pres Tom WB8ZRL, vp Tom WØWP, secy/treas Gary KØGT; Denison Rptr Assn pres Gene NØDQS, vp Arnie WAØGUD, secy Dave KFØZG and treas Donna KBØOD; Ft Madison ARC pres Tom NØMDX, vp Art AAØBL, secy/treas Preston NØSMJ; Scoland ARA pres Glenn KØTFT, vp Roland WBØSFZ, secy Dianne KAØNBI and treas Harv KAØKUA; O'Brien Co ARA pres Lloyd WØCON, vp Dean NØTFS and secy Gary NØUYJ. Congratulations to you all. I am sorry to announce that Harry Glawe, WØJOL, of Dana, became a Silent Key in Oct. A new ham just received his call sign: Carl, NØYMO, at Chillicothe. The 8th annual TRISAP (Tri State Amateur Packet) Symposium is Feb 5 at the Marina Inn in S Sioux City, NE, 9 AM-4 PM, with free admission. Coffee and rolls are free, too. Program is how to use TPK and 7PLUS. Traffic: WØSS 169, KØCNM 77, WAØKLD 76, KAØADF 73, NRØE 62, NØJL 49, WBØAVW 31, AKØN 30 and KEØWU 8.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: KØBIX. STM: WØOYH. ACC/OOC: KØBXF. SGL: NØIZE. NMs: WØOE, QKS-SS; WØNBT, KSBN & KPN; WBØYWZ, KMWN & KWN; WBØZNY, QKS; NØ5E, CSTN; WØQBK, KSRAT. DECs: WBØOQS, KBØFAX, NZØM, WAØCVR, WGØQ, KAØRID, WBØMDF. Youth Coordinator: Cathy Gilliland, KBØFDU, of Hiawatha—write her! Sep nets: KSBN QNI/QTC 1208/97. KPN 268/2. KMWN 690/597. KWN 1046/637. CSTN 2073/58. QKS 227/76. QKS-SS 5/2. KSRAT is inactive for the time being. Our deepest sympathy to the family of Virginia, KAØQNO, who recently became another KS Silent Key. Best wishes to KFØWT on a speedy recovery after his stint in the hospital. Fred, NØNQN, is reported on the mend. Old club, new name: Golden Belt ARC, Great Bend. KAØE was the KS Amateur of the Year; award presented at ARRL State Convention in Wichita. Several other

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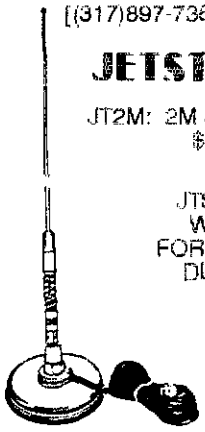
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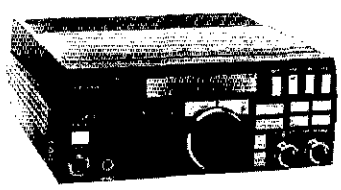
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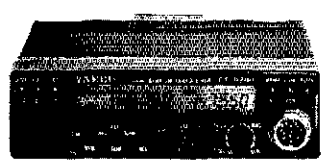
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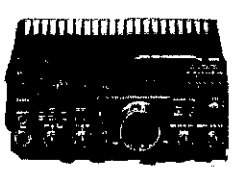
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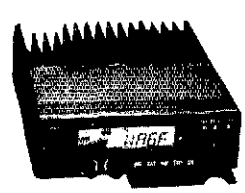
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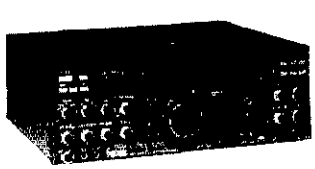
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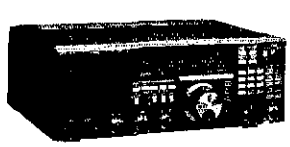
FRG-8800


FT-212RH

awards were presented to other amateurs for their past activities. Foxhunting appears to be catching on again. Have you constructed your secret weapon (antenna) yet? Congratulations to all those assisting your local clubs in public service awareness activities. Parades, walkathons, bike-a-thons, traffic booths at the malls, etc, all show the communities that there are people out there who are capable of providing emergency communications, should the need be. As the military says: "Proud...Professional... Ready." Tfc: KØBXF 300, WØOYH 261, NZØM 212, WØNBT 178, WBØZNY 69, KFØTK 36, KEØDK 30, WAØSXR 27, WØØBK 23, WØFT 21, NBØZ 13, WAØOZP 9, WTØE 7, NØLL 2.

MISSOURI: SM, Roger Volk, KØGOB—History was made in the Section on Oct 21 when the 1st SAREX contact was made to the Bloomfield Elementary School. 3rd grade teacher Sheila Perry, NØUOP, licensed less than 1 year, applied for and received a grant from the Christa McAuliffe Foundation to equip her classroom with equipment, antennas and the necessary control equipment. With technical assistance from the AMSAT expert Roy, WØSL, the 77 3rd grade students contacted the shuttle on the 1st try. In the 8 minutes of contact, 14 students were able to ask questions of astronaut Bill McArthur, KC5ACR. As if that wasn't exciting enough, parents, TV, radio and state officials were able to watch the proceedings on closed-circuit TV in the adjoining room. Eyewitnesses said that when the contact was completed, the kids let out a long series of shrieks for joy. After the pass, the students were moved to the cafeteria where they received T-shirts, patches and other mementos of the event. Thanks to Mike Koenig, NØPFF, for videotaping the event for future viewing by clubs and other interested groups. Because of restricted travel ability, the ACC, WDØGMR, has asked to be relieved of his position. The new ACC is Bill Higgins, NØNOE. You can reach Bill at 3942 Blue Heather Ct, St Louis, MO 63034. I want to thank Jack for his service and his personal friendship these past few years. Have a happy holiday season with family and friends, and a safe and prosperous 1994. Nets: MOSSB 31/735/75 KFØHW; MON1 71/121/70 WØOUD; MEOW 31/577/72 KEØAH; HAMBUTCHER 21/485/31 KØDSQ; ROLLABB 30/347/11 NAØV; CMEN 4/101/0 WBØTEG; PREVERE 5/573/0 WBØEJJ; TRULAKARES 4/102/0 WAØLHZ; MIDMOYL 4/41/1 NØMNV; QCWA35 4/53/0 WØWHK; STLRPTR 4/181/3 KØWEX; CARL 3/42/0 KCØMV; SWMOSKYWAR 4/131/0 KEØPQ; KCABARC 4/171/4 NØIWA; SEDALIARPT 4/95/0 WØENW; MON2 31/91/50 WØOUD; AUDRAINARC 5/61/2 WBØSEN; MMARC 4/54/0 NØTDG; WJACOARES 5/37/0 KØUAA. Tfc: WBØPLY 155, KEØAH 45, WØOUD 41, KFØHW 37, KYØU 12.

NEBRASKA: SM, Vern Wirka, WBØGQM—Many affiliated clubs install their new officers in Jan. Congratulations to the hardworking volunteers who dedicate their time and energy to make their clubs a success. The Hot Springs, SD, ARC and the Pine Ridge ARC of Chadron, NE, have an ARRL Field Day rivalry. The trophy will be turned over to the Hot Springs ARC from the Pine Ridge ARC because the Hot Springs ARC scored higher during Field Day 1993. A special packet system that provides weather info is operational in the Norfolk area. The Kantronics KTU weather equipment supplies info about precipitation amounts, temperature, wind speed and wind direction. For details about the system and how to use the features, contact Lyle Johnson, KØHKE, in Norfolk. The Ak-Sar-Ben ARC is selling T-shirts to promote the ARRL Midwest Division 1994 Supervention in Omaha Oct 14-16, 1994. The T-shirts feature the Supervention logo and are available in various sizes. Contact Todd LeMense, KGØEJ, in Omaha, at 402-397-7465, to order your Supervention T-shirt. Tfc: KEØXQ 61, WDØEWH 9, WCØO 6.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—ASMs: W1EFW, W1WCG. KB1H, KZ1Z. BM: N1API. ACC: NK1J. OOC: W1FAI. PIC: W1FXQ. SEC: NI1U. SGL: K1AH. STM: W1EFW. TC: W1HAD. A happy and healthy New Year to you! Together we've accomplished a great deal during this past year. There are many more volunteers working in the field. Many newcomers have been attracted to ARES and NTS; many have been motivated to upgrade their skills and participate in new ways in the public service structure! All of you on ARES and NTS nets deserve a lot of credit for working together and helping out the new op and encouraging one another to participate in different facets of service. For example, several new operators are joining the HF Section nets, which opens the door for further involvement at the region level. Such growth is healthy and needed. We've taken the task of improving the relationship between ARES and NTS seriously. The increased membership among NTS ops in ARES and the gratifying experience during SET of ARES members participating in NTS nets attests to the commitment of this Section to work together toward a unified effort in emergency communications. I'm proud of this progress, you're all to be congratulated. Special thanks to the NMs, ECs, DECs and members of my cabinet who have encouraged this progress. Randy, K1WWI, is organizing the search-and-report program within the ARES structure to train communicators assisting with search efforts in appropriate procedures involving search activities. Those interested are reminded to contact Randy. Greg, N1AEH, has agreed to serve as NM of CN, our Section CW NTS net. A great big thank you to Anne Marie, KA1JAN, who served in this capacity for about 3 years, for having done a super job with the net. Anne Marie resigned to give herself more time for her new business venture. Your SM and K1EIR, K1UWO, WA1RTB, KA1WVM, WV1D and K1HEJ, had the pleasure of witnessing the wedding of Anne Marie, KA1JAN, and John, N1IWT. Larry, K1HEJ, was best man and John, KA1WVM, was the official photographer for the occasion. Hearty congrats to you both and the best of luck—just save some time for on-air activities! Let's have a great '94—keep up the good work and thanks for your continuing support! *Net Sass/QNI/QTC:* CN 62/211/115; CPN 31/332/105; WCN 31/512/79; NVTN 31/635/57; RTN 31/359/48. Tfc: W1WCG 2475, NM1K 1308, KA1VEC 361, W1EFW 302, KA1GWE 116, KY1F 64, KD1JT 49, KA1WIF 27, N1LGE 20, N1HFX 18, W1YOL 16, KA1WVM 14, N1BOW 12, W1GPS 9.

EASTERN MASSACHUSETTS: SM: Dave Crocker, W1TMO (@K1UGM)—ACC: Elaine Chase, N1GTB

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Kenwood salutes each member of the Haymore family as winners of the "Ultimate Kenwood Family" portion of "The 1993 Kenwood Triple Challenge" contest. Franklin R. Haymore's tight knit family of sons, daughters, in-laws, grandchildren, nieces, and nephews have discovered Kenwood as a great way to keep the family together - even when they can't be together.

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(@K1UGM). BM: Bill Ledder, KA1NOI. OO/AA: Dave Potter, K1MBO (@WA1PHY). PIC: open. SEC: Terry Stader, KA8SCP (@WA1PHY). SGL: Shawn O'Donnell, K3HI. STM: Jim Hatherly, WA1TBY (@K1UGM). STC: Jim Morris, K1UGM (@K1UGM). EMA Section Hotlines: Voice 617-455-6225, 800-310-ARRL; Modem 617-376-2174, fax 617-444-8316, Internet dcrocker@world.std.com. Reminiscences (follow-up): The Channel 5 *Chronicle* broadcast Nov 11 was dedicated to activities on the home front during WWII. A segment of the show featured an interview with Lindsay Russell (ex-W1PCJ) and Brad Tiffany (ex-K1KBD) talking about their participation in the War Emergency Radio Service (WERS). Amateurs received further mention on the show, with the cover of Oct '43 *QST* filling the screen for a few seconds. In those days, the words "Amateur Radio" were large on the cover and filled the TV screen. A meeting of the American Red Cross MA State Disaster Council Communications Committee was held at MEMA in Framingham Oct 19. Chairing the meeting were Bob Salow, WA1IDA, asst dir of the ARRL NE Div; and Liberty Black, chair of the MA Red Cross Disaster Council. The Red Cross has undergone a major restructuring in MA to better coordinate disaster response across the state. With this restructuring comes the need to reexamine Red Cross communications plans and the role played by amateurs during disasters. Workshops have been established by meeting attendees on communications access, communications integration and mgmt communications. The Red Cross will continue to rely heavily on hams for disaster and backup communications and for advice and assistance on all its communications needs. If you live in EMA or WMA and would like to assist in these activities and in helping to meet our public service obligations, contact Bob Salow, WA1IDA, PO Box 3773, Natick, MA 01730-0030, or Terry Stader, KA8SCP, 8 Christopher Rd, Westford MA 01886-3228. Coordinationand cooperation: As the amateur service grows and more new hams join our ranks, the pressure on our precious spectrum resources will continue to increase. The days of being able to find an unused repeater pair for the asking are behind us—coordination and cooperation become paramount. The New England Spectrum Mgmt Council is the recognized coordinating agency for this area. With increasing band usage, its role is becoming increasingly important. It's going to have to look at reframing frequency assignments, to giving stronger consideration to power levels and geographic coverage, and to the use of CTCSS (PL) in minimizing interaction among repeaters. Repeater trustees are eligible for membership in NESMC and should plan to take an active role. Through this kind of voluntary cooperation we can maximize communications opportunities for everyone.

MAINE: SM, Michelle E. Mann, WM1C–ASMs: WA1YNZ, KA1TKS. STM: KA1ODT. BM: W1JTH. TC: KF1H. SEC: KA1LPW. OOC: W3EZ. SGL: WA1N. ACC: NX1A. Regret to report SK W1FNI. As of this writing, we still need a PIC; someone with good writing and communications skills who has the time to devote to promoting ham radio to the public and assisting the PIOs in ME. Let me know if you're interested. Congratulations to Dick, N1MDZ, a teacher at Orono Middle School, who was recently honored with nationwide recognition as an outstanding science teacher—great news! Please note a change of last name for your SM—WM1C and W1KX married in late Nov! New England Division cabinet meeting is rapidly approaching as you read this (Jan 15), so now's a good time to pass on any ideas or thoughts about ARRL policies. Aroostook ARA had another good showing at its annual Harvest Supper with 56 members and guests attending. Pine State ARC has done a makeover of its newsletter and it's looking great—K1GUP and his assistants are doing a fine job with writing and editing. Does your club need a speaker for a meeting? Give me a call, I may have a cabinet member who'd like to speak. I'd like to visit your club myself. I'm always looking for news for this column, so don't hesitate to send me anything you think others would like to hear about. Oct tfc: NR1W 278, WM1C 143, NX1A 127, KA1ODT 117, W1CE 100, KC1DI 100, W9KLS 93, N1NFK 77, K1UNQ 70, W1KX 64, N1HYF 50, NR1F 48, W1JTH 46, AF1L 45, WA1YNZ 38, WA1WPR 33, W1VEH 17.

NEW HAMPSHIRE: SM, Al Shuman, N1FIK (@WA1WOK)—ASM: W1NH. STM: KB4N. SGL: W1HSB. BM: KH6GR. SEC: N3CLZ. OOC: KB4N. Hope everyone had a great holiday season. Excited to announce that I'll be sponsoring an SM's Field Day Award in '94. This award will recognize overall improvement of an individual club against itself, in relation to other affiliated clubs in the Section. I've shown my Field Day '93 video to 4 clubs to great reviews. Contact me if you're interested. Congrats to Port City ARC new officers: pres Dan, WI1L; vp Nick, KC1MZ; secy Dave, W1YFZ; and treas John, KC1MJ. On a sad note, Ike, WA1WKH, became an SK in Oct. An accomplished musician playing with the great black bands of the '40s & '50s, Ike will be missed. NH did well in the Oct '93 SET. While at NHOEM, I saw firsthand the commitment of ARES. Thanks to N3CLZ and all who participated, including John, KA1FYB, who climbed the repeater hill to prove he "could" replace a downed antenna. If you're planning a VE session or classes let Chick, KC1OX, know so he can add the info to the KY1N Memorial list. Round of applause for KC1OX who diligently keeps the list. N1PPP and WB1GXM have started a satellite user's net on Mt Ascutney 146.76 MHz on the 3rd Thu each month. Remember: Drive safely! 73, Al.

RHODE ISLAND: SM, Rick Fairweather, K1KYI—New officers of Blackstone Valley ARC: pres AA1CE, vp K1FLD, secy N1LYA, treas WB1P, act mgr N1JFY. The Newport County RC's 147.36 repeater has 100-Hz CTCSS tone access to reduce cochannel interference. W1CG reports new repeater doing well, thanks to their committee of KA1HDY, N1NFB, KA1TPS & KC1SD. Viking ARS and NCRC combine efforts for a successful flea market & VE session recently. OSARG's Chow-n-Do meetings have featured dipole antenna assembly projects, according to N1BED. The club hopes to have its HF antenna in place on the building soon. OSARG provided comms for the annual RI Marathon in Providence in Nov, according to NZ1K, coordinator. BM KA1BNO organized Ham Radio Awareness Day, consisting of an HF, 2/222 dualband packet and RTTY setup at the Warwick Mall in Sep. Fidelity ARC provided tour guides and comms for the annual Steam-up at the New England Wireless & Steam Museum in E Green-

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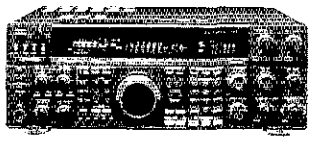

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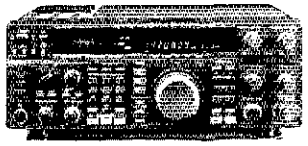

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SO-2 TCXO unit
SP-31 External speaker
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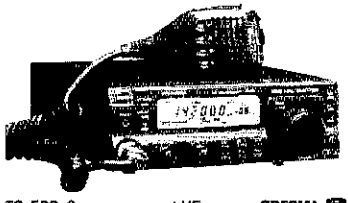
SO-2 TCXO unit
SP-23 External speaker
TU-8 CTCSS tone unit
YG-455C-1 500 Hz CW filter (2nd IF)
YG-455CN-1 250 Hz CW filter (2nd IF)
YK-88C-1 500 Hz CW filter (1st IF)
YK-88CN-1 270 Hz CW filter (1st IF)
YK-88S-1 2.4 KHz SSB filter (1st IF)
YK-88SN-1 1.8 KHz SSB filter (1st IF)



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DSP-100 Digital signal proc. 450/850
HS-5 Deluxe headphones
HS-6 Lightweight headphones
IF-232C Level translator
LF-30A 1kw PEP low pass filter
MA-5 5-band HF mobile antenna
VP-1 HD spring, bpr mt for MA-5
MC-60A Ampl. desk mic w/up-down
MC-80 Electret desk mic w/up-down
MC-85 Multi-funct. electret desk mic
MC-90 2-head DSP desk microphone
PC-1A 8-pin phone patch
SP-41 Compact external speaker
SP-50B External mobile speaker
SW-2100 1.8-30MHz SWR/pwr meter
VS-1 Voice synthesizer; 5000/751A
VS-2 Voice synthesizer; 950/850/450

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DCK-2 DC cable kit w/cig plug
IC-10 IC kit for computer control
MB-430 Mobile mounting bracket
SP-23 External speaker
VC-20 108-174 MHz VHF converter
YK-88A-1 AM filter
YK-88C 500 Hz CW filter
YK-88CN 270 Hz CW filter
YK-88S 2.4 KHz SSB filter
YK-88SN 1.8 KHz SSB filter
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YG-455C 500 Hz CW filter
YG-455CN 250 Hz CW filter **SPECIAL**

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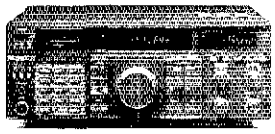

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UT-10 10w 1.2 GHz module
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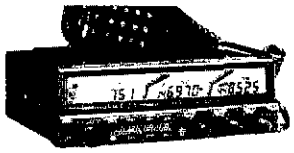
TM-641A 50w 2m/25w 220 FM xcvr/TTP
DTU-2 Digital paging unit
PG-4K 13' remote cable kit
PG-4L 23' remote cable kit
TSU-7 CTCSS decoder unit

UT-28S 50w 10 meter unit
UT-50S 50w 6 meter unit
UT-220S 25w 220 MHz unit
UT-1200 10w 1.2 GHz unit



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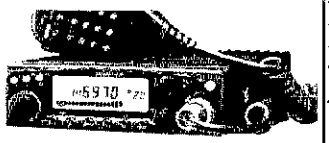

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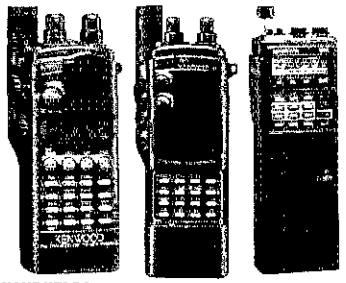

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wich recently. Its home-brew competition judging was Dec 2, with W1MB & W1EOF as judges, and it's working on a newsletter for its members. OSTN has temporarily moved to the 147.36 Newport repeater, according to STM WA1CSO. RI's traffic handlers had 100% representation on 1RN again in Oct. Tfc: WA1KKP 819, KA1JXH 84, WA1CSO 14, K1KYI 12. PSHR: WA1KKP 151, KA1JXH 129, WA1CSO 89.

VERMONT: SM, Mitch Stern, WB2JSJ (@ KD2AJ) (802-879-6589)—STM: KT1Q (@ WA2UMX). SEC: N1LDT (@ W1KOO). SGL: WB1AJG (@ N1BRT). PIC: N1DMP (@ KD2AJ). EA: N1EYD. Have a suggestion to make on ARRL policy? Tell me or Director Bill Burden, WB1BRE, before the Jan 15 New England cabinet meeting where we formulate input for the winter ARRL Board meeting. Hams from the Central VT ARC showcased Amateur Radio at the VT Girl Scout We Change the World convention Nov 6-7 in Bolton. The Schools Operating Amateur Radio runs a monthly with 5 schools checking in on 146.76 Mt Ascutney repeater; contact WB1GXM for details. VT's small, but dedicated traffic corps, has been keeping the messages moving. Monthly traffic totals averaged over the past 12 months: WA2SPL 611, KT1Q 562, N1DHT 223, KA1YLN 5. The Brass Pounders League (BPL) certificate was earned 9 times each by 'SPL and KT1Q, while the Public Service Honor Role (PSHR) was attained by 'SPL, KT1Q and 'DHT—excellent job, gentlemen! The VHF Sweepstakes Jan 22-24 is a fun way to explore the VHF spectrum without the help of repeaters. Look for activity on 52.525, 146.55, 146.57, 223.5 and 446.0 MHz. Encourage Novice and Tech amateurs to participate in the ARRL Novice Roundup, starting Jan 29.

WESTERN MASSACHUSETTS: SM, William Voedisch, W1UD @ K1UGM—STM: KA1EXJ @ K1MEA. EC: K1VSG. PIC/ACC: K1BE. DECs: W1SJV, N1IPG. TS/OO: WT1W. I want to thank Dennis, K1VSG, and his able crew for keeping WMA on the cutting edge of emergency preparedness. Most of you don't realize the number of extra hours he's spent organizing meetings and corresponding with FEMA and other emergency services. The WMA Emergency Net meets Sun at 0830 local on 3937 kHz—check in! It's a short net, but indicates the readiness of each county in an emergency. Traffic nets on HF phone and CW are in good shape, but we could use more participants. Claude Booska, N1KPV, donated a computer to Post 73. Now the Scouts will be able to get on a new mode of operation, packet. Thanks, Claude, the kids appreciate it. Congrats to W1KK for the article in *Zero Beat* on the all-band kW tuner for less than $50. Tfc: W1UD 579, KA1EXJ 264, W1SJV 126, W1KK 86, KA4FRH 13, W1ZPB 2.

NORTHWESTERN DIVISION

ALASKA: SM, Merle L. Beller, AL7LD—SEC: vacant. STM: AL7LX. DECs: NL7XG, KL7JBV. ECs: NL7LQ, NL7DL. TC: AL7CE. ACC: AL7NK. BM/OBS: NL7NC. OBS: KL7AF. ORS: KL7LA. OOC: AL7BB. OOs: KL7IKX, KL7EB. Happy 1994 to all. The New Year brings changes and vacancies to the AK ARRL organization. Regretfully, Gene, KL7GID, has tendered his resignation as SEC. He did a great job over the past 2 years, bringing spirit and activity to the position. He was one to do things, not just fill the position in name only. Thanks, Gene, you done good! This position of SM is open—filled temporarily, pending ARRL action. In the Anchorage area, repeaters are being relocated or revised operationally. The 146.94/.34 has added CTCSS 141.3 Hz subtone for access. At this time (Nov 3), it appears that the ARES 147.30/.90 machine will be of diminished service because of PA problems, running at about ½ power, which will probably not be corrected until the snow disappears in Apr/May 1994.

Net	Freq	Time	QNI	QTC	Sess	NM
ABN	7 087	0500	1098	20	31	AL7LX
APN	14 292	1730	850	32	20	KL7IPJ
MG	3.933	0600	2158	108	31	KL7GID
SN	3.920	0300	1258	90	31	KL7GG

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—STM: W7GB. SEC: WA5ZAY. BM: W7EQU. ACC: WV7Y. OOC: WB7AUK. PIC: N7DWD. SGL: KD7AC. TC: N7IRM. ASM: KC7FJ. On Oct 16, the Spokane ARES conducted its SET. The scenario was created by NE DEC Pat, NQ7M, and was implemented by Spokane Co EC Gordon, WA7LNC, with a number of hams participating at area fire stations who handled 100 pieces of formal written traffic. No other SET exercises were reported in the Section. Art Gemmrig, WB7AUK, of Spokane, is the new Official Observer Coord (OOC). TC Bernard, N7IRM, reported solving 2 RFI problems and a request for technical assistance. STM Don, W7GB, reported the Central WA ARC will be activating a 440 repeater in the near future. Harvey, KA7EKL, is a new TCC station, and is active doing RN7-to-PAN liaison. I'd like more Section news. Send it to me on the FSD-210 postcard or on packet. 73, KA7CSP. Tfc: W7GB 328, K7GXZ 238, KA7EKL 119, KK7T 56, W7LBK 52, W6UVP 1. PSHR: W7GB 138, K7GXZ 108, W7LBK 94, W6UVP 71, N7IRM 30.

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. STM: W7GHT. SEC: KI7EP. I'm pleased to report that we have a new SEC in ID, Roy Davis, KI7EP, has agreed to take the job. Roy's address is Box 540 in Athol and the ZIP is 83801. Roy is active in ARES and RACES, and will try to establish a good emergency system for ID. I hope everyone will give Roy a lot of support and help. The hamfest in Nampa on the 30th was a real success, and there were a lot of hams who showed up. Thanks to the vendors who supported the hamfest. The SW ID DX Club has a DX *PacketCluster* in the Boise area linked to the NW *'Cluster* and covers most of OR and WA. The frequency is 145.53 and more info can be had by contacting AA7TF or me. Tfc: W7GHT 187, N7MPS 73. PSHR: W7GHT 124, 73, Don.

Net	Sess	QNI	QTC	NM
FARM	31	2278	51	N7OGR
NWTN	31	1657	76	AA7OX
IDACD	21	623	21	K7UBC
IMN	30	289	134	KB7GZU

MONTANA: SM, Darrell Thomas, N7KOR—Word has been received that most of the legs of the UHF packet backbone across MT are in place and operating. It's too soon to see the results of the efforts, but indications are that traffic is

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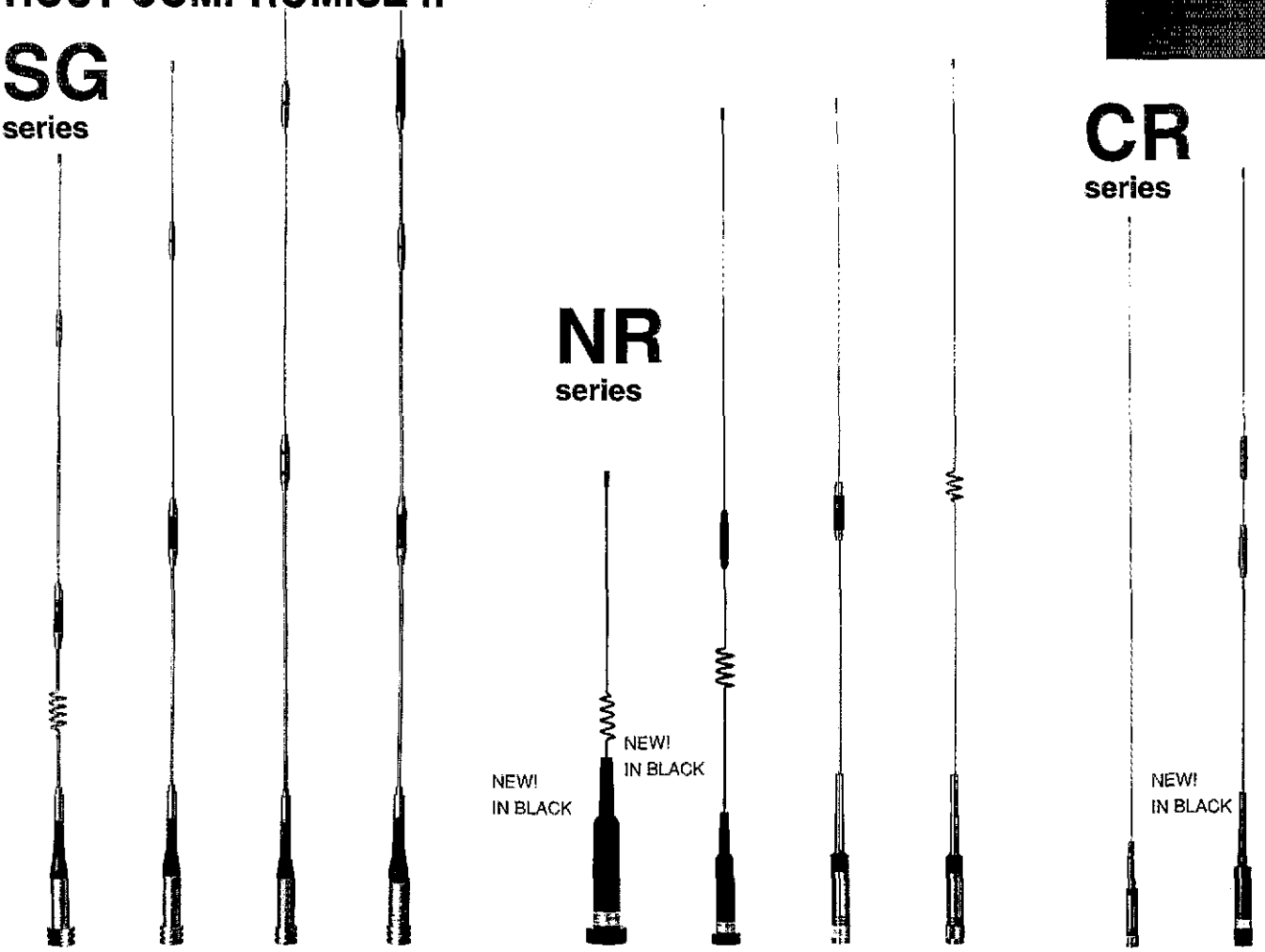

SG7200NMO SG7500 SG2000 SG7900 NR72BNMO NR73BNMO NR770R NR770H CR214S CR320A

MODEL	BAND		POWER (W)	MOUNT	HT (IN)	ELEMENT PHASING
R-72BNMO	2m/70cm		100	NMO	13.8	1/4 λ ,1/2 λ
R-73BNMO	2m/70cm		100	NMO	33.5	1/2 λ ,2-5/8 λ
R-770SA	2m/70cm		100	UHF	16.9	1/4 λ ,1/2 λ
R-770HA	2m/70cm		200	UHF	40.2	1/2 λ ,2-5/8 λ
R-770HNMO	2m/70cm		200	NMO	38.2	1/2 λ ,2-5/8 λ
R-770RA	2m/70cm		200	UHF	38.6	1/2 λ ,2-5/8 λ
R-790A	2m/70cm		120	UHF	57.5	6/8 λ ,3-5/8 λ
G-7000	2m/70cm		100	UHF	18.5	1/4 λ ,6/8 λ
G-7200NMO	2m/70cm		150	NMO	36.6	1/2 λ ,2-5/8 λ
G-7500A	2m/70cm		150	UHF	40.6	1/2 λ ,2-5/8 λ

MODEL	BAND		POWER (W)	MOUNT	HT (IN)	ELEMENT PHASING
SG-7900	2m/70cm		150	UHF	62.2	7/8 λ ,3-5/8 λ
SG-2000	2m		150	UHF	62.6	7/8 λ
NR-140A	1-1/4m		100	UHF	36.2	5/8 λ
NR-124	23cm		100	N	25	4-5/8 λ
CR-214S	2m/1-1/4m		120	UHF	37	1/2 λ ,5/8 λ
CR-224A	2m/1-1/4m		150	UHF	68.5	7/8 λ ,2-5/8 λ
CR-320A	2m/1-1/4m/ 70cm		200/ 200/100	UHF	37.4	1/4 λ ,1/2 λ , 2-5/8 λ
NR-2000NA	2m/70cm/ 23cm		100	N	39	1/2 λ ,2-5/8 λ , 5-5/8 λ

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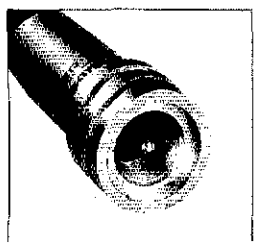
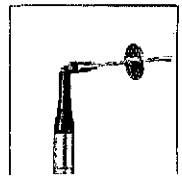


FOLD-OVER

PATENTED ONE-TOUCH FOLD-OVER FEATURE



moving much quicker in and through the Section. VE sessions in the Section continue to be well attended, with several candidates appearing wherever they're scheduled. We're noticing not only a lot of new hams, but many of them passing code and upgrading who previously held codeless licenses. Some youngsters are showing an interest in the hobby. Congratulations to Brandi Hills, age 9, and Sara Hills, age 7, for passing exams in Oct at a VE session in Missoula. The 60th Annual Glacier/Waterton Hamfest at Three Forks Campground Jul 15-17, 1994, has been approved by the League as the 1994 ARRL State Convention in MT. Start planning now to attend this gathering near Glacier National Park. Tfc: KA7YYR 120; PSHR: KA7YYR 101. *Net/QNI/QTC/NM:* MSN/110/1/KF7R; MTN/1452/73/N7AIK; IMN/289/134/KB7GZU.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—Volunteers under the Field Auxiliary program provide a service to fellow amateurs and the community that's to be commended. Each year an individual amateur is recognized for outstanding service, to be honored as Field Appointee of the Year for the NW Division. For 1992, this honor and a plaque and Certificate of Merit has been presented to Official Observer Coord Merle McLaughlin, W7DNY. Merle reports 203 OO monitoring hours with 17 Good Guy & 47 Advisory reports sent. SEC KC7FA reports 18 emergency nets active with 78 drill sessions and 984.5 public service hrs reported by ARES members. A fall exercise of the Medical Service Team is reported by EC Marina N7LSL with 63 ARES ops participating for 301¼ hrs service and 730 mi traveled in King, Kitsap, Pierce & Snohomish cts. Participation reported on Vashon Isle by EC W7AY. EC KI7GW held fall meeting for all KING leadership & assts. EC NU7D Cowlitz cty reports a search for a missing plane ended in sorrow with 2 Seattle TV producers found dead. DS DEC N7WOM reports Whatcom cty had a Red Cross callout drill as part of Oct SET, with 17 responding. In Snohomish cty, SET involved a simulated jet crash on the Paine Field runway. San Juan cty participated in SET by establishing comms with cty EOC and the Red Cross. Net reports *(QNI/QTC/QNS/NM):* NTN 2921/197/31/W7TVA, NWSSBN 784/48/31/N7MGQ, PSTS 112/74/58/KD7ME, WARTS 3036/180/31/W7GB, WSN 575/186/62/W7AZU. Activity rpts: KD7ME 460, KB7JQM 201,W7LG 135, W7AZU128, W7NWP 64, KA7TTY 52, K7CLL 29, W7PFD 21, PSHR: WA7AZU 129, KD7ME 116, W7NWP 112, KB7JQM 92.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV, DECs: W6CPO, N4OGL. STM: K6APW. ACC: vacant. TS: KF6NY. The Alameda County Emergency Services (ACES) Net is held Tue at 8 PM on 147.24, 444.20 (CTCS 107.2 Hz), 147.12, 224.74, 441.125 (CTCSS 100.0 Hz) & 145.43 (CTCSS 100.0 Hz). All are linked for the net & those interested in emergency comms are invited to check in. NALCO RACES has had 20 of its members complete fire patrol training with the Berkeley Fire Dept & have been on several patrols in the Berkeley hills. Contact WB6HPA for info. Pacificon '93 was bigger & better than last year! 2600 attended the 36 tech sessions and 200 took license exams! The MDARC has set a standard that will be hard to equal. MDARC welcomes new members Mark Garcia, WA6CPY, KD6TND, K7SKO, W6LTI & KD6TWS. LARK congratulates upgraded members KD6SHW to Extra Class; KD6DES & KD6MUC to Adv. SBARA congratulates N6MWC on his appt as EC for Fremont. EBARC's VE team of W6THD, N6VMK, WB6DOB, AA6UX, AA6YZ & KB6JZL issued 1 Novice, 3 Techs, 2 Gens, 1 Adv & 1 Extra Class at their last session. VVRC mourns the loss of N6NIC. Its VE session saw 7-year-old Hitesh Diwan pass his Tech test! CCCC welcomes new members KD6WCC & KC6ZJL. HRC welcomes new members KC6QOF & KC6OOM. NBARA has paid the *QST* subscription cost for the Solano County JFK library, after learning that budget cuts would force it to let its subscription lapse. That's a great idea for all clubs to consider. Oct tfc: WB6DOB 678, W6VOM 49, K6APW 67, WB6UZX 18, WB6ETY 14. PSHR: WB6DOB. BPL: WB6DOB. Tfc nets: NCN1/3630/7 PM, NCN2/3705/9 PM, NCN-VHF/145.41/8:30 PM; RN6/3655/7:45 PM & 9:30 PM, PAN/3652/7052/8:30 PM. Your check-ins are always welcome.

NEVADA: SM, Joe Lambert, W8IXD—ASM: Curly Silva, K7HRW. TC: NW7O. SEC: K7HRW. ACC: N7FFP. STM & SGL: N7CPP. Happy New Year to everyone. I hope we all enjoyed the ham club Christmas parties in various parts of the state and are ready to charge into the new year. I hope that the DMV is ready to charge into the new year! As of this writing, it still hadn't prepared the forms for the amateur license plates, as required by SB-262. Each office has been handling that situation on a case-by-case basis with different guidelines. I trust this is resolved by the time you read this. Elko ARC reports an active RACES group, partly because of greater repeater coverage, because of new repeaters at Wells and Battle Mtn and soon-to-be in Elko. The SNARS special-event station at the Reno Air Races was a great success with 800 contacts on various bands. National Volunteer Organizations Active in Disasters had a preliminary meeting Oct 20 to coordinate NV volunteer disaster assistance agencies. The 146.88 repeater in Ely has CTCSS 100-Hz tone access. This is an open repeater and the tone is to cure an interference problem. Traffic reports to Bruce, N7CPP by the 1st of the month. Tfc: W4JLS 23, N7CPP 21, K7OK 3.

PACIFIC: SM, Bob Schneider, AH6J—We all mourn the sudden death of Ron Kokubo, KH6E, of Kauai, Oct 23. He was very active and will really be missed. There were 2 SETs: One was 9 Oct on Kauai & one Oct 16 statewide. EARC held elections Oct 28 & put in pres Wayne Jones, NH6GJ; vp D. J. Donna Frumma, NH6HC; secy Chester Koga, NH6YW; treas Bev Yuen, WH6GJ; dirs Bill Stookey, WH6EL; John Elliott, AH6BJ, Ann Shaver, AH6KY; Shorty Cagala, NH6UW; Clyde Hood, WH6AB; and Eric Johnson, AH6MQ. There was a packet users meeting Sat, Nov 6, at HI Baptist Academy. I saw Greg Pool, WH6DT; Stan Harter, KH6GBX, former HI state CD director; and Mel Vittem, KH6D, former FCC engineer at Honolulu office in CA, while at Pacificon. Curtis Nakayama, KH6LE, went with me & received the Pacific Division Volunteer of the Year award. Katashi Nose, KH6IJ, was awarded a Certificate of Merit by

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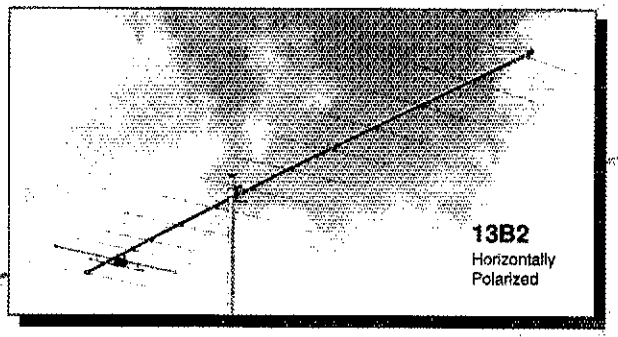

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Dir Charles McConnell, W6DPD (I picked it up for him). BIARC supported events for Haitat for Humanity & Malamalama school with communications. Tfc (Oct): KH6S 39.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—Happy New Year! Hope you're on the air with new rigs, brought by Santa. Pacific Division Amateur of the Year went to Al Biegler, WA6WJZ. Al is STM, active in Golden Empire ARS, transcribes bulletins and text into Braille for the blind and is sightless himself--congratulations. Alll He was awarded a plaque at the Pacificon Convention by Pac Div Director W6DPD. Clubs: Now's the time to schedule a visit to your club by your SM during 1994. Clubs, please send me a list of your new officers. Sierra ARC has closed down for the winter and the next meeting is in Apr. Classes/exams: Yuba Sutter ARC exam Jan 26, call 673-0868; River City ARCS classes Jan 5, Feb 9, exams Jan 15, Feb 19, call 483-3293. New affiliated club in the Section is CA State University-Sacto Student ARC; meets 2nd Mon at noon. KC6URB is advisor. Your SM presented a Certificate of Affiliation to the club. Traffic handling is still an active part of ham radio. For CW, SSB, FM packet traffic handling, check with NM K9JM, mgr of N CA Net. NCN meets daily at 7 PM on 3630 kHz, 9 PM on 3705 kHz, 8:30 PM on 145.41 MHz. Sacramento Valley Traffic Net at 9 PM 146.85 MHz (WA6WJZ NM). Sacramento Valley Section Net 8 PM 146.085+ on 1st Sun for ARRL and Section info. Silent Key is GEARS member K6IF. New club members: River City ARCS--W6DVO, KE6API, KE6CFT, WD6BMJ, KN6KZ, KD6FWC, KC6ZEH, KE6APS, KD6GXR, KD6KR. ARL 61. Tfc: WA6WJZ 87, K9JM 79, KK1A 66, W6RFF 29.

SAN FRANCISCO: SM, John Wallack, W6TLK—I'm sad to report that AA6DE and KA6TAD are SKs. New appointment: KI6JC, PIO. Congrats to the members of the Willits ARS for being the newest ARRL Affiliated Club in the SF Sect. Congrats to the S Humboldt ARC for the highest Field Day score of 7176 in the SF Section. SHARC operated 2A with 9 hams. Great job for an active and growing club with 28 members. It was great seeing so many SF Section hams at the excellent Pacificon. I was glad to see Valley of the Moon ARC members staffing their emergency comms van at Pacificon. KK6JJ reports Marin ARC members are developing a good working relationship with the Marin County Sheriff's Search-and-Rescue Team. WA6TVQ reports the Humboldt ARC has a home of its own; a place to go for meetings, classes and hopefully a club station. It's in the lower area of the Eureka Mall. KC6UXJ reports Sonoma County RA has been busy with 62 members participating in the last 4 public service events of 1993. KK6JJ, OOC, is looking for a few good hams to join the elite corps of the Amateur Auxiliary of the FCC as OOs. Training and a test are provided by the ARRL. Contact KK6JJ or W6TLK for info. Tfc: N6FWG 380, AB6EU 230.

SAN JOAQUIN VALLEY: SM, Mike Siegel, KI6PR—Let a guy think he has some extra time and he'll try anything! K6IXA is now editor of Turlock ARC's *Arc-Over* newsletter. Glad to see it back, and I hope it stays. TARC meets 2nd & 4th Tue in Turlock. Fresno ARC has found a unique way to expose schools to ham radio; it recently took its new emergency communications bus to a local school's PTA meeting. This even gets the parents involved and draws tremendous interest from all. Public service is becoming a major activity among our valley clubs; at least 1/3 of our clubs report contributing time and radios to activities ranging from walkathons to cross-country horse runs. One club even reports working 3 different walk/run events in a single month. These are a great activity, an excellent training tool, and a good source of T-shirts! After almost a year of efforts, the Kings ARC's repeaters are on a new hilltop, and there have been some call sign changes. N6OA/R on 224.44, WB6VFZ/R on 222.82, and N6OA/R on 441.09 have all moved to a site to the west, in San Benito County. They anticipate no intermod at the new sites, and all machines are wide-open. Congratulations to KF6HV; he was recently awarded a life membership in the Kern River Valley ARC. KRVARC sponsors a weekly ARES/RACES net Mon at 1910L on 144.50 simplex. Check in with them sometime! Manteca ARC is sponsoring ham radio classes, starting this month. They'll concentrate on the NC Tech license as an entry level. Contact Andy, WB6GUM, at 209-239-5106 for details and registration. Congratulations to the new officers at the Mountain ARC: pres K6STR, vp KK6XO, secy WB6BZZ.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—SM: AB4S. ASM: KE4ML. SEC: WB4SGA. STM: K4IWW. ASTM: W4EAT. ACC: WC4T. TC: KM4OX. SGL: KI4AN. OOC: W4ZRA. Many thanks to John Clapp, AA4MP, for his long and dedicated service as NM for the Carolinas Slow Net, the NC/SC CW traffic net that meets at 6 PM on 3715 kHz. Roy, AD4IF, is serving as NM and all NC & SC amateurs, especially Novices and Techs, are encouraged to participate in this net. Congratulations to the Rowan ARS for 25 continuous years as an ARRL Affiliated Club. Roger Paxton, KB4BME, has been appointed Area D District Emergency Coord (DEC). He's already attended several EM meetings and "tabletop" exercises. Roger's experience as EC in Hyde and Greene Co during emergencies (including many hurricanes), and his knowledge of NC Emergency Mgmt, give him an excellent background for this position. He's joining a group of extremely dedicated DECs who deserve the thanks of all NC amateurs for their efforts. The other 5 DECs are Bernie, WA4MOK (Area A); Tom, KM4LB (Area B); Jim, W4NHV (Area C); Greg, WB4HRR (Area E); and Louis AC4WI (Area F). Thanks to WB4HRR for planning an excellent scenario for SET (which included Hurricane Hillary). I'm pleased to report that, after years of planning and negotiations, and with considerable assistance from the NC Em Mgmt Div and the Center for Public TV, a procedure has been established to locate amateur repeaters on selected state-owned towers. Your ARRL Field Organization will provide a recommendation to Em Mgmt, based on anticipated enhancement of emergency communications capability and the technical quality of the repeater equipment. SERA coordination will be essential. Chuck Davis (age 40), NB4L, who served as SEC (c 1980-82) until he moved to Dallas, TX, became a Silent Key recently. Chuck appointed the 1st NC DECs and made significant

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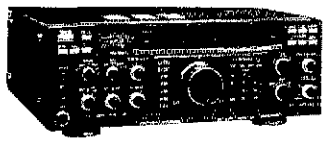

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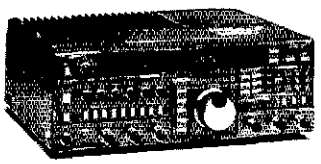
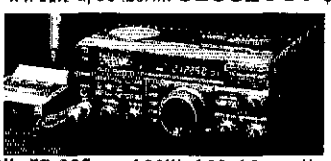
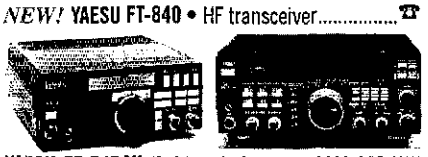


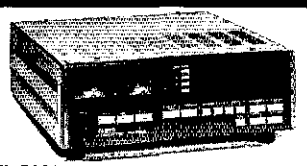
YAESU FT-767GX • All-mode, 160-10M xcvr with 100kHz-30MHz receiver. Options for 6M, 2M & 70cm 100W out to 30MHz, 10W above. Built-in AC ps. 5½"h x 14½"w x 11½"d, 30 lbs..... **CLOSEOUT $1699**



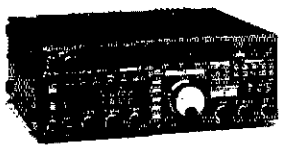
YAESU FT-890 • 100W 160-10m all mode transceiver with 100kHz-30MHz receiver. Optional internal automatic antenna tuner. 13.5VDC @ 20A. 9⅛"w x 3⅜" x 9½"d, 12.3 lbs..... ☎
YAESU FT-890/AT • w/ant tuner..... ☎
NEW! **YAESU FT-840** • HF transceiver..... ☎



YAESU FT-747GX (left) • 100W, 160-10M SSB/CW base or mobile transceiver with 100kHz-30MHz receiver, and optional FM transmit/receive. 12V DC @ 20A. 3¾"h x 9½"w x 9½"d, 7 lbs..... ☎
YAESU FT-650 (right) • 100W ,6, 10 & 12M all mode with 24.5–56.0 MHz receive, 105 memories: 99 for channels, 4 programmable scan memories and 2 priority channels. Built-in AC supply or 12V DC.@ 18A. 5¼"h x 11¼"w x 11¼"d, 18 lbs..... ☎



YAESU FL-7000 • Solid-state, 160-12M. linear with built-in automatic antenna tuner and power supply. 70W drive for 600W output. Full break-in for CW, HF Packet and AMTOR. Auto. selection of 4 antennas with opt. unit. 5"h x 15"w x 15"d, 66 lbs..... ☎



YAESU FT-736R • All-mode, 2M/430 multi-band VHF/UHF. Optional, modules for 50MHz, 220MHz, and 1.2GHz. 10W on 50MHz and 1.2GHz, 25W. on 2m and 440 MHz. Built-in AC ps, or 12V DC w/optional power cord. 5¾"h x 14½"w x 11½"d, 19.8 lbs..... ☎

MK II's 2½W, FM, SSB/CW portable. Requires 12V DC @ 1.1A, or opt. battery case with 9 (C) cells or nicads. DTMF mic with up-down control, dual VFOs, 10 memories with scan. Offset tuning, LCD display. 2¼"h 6¼"w x 7½"d, 2.6 lbs.

FT-290R MK II • 2 meters, 25W..... ☎
FT-690R Mk II • 6m, 50-54MHz, 10W..... ☎
FT-790R Mk II • 430-450MHz, 25W..... ☎

YAESU FT-5200 • 2m/440MHz FM Mobile. Covers 140-150 (tx), 140-174 (rx) & 430-450MHz. 32 memories, CTCSS encoder, (2m) 50/5W, (70cm) 35/5W. Cross band full duplex. DTMF mic., detachable front panel for remote. 5½"w x 1⅝"h x 6"d, 2 lbs.. **SPECIAL** ☎
FT-5100 • Like 5200 w/o remote cap. **SPECIAL** ☎
FT-6200 • 35/10w, 440MHz/1.2GHz..... ☎
FT-2200 • 50w 2m FM xcvr w/TTP mic..... ☎
FT-7200 • 35W 440MHz FM/TTP..... ☎
FT-912RH • 1.2GHz, 10W, 12VDC @ 4A..... ☎
YAESU FT-2400H • Rugged 2m FM mobile. 50W/25W/5W. Receives 140-174MHz (140-150MHz tx). 31 memories, CTCSS encoder, 5 scan functions. Programmable call channel, auto. offset. Backlit DTMF mic. 6"w x 1⅝"h x 7"d, 1½ lbs.. **SPECIAL** ☎
YAESU FT-7400H • 35W 440MHz FM..... ☎
FT-712RHT/C8 • 35W 440MHz FM.... **CLOSEOUT $309.95**
DVS-1 • Memory module for 712. **CLOSEOUT 49.95**

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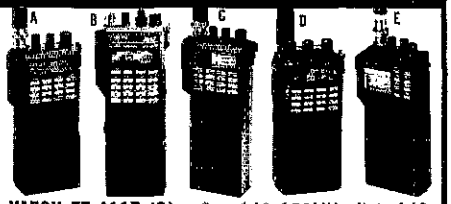

YAESU FT-411E (C) • 2m, 140-150MHz (tx), 140-174MHz (rx). 2½w FM HT. LCD, keypad and rotary-dial frequency entry. 5½"h 2¼"w x 1½"d, .85 lb..... ☎
YAESU FT-811 (A) • 2w, 430-450..... **CLOSEOUT $259.95**
YAESU FT-911 (A) • 1w, 1.2GHz..... ☎
YAESU FT-416 Black 2m FM HT/batt/chgr.... **SPECIAL** ☎
YAESU FT-816 Black 440 FM HT/batt/chgr..... ☎
YAESU FT-470 (B) • 2m/440MHz, 2.3w, FM HT. Similar to FT-411/811. Simult. receive, both bands, 21 memories/band. 6½"h x 2¼"w x 1½"d, .88 lbs **SPECIAL** ☎
YAESU FT-815 (D) • 70cm, 2W, 430-450MHz receive and transmit. Dual VFOs, 41 tunable memories. 2½"w x 5¼"h x 1¾"d, 12½ oz..... **CLOSEOUT $329.95**
These are similar to FT-815 but without TTP
FT-26/25 • 2-meters, 2W, 130-174MHz receive and 140-150MHz transmit..... ☎
FT-26/27 • 2-meters, 5W, 130-174MHz receive and 140-150MHz transmit..... ☎
FT-76/25 • 70cm, 2W, 430/450 MHz..... ☎
YAESU FT-23R-17 (E) • 2m FM HT 2.5w ouput, rotary dial frequency entry, LCD display, 10 memories, scanning, priority. Rugged and weatherproofed. 4¼"h x 2¼" x 1¾"d, 1 lb..... ☎
FT-23R-12 • as above but 2m, 5w..... ☎
FT-33R • 220 MHz FM, 5w..... ☎
FT-530 • 2m/440 FM HT w/TTP..... **SPECIAL** ☎
NEW! **FT-11R and FT-41R** Handhelds..... ☎

FRG-100B • Shortwave receiver..... ☎

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G-800SDX • Med/hvy duty, 21 sq. ft, presets..... ☎
G-1000SDX • HD, 21 sq. ft, 450° rot/presets..... ☎
G-2700SDX • HD, 34 sq. ft, 450° rot/presets..... ☎
G-5400B • Light/med, 11 sq. ft. az/el combo..... ☎

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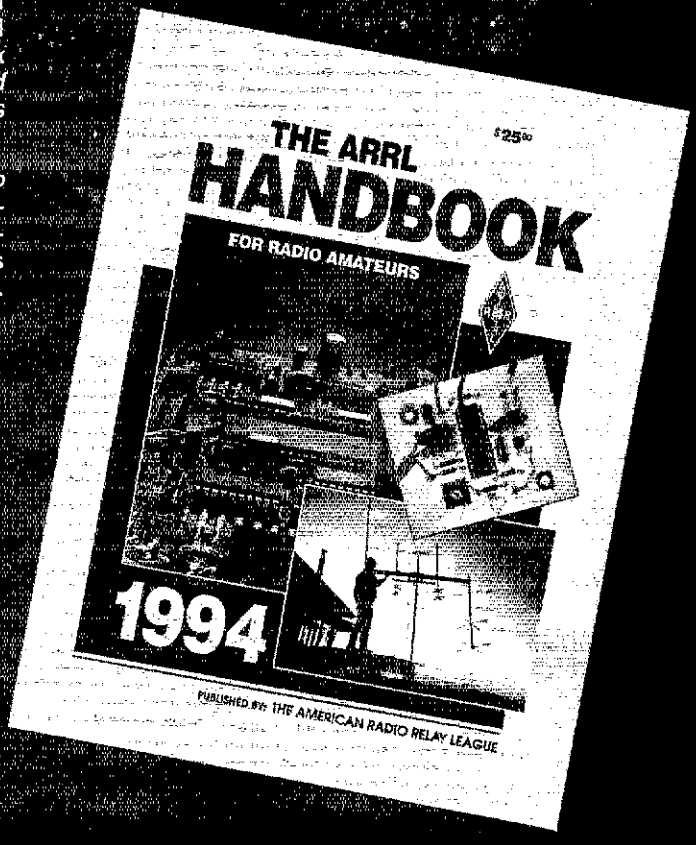

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MFJ *halfwave vertical* Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

Operate 40, 20, 15, 10, 6, 2 Meters with this MFJ-1796 *ground independent halfwave* vertical antenna -- no radials or ground ever needed!

It's only 12 feet high and has a tiny 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on a motorhome. You can take it anywhere -- vacations, field day, DX-pedition, camping, nearly anywhere you go.

Frequency selection is fully automatic -- there are no moving parts, nothing to adjust -- all you do is transmit. It handles up to 1500 watts PEP. You'll work your share of DX because its *low angle of radiation* really reachs out and brings in DX.

During a contest, you'll love being able to *quickly* work one station after another from all directions because of its omni directional pattern.

It's so easy to put together that you can have it on the air in an afternoon.

How does MFJ achieve maximum efficiency in such a compact multiband antenna?

The key is *end loading* -- the most efficient form of loading known. The *entire length* of the antenna is always radiating power. There are no lossy traps to reduce effective length.

End loading provides multibanding and full electrical half wavelength on each HF band. An *optimum* combination of capacitive hat and inductive end loading delivers a close 50 ohm match without a lossy impedance matching network.

Efficient high-Q loading coils are wound on low loss *fiberglass* forms. Large 1-inch diameter aluminum radiators are used to keep losses to a minimum.

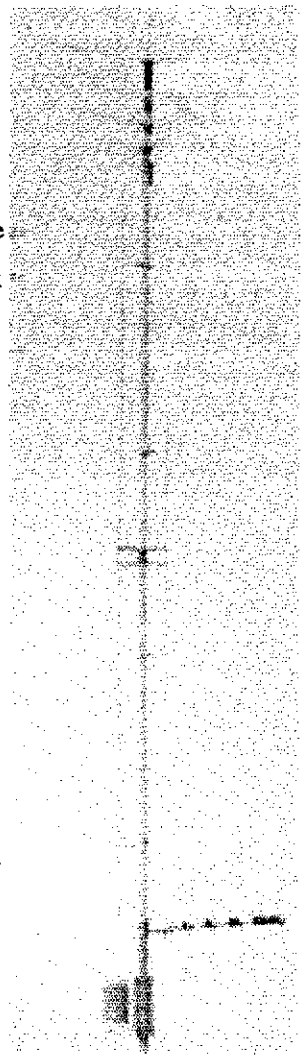
No Radials or Ground *ever* Needed!

The MFJ-1796 is balanced and center fed to totally eliminate the need for radials, counterpoises or a groundplane -- you don't have the kind of ground losses that's common with a quarter wave vertical.

No Feedline Radiation

There is no feedline radiation that causes pattern distortion and wastes power. The 50 ohm Teflon® coax feedline exits through the bottom radiator from a low impedance point -- the loading unit is mounted at right angles to decouple the feedline and to provide a low impedance point.

The feedline is further decoupled and isolated from the antenna with a highly efficient *air-wound* choke balun. This attentuates RF on the outside of the coax and minimizes feedline radiation that waste power.



MFJ-1796
$199.95

Easy to Adjust

It's very easy to optimize the MFJ-1796 for your favorite part of the band. Frequency adjustments are nearly independent -- adjusting one band has minimum effect on the resonant frequency of the other bands -- unlike most other multiband antennas.

Built to Last

You get an antenna built with heavy duty aluminum radiators, machined aluminum parts and stainless steel hardware.

The coils are wound on tough low loss *fiberglass* forms using durable Teflon® covered wire that's highly weather resistant.

Full halfwave on 2 and 6 Meters

On 2 Meters and 6 Meters, MFJ's unique stub decoupling and efficient full size halfwave elements really get you out with low angle radiation for lots of DX.

The *most* for your Money

For $199.95, the MFJ-1796 gives you the *most* for your money--no other multiband, automatic band-switching, ground independent DX antenna even comes close.

No Matter What™ Guarantee

You get MFJ's famous one year *No Matter What*™ *unconditional* guarantee. That means we will repair or replace (at our option) your MFJ-1796 *halfwave vertical* antenna *no matter what* for a full year.

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MFJ Customer Service Technicians will help you keep your MFJ *halfwave vertical* performing flawlessly -- no matter how long you own it. Just call our toll-free help line 800-647-TECH (8324) -- *an MFJ exclusive.*

Made in USA

MFJ *halfwave verticals* are made in the USA. Help our fellow Americans by keeping our money here -- buy Made in USA.

Call Your Dealer for Your *Best* Price Today

Enjoy DXing and ragchewing on six bands from your apartment, condo or anywhere. Call your favorite dealer for your best price and order your MFJ *halfwave vertical* today!

Shortwave *Regenerative* Receiver *Kit*

MFJ-8100K
$59.95

Remember hunching over your regenerative receiver for hours with a pair of phones pressing uncomfortably against your ears?

You could hear just about anything that fancy superhets could hear. Sure, you had to play around with the regeneration control just right and have a steady hand to tune but you could hear'em.

Don't you wish you could relive some of this fun and excitement of your youth -- share some of it with your kids and grandkids?

Well, you can -- with the MFJ-8100 *World Band* Shortwave Radio *Kit.*

Spend a fun evening with your child or grandchild and help him put this simple kit together. When you two finish, watch him glow with excitement as he tunes the world bands--just like you did--and remember for life.

This baby performs. An RF stage really picks up the weak ones and it goes into regeneration smoothly without pops or dead spots. Stations all over the world will come in loud and clear with just a 10 foot wire antenna.

Listen to international shortwave broadcasts, hams on SSB and CW, WWV, RTTY, packet and much more. Covers all or part of 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15, 13 Meters in five bands.

It has vernier reduction drive, bandswitch, volume and RF gain controls, uses a 9 volt battery and is built into a rugged aluminum cabinet.

Two earphone jacks let you and your child or grandchild listen together with your Walkman style earphones or plug-in speakers. 7x6x2½ inches.

Order one as a gift for your child or grandchild . . . or for yourself. **MFJ-8100K,** $59.95 kit; **MFJ-8100W,** $79.95 wired and tested.

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300 KHz-200 MHz Active Antenna

MFJ-1022
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Wish you could hear everything your expensive general coverage transceiver or receiver is capable of receiving?

Your ham band only antenna does great in the ham bands . . . but plug this new MFJ all band *active* antenna into your general coverage transceiver or receiver and you'll hear strong clear signals from all over the world from 300 KHz to 200 MHz --including low, medium, shortwave and VHF bands.

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Take it on trips and use it with your mobile or QRP rig to listen.

Also improves weak noisy scanner radio reception from low band to high band VHF -- hear signals you couldn't hear before.

A J-310 FET handles strong signals and a new *noiseless feedback* circuit gives you excellent low noise reception. A 4.5 GHz MRF- 901 transistor lets you receive weak signals well into VHF.

Detachable 20 inch telescoping antenna. Uses 9 volt battery or 110 VAC with MFJ-1312B, $12.95. 3⅓x1¼x4 inches.

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contributions toward the growth of ARES. Tfc (Oct): KO4BJ 286, KI4YV 232/136, K4IWW 148, W0UCE 133/98- Jul/68-Jan, WD4CNR 108, W4EAT 103, N4SMS 82, AC4DV 81, K4NLK 78, N9CGD 65, KD4EVS 62, NT4K 61-Aug, KD4UAI 48, N4LST 40, WD4MRD 38, KD4UJC 37, N4UE 32, WA4SRD 31, K4AIF 29/25-Aug, KC4PGN 29, WA4MNR 28, NT4K 28, AB4W 26, W4SVG 24-Sep, N4BJX 17, N4JTG 15, W4DYW 12, AK1E 12, N4XUN 4.

SOUTH CAROLINA: SM, Ned Moeller, N4FVU—AIRS: W4DRF. ASM/STM: WB4BZA. BM: KQ4OU. OOC: W4NTO. PIC: KA4LHM. ACC/SGL: N4FVU. Many thanks to John Kanode, N4MM, Roanoke Div Dir and to Luck Hurder, ARRL Field Services Dept Deputy Mgr, for their excellent program and Q&A session at the Sumter ARC hamfest. A fine interview was given by Lee, W8CGQ, EC Cherokee Co. The article was written by Janet Spencer, Spartanburg *Herald-Journal* after the Cherokee Co SET and published in the Nov 1 state newspaper. Lee hosted the state's RACES officers' meeting at the Cherokee Co Red Cross Bldg. Thank you, John, AA4MP, for your dedication, leadership and great instructional material during your tenure as CSN NM. John has passed the reins to the capable hands of Royce, AD4IF, who became NM CSN on Nov 1. Oct Tfc: WB4BZA 144, K4ZN 90, KO4XE 74, W4DRF 44, AD4IF 34, KA4UIV 33, N4PNE 30, KQ4OU 28, WA4NHA 24, KA4LRM 23, AA4IX 22, KA4SLQ 13, KD1DS 12, KQ4SY 11, KA4DFW 10, K4GLT 8, W4NCN 7, K8DZH 7, AJ4G 5, KD4WUU 5, WA4SJS 3.

VIRGINIA: SM, Ted Dingler, N4KSO—SEC: N4SCK @ KF4TE. STM: N4GHI @ WA3TAI. OOC: W8IRT. TC: N4UA. BM: W3ATQ. ACC: KA4YUY. SGL: W4UMC. Thanks to the following clubs for renewing as ARRL Special Service Clubs: Richmond ARC and SW VA Wireless Assn. Is your club doing more than the normal as far as club activities are concerned? If so, consider becoming an ARRL Special Service Club. For information, contact the ACC. Congratulations to the following on their elections as officers of Woodbridge Wireless Inc for 1994: pres KD4KBT, vp WB4RMJ, secy WD4AIR, treas N4LJZ, activities KD4PUR, board WA0DYJ, WJ4M, K8EI, trustee WB4FQR. I hope you have another successful year. If your club recently had an election of officers, please let me know. Is your club looking for activities for the new year? If you need ideas, check out the videos available from the ARRL. Contact the Educational Activities Dept at League HQ. These videos are available to all affiliated clubs and ARRL Members. Does your club have a representative at the exam sessions? If not, consider doing so. This is a great place to recruit new club members. These new amateurs are excited and can add a lot to your club. Check them out. These are also prime candidates for Elmers. We need to reinstitute the Elmer system. There are a lot of new amateurs who need guidance and the Elmer system is the way to go. It worked for you and me, and I'm sure it will work for them. The RATS group gives all new club members a class on the proper use of its repeater before they're given access to it. Does you club do this? If not, consider doing so. This could go a long way to eliminate a lot of the things we're hearing on 2 meters. Now that you've had a chance to get familiar with that new equipment you received for Christmas, now's a good time to consider trying a new mode of operation. When you decide to try that new mode, why not invite a new amateur to join you. They'd appreciate it very much. Remember how excited you were when you got your license? They're just as excited. Don't let their excitement wane—get them involved. An activity to try is the CW NTS. This is a great place to hone your CW skills. Don't be intimidated by the CW nets. They'll slow down if need be. This is a great activity and it doesn't take a lot of time. Most nets last 15-20 minutes. Come join us. By the time this issue of *QST* reaches you, the Richmond Frostfest will be history. I hope you had a good time at it and are looking forward to next year's edition. 73. Tfc: K4DOR 712, N4GHI 533, WA9FCH 367, K4MTX 238, W3ATO 198, KD4JMA 160, K4BGZ 146, KQ4ET 138, N6ANQ 124, W4UQ 111, K4YVX 107, AA4GL 107, N4DCC 107, AA4AT 92, WA8AHV 86, WB4ZNB 82, KN4US 82, WB4FLT 69, W7UQQ 66, N6OD 63, WD4MIS 47, N4SKO 41, KD4DDI 29, N4VJK 28, KQ4AG 27, WA4TVS 27, KB4CAU 25, KC4URI 25, K8EI 20, K4MLC 16, W4TZC 14, N4OGM 13, AB4UM 13, KD4NFY 13, KA6UXX 12, WB4UHC 12, KD4UFS 12, N4JEO 10, KD4QBT 10, N2NMH 8, N4FZA 8, K4IX 7, WB4KIT 7, KD4ZSC 6, KI4W 6, KC4YIX 5, WA1VRL 4, K4JM 4, KC4YIW 4, W4HU 3, KG4JGC 3, KQ4EY 2, N4FNT 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: N8FXH. SGL: K8BS. TC: K8LG. ACC: WA8FLF. Tony, KC8BK, reports new club officers for Central ARA: pres Mike Gullo, N8UJZ; vp Mike Fisher, N8MUP; secy/treas Anthony Simons, KC8BK. Ronald Selders, AA8AN, and Arthur A. Ellis, W8PBO, have been appointed ORSs. Ed Messenger, N8OYY, has been appointed OO. K8QEW reports we now have 979 ARES members in the state, up 11 from last month. Hal, KC8FS, reports there will be 33 new amateurs on the airwaves soon, as a result of the all-day crash/cram course given on Oct 2 in Chas. Greg Payne, KB8NJH, has announced that the 147.21 repeater is in operation and open for general use. It's on Amber Ridge in Roane Co.

Net	Freq	Time	QNI	QTC	Sess	NM
WVFN	3865	6:00	1329	185	31	WD8V
WVMD	7235	11:45	955	61	31	W8KBM
WVN-E	3967	7:00	320	55	31	W8IMX
WVN-L	3567	10:00	152	38	31	W8IMX
Hillbilly	14290	Noon Sun	161	0	5	W8YP

Tfc: WD8V 498, KA8WNO 319, W8YP 201, W8IMX 139, K8QEW 98, W8JWX 62, N8IXF 54, K8KT 32, KA8OGF 24, N8FXH 23.

ROCKY MOUNTAIN DIVISION

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K6YEJ. STM: ND5T. NMs: WA5UNO & WB5ZME. TC: W8GY. ACC: KA5BEM. NM Roadrunner Net meets daily, 3939 @ 0100 UTC, handled 102 msgs with 1339 check-ins. New Mexico Breakfast Club meets daily, 3939 @ 6:30 AM, handled 129 msgs with 1023 check-ins. Yucca 2-mtr Net, .78/.18, handled 21 msgs with 515 check-ins. Caravan Club 2-mtr Net, .66/.06, handled 7 msgs with 185 check-ins. SCAT Net, .66/.06, handled 17 msgs with 539

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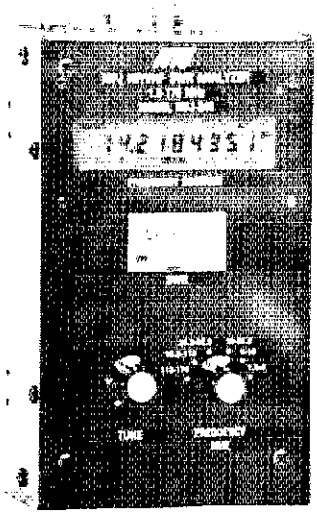
. . . covers 1.8-170 MHz . . . built-in 10-digit LCD counter . . . smooth reduction-drive tuning . . . simple-to-use . . . inexpensive to own . . .



MFJ-249 **If** you work with **$199.95** antennas, MFJ's revolutionary new *SWR Analyzer*™ is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

What the MFJ-249 Does

The MFJ-249 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

Here's what you can do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds--without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss.Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-249 is really 3 test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter and an *SWR Analyzer*™.

***Free* Manual**

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand!

For free manual write or call MFJ.

Take It Anywhere

The MFJ-249 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. Take it to remote sites, up towers, on DX-peditions--anywhere your antennas are located.

For rough service, pick up a convenient **MFJ-29**, $19.95, padded carrying pouch to keep your MFJ-249 close at hand and looking like new.

How Good is the MFJ-249?

MFJ *SWR Analyzers*™ work so well, many antenna manufacturers use them in their lab and on the production line--saving thousands of dollars in instrumentation costs! Professional installer and technicians use them worldwide.

Get More by Paying Less

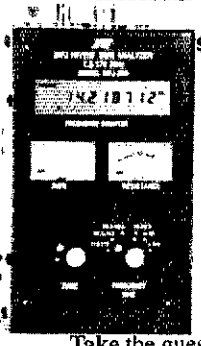
With the MFJ-249, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, plus a high accuracy frequency counter-- all for a low $199.95.

HF/VHF SWR Analyzer™

MFJ-209 **If** you **$109.95** don't need a built-in frequency counter but want 1.8-170 MHz *continuous* coverage and smooth vernier tuning, choose MFJ-209.

Same as MFJ-249 without LCD frequency counter. Has jack for external frequency counter.

MFJ HF/VHF SWR Analyzer™ with RF Resistance Meter



MFJ-259 **All** the features **$219.95** of the MFJ-249 plus exclusive *MFJ RF Resistance Meter*™.

Does 2:1 SWR mean 25 ohms or 100 ohms?

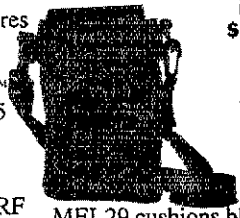
The new MFJ-259 tells you at a glance.

Now you can measure RF feedpoint resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's exclusive side-by-side *RF Resistance Meter*™ and SWR Meter!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna!

Carrying Pouch



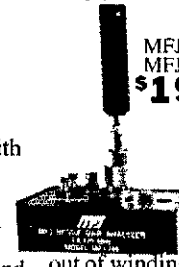
MFJ-29 **Tote** your **$19.95** MFJ-249, MFJ-259 or MFJ-209 *SWR Analyzer*™ anywhere with the MFJ-29 custom Carrying Pouch.

Made with a special foam-filled fabric, the MFJ-29 cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work--the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Protect your investment. The MFJ-29 is the perfect way to keep your analyzer safe and looking like new!

Dip Meter Adapter



MFJ-64 MFJ-65 **Plug** a dip meter coupling **$19.95** each coil into your *MFJ SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Order **MFJ-64** for 1.8-30 MHz or **MFJ-65** for 30-170 MHz.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. You can use it to determine resonant frequency of tuned circuits and measure Q of coils.

Free MFJ Catalog

Write or call . . . 800-647-1800

10-160 Meter HF SWR Analyzer™

MFJ-207 **If** you're an HF man, this **$79.95** compact MFJ-207 *HF SWR Analyzer*™ will help you build 10-160 Meters antennas that'll make working DX almost routine.

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B, $12.95. 7½x2½x2¼ inches.

2 Meter VHF SWR Analyzer™

MFJ-208 **MFJ-208** 2 Meter *VHF* **$79.95** *SWR Analyzer*™ finds the SWR of any antenna from 138-156 MHz.

Jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312 B, $12.95. 7½x2½x2¼ inches.

For Commercial VHF Radio

Same as MFJ-208 but for commercial VHF. **MFJ-217**, $79.95, covers 30-50 MHz and **MFJ-218**, $79.95, covers 150-170 MHz.

440 MHz UHF SWR Analyzer™

MFJ-219 **The** New MFJ-219 **$89.95** *UHF SWR Analyzer*™ lets you read the SWR of any antenna from 420 MHz to 450 MHz--just plug in the coax of your antenna, set the frequency and read the SWR on the MFJ-219.

The MFJ-219 uses the latest high-tech microwave integrated circuits and microstrip technology to produce an affordable *UHF SWR Analyzer*™ for only $89.95

Has jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B, $12.95. 7½x2½x2¼ inches.

MFJ Bandswitched Dip Meter™

MFJ-203 **The** MFJ-203 is a **$99.95** sensitive *Bandswitched Dip Meter*™ that covers all hams bands from 160-10 Meters. There are no plug-in tuning coils to keep up with or break.

Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B, $12.95. 7½x2½x2¼ inches.

Antenna Resistance Analyzer™

MFJ-205 **Measure** the feedpoint **$89.95** resistance of your antenna at its resonant frequency directly from the MFJ-205 calibrated resistance meter.

It's great for designing impedance matching networks for your antenna.

Reads up to 500 ohms RF resistance. Covers ham bands 160-10 Mtrs.

Jack for frequency counter. 7½x 2½x2¼ inches. Use 9 volt battery or 110 VAC with MFJ-1312B, $12.95.

Nearest Dealer/Orders: 800-647-1800
Technical Help: 800-647-TECH(8324)

• 1 year **unconditional** guarantee •30 day money back guarantee (less s/h) on orders from MFJ • **FREE** catalog

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check-ins. Into Net 12/.72, with no report. Four Corners Net handled 12 msgs with 531 check-ins. The International Hamfiesta was certainly a nice function and well attended. So good to see N5TC, W5OVH, K5TRW, K5BIS, K6YEJ, KJ5FW and several hundred more. Also good to attend the 2 club meetings (El Paso ARC & Sun City ARC) and to visit with so many from the Mesilla Valley RC, W TX Repeater Assn. Bilingual ARA & QCWA. Looking forward to visiting the Totah ARC (Farmington) Nov 4 & E NM ARC Nov 9, the Socorro Hamfest Nov 20 and maybe the N NM ARC Christmas Party Dec 4 at Rancho de Chimayo, and maybe even Grants/Gallup before the end of the year. Congrats to WA5IHL, KC5AYV, N5OBZ & many others on the new 147.28 linking system in E NM. Boy, what a job they've done! Thanks to WB9ERE, KG5VG, K8BI and many others for the super design & engineering on the URFMS Linking System. FB WA5IND on the .76 autopatch. Tfc: NC5R 4.

UTAH: SM, Rich Fisher, NS7K,STM: Jim Brown, NA7G. SEC: Mike Collett, K7DOU. PIO: Lon Stuart, WM7E. OOC: Ron Johnson, WE7H. BM: Dallas Barrett, WA7MEL. UT held its SET Oct 14. This was the best UT has had in the past few years. The people who planned the exercise were the EOs and their staff from Utah Co N, along with MARA and MARS. On Oct 14, Morgan Co hams had an exercise of a truck accident near Taggart's Camp. There had been an accident near this area a few weeks before where the hams helped, so they had an idea of what was needed. The people involved were Norm, K7NDC; Keith, KG7FH; Ron, KB7TCS; Dave, N7TUT; Jonathan, KB7ZBY; Allen, N7SHA; Mikel, KB7ZCH; Steve N7VVW; Chuck, N7JMO, who ran the crossband operation, and Cliff, N7ZTY. Weaver Co ARES helped with the exercise. Jonathan and Mikel received their call signs 2 days before the exercise. That's a fast start into emergency communications. The Morgan and SET exercises went well and our hats are off to all who helped. Tfc: WA7MEL 55, KD7UM PBBS: private messages 496, traffic 67, bulletins 115, users 42, forwarded 567.

WYOMING: SM, Rev Morton, WS7W—Oct was a rough month for our HERC System. After the Boysen equipment was moved to Copper Mtn, the antenna had to be replaced. In addition, Limestone Mtn was the site of a massive ac power failure that wiped out the 35-A power supply. On top of that, Rawlins had 440 antenna problems. After many hours of work and hundreds of dollars, however, everything is back up and running for the winter. This is a great opportunity to thank Larry Hudson, KD7BN, and all the mountaintop sponsors for the wonderful job they do in providing us with a great statewide network. Remember your HERC habits: (1) Key mike and wait a second before talking. (2) Let machine drop out and wait 2 seconds before keying mike. (3) If in a long QSO, ask for breaks or allow time for someone to break in for possible emergency traffic. It's a great system, let's use it to its potential.

SOUTHEASTERN DIVISION

ALABAMA: SM, Ken McGlaughn, KM4JD—ASM: W4XI, ACC: AD4DB. PIC: KA4PSE. SEC: KB4JHU. SGL: KC4YAU. STM: W4DGH. OOC: KC4TFF. OBM: KL7Q. TC: N4MOK. Football is about over, the holidays have come and gone, and it's time to dust off that ham gear and get active. During these winter months ahead, check out the nets around the state. Learn to handle traffic or increase your proficiency with traffic. We need all the people we can get on the nets. Hope everyone enjoyed the hamfest season in AL. We had great shows this year. I'm hearing that many clubs are starting upgrade classes. If you've been thinking of upgrading, check with your club or the *AL Section News* for classes. There are many wintertime activities to enjoy–traffic nets, classes (student or teacher), building projects for you or your club, contest operating, ragchewing and more. The point is to get involved. 73 for now, de Ken, KM4JD, AL SM.

GEORGIA: SM, Jim Altman, N4UCK—ASMs: AA4UA, W8BLA, KM4QQ, K4JNL. SEC: KA4HHE. OOC: W8BLA. STM: KC4BHX. SGL: WB4UVW. PIC: K4MZW. ACC: KB4TJO. TC: KI4XO. BM: N4CYC. It's nice to be able to pick one thing or another to spotlight here each month and give recognition where it's deserved. The Metro Atlanta Telephone Pioneers ARC (MATPARC) is one group that truly deserved the ARRL Special Service Club designation. Here's a club that in the space of one month participated in 2 public service events, a presentation on radio to a middle school and held a club picnic. Another hamfest season draws to a close as the Alford club presents the Lawrenceville Fest, the usual fine job we've come to expect and appreciate. I always enjoy this test; it's like a last opportunity to pack extra nuts away before winter. But, gosh, by the time you read this, it's time to look forward to Dalton. It's appropriate at this time of year to look back and forward. Last year we dodged a bullet with Hurricane Emily, but had the most severe blizzard in this century. We lost the license plate fee battle, but look forward to trying again and presenting other legislation to the General Assembly. In the past year, old friends moved on to become Silent Keys, but we'll make new friends in the coming year and welcome newcomers to our ranks. I mentioned a couple months back that the STARS at Sci-Trek in Atlanta can use your help–contact KI4Y to volunteer. There isn't a finer way to serve the public and have fun with great young people. As you read this, the Peter I DXpedition should be about to begin. Remember Bouvet? Let's not have a repeat! Tfc: W4AET 168, K4KIC 151, N4CYC 139, KM4QQ 99, AD4KA 80, KA4FOM 78, WD4DSS 77, W0HMS/4 48, KD4BSM 37, KA4HHE 37, N4UZ 35, K4BEH 30, WB4GGS 27, N9TN 27, W4REI 20, K4JNL 6, K4BAI 1. (Sep) WD4DSS 104, KM4QQ 99, AD4KA 79, KA4HHE 62, KA4FOM 58, WB4GGS 52, N4CYC 42, KD4BSM 41, WB4WQL 40, K4BAI 25, W4REI 16, N9TN 10.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM: N4ADI. ACC: KI4BI. BM: N4GMU. OOC: WB4GHU. PIC: W4SME. SEC: W4MLE. SGL: KC4N. STM: WX4J. TC: W0RAO. Packet: N4GMU. The main activity for Oct was the SET. The SET was a test of ARES' ability to send messages to and from County Emergency Mgmt Directors all over FL. The state Div of Emer Mgmt filed 67 messages, each addressed to a different county. NFL ARES operators reached 42 of the Section's 44 counties. SFL had already held its SET and wasn't alerted for this one, messages reached most SFL counties, too. Messages went from the

MFJ ACCESSORIES

Compact Speaker/Mics

Here's a Compact *Speaker/Mic that fits comfortably in your hand and has a* full size *speaker for crystal clear audio.*

No need to remove your handheld from your belt to talk or monitor calls. Clip it near your ears so you can easily hear every call with the volume turned down.

First-rate electret mic element and full size speaker gives superb audio on transmit *and* recieve. Earphone jack, PTT, light-weight retractable cord. Gray. 1¼x2x3 in.

MFJ-284 fits Icom and Yaesu. **MFJ-286** fits Kenwood.

MFJ-284 or MFJ-286 **$24.95**

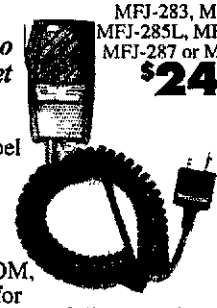
Mini Speaker/Mics

These tiny *MFJ Speaker/Mics are so small and so lightweight you'll forget they're there -- until you get a call.*

Excellent audio from electret mic element and speaker. Has swiveling lapel /pocket clip, PTT button with transmit LED, earphone jack, lightweight retractable cord. Available with L or regular connector. *Tiny* 2x1¼x¼ in.

Order MFJ-285/MFJ-285L for ICOM, Yaesu, Alinco; **MFJ-287/MFJ- 287L** for Kenwood; **MFJ-283** for split plug Alinco; **MFJ-285W** for IC-W2A.

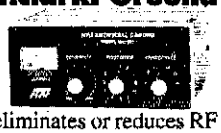
MFJ-283, MFJ-285, MFJ-285L, MFJ-285W, MFJ-287 or MFJ-287L **$24.95**



L Connector also available - order L model.

MFJ Artificial RF Ground

MFJ-931 **$79.95**



Creates artifical RF ground that eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding.

Greatly improves your signal if you're using a random wire or longwire antenna with an ineffective ground.

Electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

20 Meter CW Transceiver

MFJ-9020 **$179.95**

Throw this *tiny* MFJ 20 Meter CW Transceiver in a corner of your briefcase and enjoy DXing and ragchewing wherever you go. You get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 watts output, semi/full break-in, much more. *Free* manual. See *free* MFJ catalog for 40, 30, 17, 15 Meter versions, keyer, audio filter, power pack, tuner, antennas.

Super Active Antenna

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to- operate active antenna...quiet...excellent dynamic range...good gain... low noise...broad frequency coverage... excellent choice."

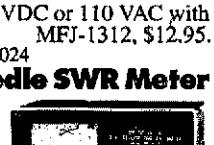
Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz - 30 MHz.

Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. Remote has 54 inch whip, 50 ft. coax. 3x2x4 in. 12 VDC or 110 VAC with MFJ-1312, $12.95.

$129.95 MFJ-1024

Cross-Needle SWR Meter

MFJ-815B **$69.95**



Peak/ average Cross-Needle SWR/ Wattmeter. Shows SWR, forward/ reflected power in 2000/500 & 200/50 watt ranges. 1.8-60 MHz.

Mechanical zero. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

"Teflon® is a registered trademark of Dupont"

MFJ Coax Antenna Switches

$34.95 MFJ-1701

$21.95 MFJ-1702B

$59.95 MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. One year *unconditional* guarantee.

MFJ-1701, $34.95. 6 position antenna switch. SO-239 connectors. 50-75 ohm loads. 2 KW PEP, 1 KW CW. 10x3x1½ in. DC-60 MHz.

MFJ-1702B, $21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in. *MFJ-1702BN, $31.95, N connectors, DC-1.1 GHz.*

MFJ-1704, $59.95. 4 position cavity switch with lightning/surge protection. Center ground. 2.5 KW PEP, 1 KW CW. 50 dB isolation at 500 MHz. 50 ohm. 6¼x4¼x1¼ in. *MFJ-1704N, $69.95, N connectors.*

Dry Dummy Loads for HF/VHF/UHF

MFJ has a full line of dummy loads to suit your needs. Use for tuning to reduce needless (and illegal) QRM and save your finals.

$29.95 MFJ-260B

$59.95 MFJ-264

MFJ-260B, $29.95. VHF/ HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. 300 Watts for 30 seconds, derating curve. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 150 MHz. 2½x2½x7 in. *MFJ-260BN, $34.95, N connectors.*

MFJ-264, $59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz, usable to 750 MHz. 100 watts/10 minutes, 1500 watts/10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 in. *MFJ-264N, $69.95, N connector. MFJ-5803, $4.95, 3 ft. coax/ PL-259.*

MFJ Low Pass Filter

Suppress TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. 9 poles, MFJ's exclusive *Teflon® Dielectric Technology™* capacitors, hi-Q inductors, ground plane shielding, RF tight cabinet gives excellent TVI/ RFI protection. Full legal power 1.8-30 MHz. Mounting tabs.

MFJ-704 **$39.95**

Full Color FAX

Use your computer and transceiver to receive, display and transmit *brilliant full color* news photos and incredible WeFAX weather maps with all 16 gray levels. Also receive/transmit RTTY, ASCII and CW.

MFJ-1214PC **$149.95**

Animate weather maps. Display 10 global pictures simultaneously. Zoom any part of picture or map. Manager lists over 900 FAX stations. Automatic picture capture and save.

MFJ Iambic Paddles

MFJ Deluxe Iambic Paddles feature a full range of adjustments in tension and contact spacing, self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. For all electronic CW keyers.

MFJ-564 **$49.95**

MFJ/Bencher Keyer

The best of all CW worlds --a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact package that fits right on the Bencher iambic paddle!

MFJ-422B **$134.95**

Iambic keying, speed (8-50 wpm), weight, tone, volume controls. Automatic keyer or semi-automatic ("bug")/tune mode. RF proof. 4⅛x2⅝x5½ in.

MFJ-422BX, $79.95, keyer only for mounting on your Bencher paddle.

12/24 Hour LCD Clocks

$19.95 MFJ-108B

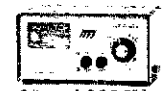
$24.95 MFJ-112

MFJ-108B dual clock has separate UTC and local time displays. Huge 5/8 inch LCD digits are easy-to -see. Brushed aluminum frame.

MFJ-112 shows hour/minute/ second, day, month, date, year at any QTH on *world map*. 12 or 24 hour display. Daylight saving time feature.

VHF SWR/Wattmeter

MFJ-812B **$29.95**



Covers 2 Meters and 220 MHz. 30 and 300 Watt scales. Relative field strength 1-250 MHz, SWR above 14 MHz. 4½x2¼x3 in.

Code Practice Oscillator

MFJ-557 **$24.95**

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable. 9-volt battery or 110 VAC with MFJ-1305, $12.95.

Earphone jack for private practice, tone and volume controls for a wide range of sound. Speaker. Adjustable key. Can be hooked to transmitter. Sturdy. 8½x2¼x3¾ in.

MFJ Multiple DC Outlet

MFJ-1118 **$64.95**

Use your rig's 12 VDC power supply to power two HF/VHF rigs and six or more accessories with this MFJ *high current* multiple DC outlet.

2 pairs of 30 amp 5-way binding posts separately fused for rigs. 6 switched, fused pairs for accessories. DC voltmeter, "on" LED, RF bypassed, 6 ft. of 8 guage power cable. See *free* MFJ catalog for more DC outlets.

Write or call... 800-647-1800

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state EOC on a 440-MHz repeater to gateway stations posted on the ARES HF net. Most of them went as book messages to HF gateways in each of the 7 districts. The District Net then distributed the messages to individual counties for delivery and reply. ARES teams handled nearly 200 EOC messages, while they dealt with real emergencies caused by tornadoes, heavy rains and high winds. One area reported more than 12 inches of rain in about 2 hours. Walton County ARES operators were busy assisting a bike ride when a tornado ripped into a vacant school and several homes. They expanded their operation to handle shelters and other tasks for the Red Cross. then took care of the SET messages and closed down in time for lunch. Everyone participating in the SET is to be congratulated for a successful operation. 90 NFL ARRL officials now use computer e-mail for routine and emergency coordination. 17 NFL hams use CompuServe, which is faster and cheaper than postage and much cheaper than telephone. E-mail allows quick contact with ARRL HQ to get info, file reports and even to order publications. Congrats to N4OVO, new EC Alachua County, and K4RDP, new DEC Suwannee District, and to NR2F, WX4H and WD4IIO on making BPL. Here's wishing everyone the best for the holidays, and let's make 1994 the best year yet. 73, Rudy. Tfc: NR2F 752, WX4H 744, N4SS 398, WD4IIO 330, WA4NDA 144, N4JAQ 135, WA4QXT 120, KI4CQ 102, AD4CN 100, KM4DY 94, WA4EYU 89, N4GMU 88, KO4DR 79, AA4FG 78, WX4J 74, KC4FL 56, N4WMS 37, N5XUJ 26, KD4OBN 23, KD4RZP 20, W4KIX 18, KJ4UW 16, WB4WOO 15, KB4DCR 14, W8IM 13, KD4WDB 10, N4YHE 8, KB4OLY 8, N4NKI 6, WB4DHF 4, KD4SRD 3.(Sep) AD4CN 72.

PUERTO RICO: SM, Tele Figueroa, KP4P—PIC/SGL: KP4PQ. STM: KP4DJ. ACC: KP4JZ. TC/BM: KP4RF. FRA new board of directors: pres WP4IZI, vp WP4ERP, secy WP4IZL, s. secy KP4ST, treas KP4TG, PR KP4UK. Sambo, KP4CI, received awards, one from ARRL by Tele, KP4P. House of Representatives project no. 330 was approved in Oct. This project makes it easier and convenient to all hams to obtain license plates with their call signs. Thanks to KP4PQ and KP4KN for their follow-up on this important achievement to the radio amateur community. PRARC celebrated an old-timer get-together at KP4CL's home. KP4U, KP4JZ, KP4AOC, KP4EW, KP4L, KP4DJ and KP4CV were present, among others. PRARL convention is Jan 30, 1994, at Albergue Olimpico. PRVIVFC pres KP4BKY has mailed the PR coordinated repeaters list to all trustees on the island. 73 de Tele.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK @ KD4GR. W4ROA reported that he contacted STS-58 SAREX KC4ACR on orbits 84 and 100. K4SCL reported that he contacted KC4ACR on ST8-58 SAREX on Oct 30. W4ROA was active with JOTA, hosting 4 Scout groups at his house at 10 AM, noon, 2 PM and 4 PM. The groups were Cub Scout Pack 136 Den 2, Boy Scout Troop 114 Den 3, Boy Scout 136 Screaming Eagles and Pack 114 Den 1. The SFL SET was a roaring success and congratulations to all who contributed to its success. Special thanks to KD4GR and WB2WPA, Asst SECs who conceived the scenario, developed the plan, successfully implemented it and brought it to a successful conclusion. KD4GR moved Communication Assistance Teams (CATs) from the FL E coast to the W coast to assist with damage caused by "Hurricane Waldo." The exercise took a turn toward reality when WB2WPA and W4SS had to cope with real severe weather conditions late Sat. There were several hundred participating, but reports received by the SM from several groups included: Broward Cty Emergency Preparedness Net (WA2DXQ reported 9 sessions with 151 QNI), Collier Cty Emerg Net, St Lucie Cty ARES/RACES, Sarasota Cty (Red Cross from WD4AHZ and KA3DEP, staging area for CAT from N4LML and N8DEK at Red Cross reported Channel 40 was at the SET operations center). KD4GR with a CAT in Collier Cty, St Lucie Cty and many operators in Pinellas Cty. Individual stations reporting: WA4EIC, K4SCL, NY1H, WA1BXU, WD4EEP, N4TBE, WA4PGS, N4SYA, KF4ZO, N4QGL, KQ4PJ, KD4MEE, KC4NFA, WB2LEZ (Pinellas CAT, WB4TEJ, KK4XI, N4QBT). KC4KGN, Polk Cty EC, reported that Polk Cty held its annual SET Oct 13. Many club bulletins were received and they're much appreciated. Hillsborough Cty Emergency Planning Operations reported an excellent outline of the Emergency Support Functions (ESF). Many thanks to Rex, N4LXG, who has retired as EC for Polk Cty, and to Darrell, KC4KGN, who picked up the reins. WB2WPA reported that the Collier County Emergency Net was activated under SKYWARN because of severe thunderstorms and tornadoes the Sat before Halloween. KB4VOL (Packet Mgr) reported 1032 NTS traffic handled. Congrats to WN1L, who's been appointed as an HF and VHF Awards Mgr for the FL Keys ARC, an ARRL Special Service Club. AE8G reported the High-Speed CW Contest was a modest success. K4IA was the overall winner with 2.02017 mins of continuous errorless copy at 41.18913 WPM. W4WJ won the 41-60 age group and K4ZK won the Over 60 age group. Others who qualified were W4LOO, K2QPR, N4PSL, W8DUV, AA4CM and K4PB. Thanks to Lab Supervisor Ed Hare, KA1CV, at ARRL Headquarters, who built a special Morse code-shaping electronic box. W4ROA, Asst Director ARRL SE Div, has been informed that he'll receive the CEO Award for Volunteerism issued by Motorola Inc Land Mobile Products Sector. He and his wife will accept this award in Schaumburg, IL, in Dec. K4RBR reports the new officers for the Conch Republic ARC in Tavernier: pres KD4ZPP, vp N4VDM, secy N7CJE, treas N4UNT, Red Cross Radio Officer W4MUG. Remember that the ARRL Info Net meets at 7:30 AM Sat on 3940 kHz and is followed by the SFL ARES Net at 8 AM on the same frequency. 73 de WA4PFK. Tfc: W3CUL 2972, W3VR 992, WA9VND 829, KB4WBY 502, K4SCL 414, WA4EIC 350, WA4PFK 302, K4FQU 296, NY1H 252, W4DL 246, KD4GR 178, N4RHJ 160, KA4FZI 153, KC4ZHF 145, K4ZK 144, KC4VK 143, AA4HT 138, KD4JMV 125, KD4HGU 125, KC4ZHN 115, K4IA 109, KB6ECH 103, KD4LQG 102, AA4BN 100, WB4WYG 97, KC4PZG 89, KD4HKS 70, KD4NPC 68, KD4ELI 64, KB4MON 59, N2WX 48, KC4ECA 46, K4EUK 45, K4RBR 42, K2GNZ 38, W4DWN 36, N4YES 30, WB4GCK 25, WB9SHT 25, W4WYR 19, KQ4DF 19, K4JI 16, W3IJR 9, W4NSY 8, WB4TOV 8, KA0RUL 8, WA4PIL 8, AA4IF 7, WB4PAM 7, W3DHN 6, KE4BOH 6, WB4GHU 3, K4ENA 2, KA0GYF 2, KA4GDU 2, KM4G 1. Tfc (Sept): N4RHJ 63, WB4GHU 16.

VIRGIN ISLANDS: SM, Ron Hall, KP2N—ASM: KV4JC.

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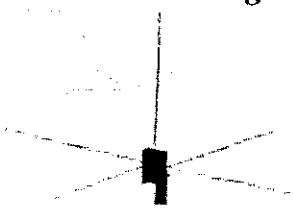
For an incredible $19.95, you get a 300 watt 5/8 wave ground plane 2 Meter base antenna. Other 5/8 wave ground planes can't work any better — no matter how much they cost . . .



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Competitive 5/8 wave ground planes can't work any better — no matter how much they cost.

You get . . . shunt fed matching that bleeds off unwanted static and gives you lowest possible SWR . . . strong lightweight aluminum construction that's protected by MFJ's Permanent Molecular Bonding Technology™ . . . low loss ceramic antenna insulator for maximum radiated power . . . MFJ's Fast Tune Radiator™ for quick accurate tuning . . . super easy installation to any 1" to 1 1/2" inch mast with single U-bolt (included) . . . and it's Made in USA.

Also available for 220 MHz, MFJ-1752, $19.95.

MFJ Pocket Roll-Up™

2 Meter Halfwave J antenna

MFJ-1730

$14.95

Roll up this half-wave 2 Meter J-antenna and stick it in your pocket! This new MFJ Pocket Roll-Up™ is the perfect gain antenna for traveling.

Get home station performance on the go. Just hang your Pocket Roll-Up in the clear, plug the handy BNC connector into your handheld and enjoy some great QSOs.

It's omni-directional and has significant gain over a 1/4 wave. It doesn't need a cumbersome ground plane so it's convenient for indoors and works great with handhelds.

1/4 Wave Ground Plane

MFJ-1740

$12.95

The MFJ-1740 is the most inexpensive way to put out a potent FM signal on 2 Meters. It'll bring up repeaters as well or better than *any* 1/4 wave ground plane — even if it cost twice as much.

The *improved* MFJ-1740 1/4 wave ground plane minimizes feedline radiation for more useful radiated power, reduced TVI and noise pickup by the coax shield.

It's made of strong lightweight aluminum parts protected from corrosion by MFJ's Permanent Molecular Bonding Technology™.

You get MFJ's Rapid-Tune-Radiator™ for easy tuning and low loss ceramic antenna insulator for maximum radiated power. Single included U-bolt mounting for 1 to 1 1/2 inch mast. Cutting chart included for 220/440 MHz. Made in USA.

"Shorty" Duck for HTs

MFJ-1718

$12.95 NEW

Add this strong, flexible "Shorty" 4¼ inch rubber duck to your 2 Meter handheld and enjoy an outstanding signal! Its super efficient, high-Q helical wound radiator is specially impedance matched to handhelds for maximum gain.

No Matter What Guarantee

Your MFJ antenna comes with MFJ's famous *No Matter What™* One Year *Unconditional* Guarantee. That means we will repair or replace your MFJ antenna (at our option) *no matter what* for a full year.

MFJ Permanent Molecular Bonding Technology™

MFJ's *exclusive* Permanent Molecular Bonding Technology™ protects aluminum. This super durable finish actually bonds itself to aluminum molecules — it won't come off unless metal comes off!

5/8 Wave 2 Meter Mobile Antenna

MFJ-1728 **$24.95**

For *maximum range* while mobile, use MFJ's *Maximum Gain™* 5/8 Wave 2 Meter Mobile Antenna. You'll get the maximum possible theoretical gain of any single element mobile antenna!

Competitive 5/8 wave mobile antennas can't work any better — no matter how much more they cost.

You get low SWR so your rig can safely deliver maximum power into your antenna. It's rated at 300 watts PEP so you can use any mobile rig plus a mobile amplifier.

You get a heavy-duty magnet mount that holds your antenna tight at highway speed and a chrome plated magnet base that keeps it looking good for years.

You get has a stainless steel radiator that'll endure years of harsh mobile use and 12 feet of coax cable with connector.

You get MFJ's famous one full year *No Matter What™ Unconditional* Guarantee.

The MFJ-1728 *Maximum Gain™* 5/8 Wave Mobile Antenna gives you *maximum* mobile range *and* the most for your money. Get yours today.

MFJ Dual 5/8 Wave Super Gain™

2-Meter Antenna . . . ***direct feed gives you irrefutable real gain.***

MFJ-1764 **$34.95**

This new MFJ Super Gain™ 2-Meter antenna *directly feeds* two full size 5/8 wave radiators *and makes both elements strongly radiate*. You get *irrefutable* real gain.

Plus, *you get additional gain* for FM and Packet because your mast doubles as a reflector. There's plenty of antenna gain to work stations off the sides and back, it's just stronger in the direction the MFJ-1764 faces.

The result? You get more range to reach distant repeaters and much better local coverage on direct channels and Packet.

You get an extremely wide 10 MHz 2:1 SWR bandwidth . . . excellent ferrite choke balun feedline decoupling to eliminate wasted power due to field pattern distortion . . . shunt choke for bleeding off unwanted static . . . strong lightweight aluminum construction protected by MFJ's Permanent Molecular Bonding Technology™. . . Made in USA.

It's fully assembled — simply attach radiators — no tuning required. Mounts vertically for FM and Packet or horizontally for SSB. Easy-to-install with single U-bolt (supplied) on any 1 to 1 1/2 inch mast or tower leg. Weighs 1 1/2 pounds, two 47 inch radiators, 23 inch boom. **Also** works as excellent *6 Meter* full halfwave centerfed antenna. Has low SWR across entire band.

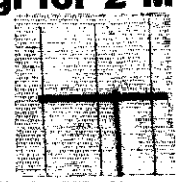
Double your Gain with direct feed!

You can double the gain of one MFJ-1764 5/8 Wave Super Gain™ 2-Meter Antenna by mounting two MFJ-1764s one above the other on the same mast and *directly feeding* both. Order MFJ-1766, $89.95, includes 2 MFJ-1764 Super Gain™ 2-Meter Antennas and a *Direct Feed* Power Splitter/Cable Harness. Also double gain on 6 meters.

If you already have two MFJ-1764s, order MFJ-1765, $29.95, *Direct Feed* Power Splitter/Cable Harness to feed your two MFJ-1764s.

Portable 3 element Yagi for 2 M

MFJ-1763 **$39.95**



You can set up or take down MFJ's new *portable* 3 element 2 Meter Yagi in seconds! Elements simply screw into the boom.

You can take it with you wherever you go and have the "oomph" and directivity of a beam.

It's easy to store and sturdy enough to use as your home station antenna.

You can mount it vertically for FM or horizontally for SSB. You can easily *center* mount it on a mast or *end* mount it on a tower leg with a single U-bolt (included). It's great for packet and PacketCluster™.

Its compact 2 3/4 foot boom gives you a calculated gain within 1 dB of a four element Yagi with a boom nearly twice as long.

Extra thick elements maintain high gain and directivity over virtually the whole 2 Meter band. A ferrite choke balun gives you excellent feedline decoupling. Coax coupling is further reduced by mounting the SO-239 connector behind the reflector.

Elements and boom are made from strong lightweight aluminum and protected by MFJ's Permanent Molecular Bonding Technology™.

Weighs just 2 pounds. Boom is 30½ inches. Made in USA.

Dual Band Mobile

Mobile Antenna for 144/440 MHz

MFJ-1724B

$14.95 NEW

For $14.95, you get an MFJ *dual band* magnet mount mobile antenna for 2 Meters *and* 440 MHz! Plus, it's covered by MFJ's famous One Year *unconditional* **No Matter What™ Guarantee.**

The MFJ-1724B is a 1/4 wave on 2 Meters and a gain antenna on 440 MHz — it's perfect for dual band radios.

Low SWR across both bands lets your rig safely deliver full power into your antenna.

The stainless steel radiator will withstand the toughest mobile service. It's only 19 inches tall so you can park in your garage without knocking over your antenna.

The MFJ-1724B handles 300 watts PEP, has 15 feet of coax and has an extra powerful magnet to hold it steady — even at highway speeds.

HT Range Extenders

Telescoping antennas for handhelds

A. B. C.

A. The Long Ranger™ 2 Meter Halfwave. MFJ-1714, $16.95. For really long range this MFJ endfed halfwave is hard to beat. It outperforms a 5/8 wave on a handheld because the 5/8 wave needs a ground plane. The MFJ halfwave doesn't. It's shorter, lighter, has more gain and places less stress on your antenna connector than a 5/8 wave antenna. When collapsed, it performs like a rubber duck. 40" extended. 10 1/2" collapsed.

B. The Dual Bander™ for 2 Meters and 440 MHz. MFJ-1712, $14.95. Got a new dual band handheld or separate units? One antenna fits all. It's a 1/4 wave for 2 Meters and a 5/8 wave with gain for 440 MHz. 7 1/4" collapsed, 19" extended.

C. The Pocket Linear™ 3/8 Wave, 2 Meters. MFJ-1710, $9.95. Carry this pen size antenna in your pocket like a ballpoint pen. When you're using your rubber duck, on the fringe and noisy, put on The Pocket Linear™, extend it to 24 1/2" and carry on your QSO. Has pocket clip. 5 1/4" collapsed.

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SEC: NP2B. STM: NP2E. TC: NP2R. PIC: NP2DI. SGL: NP2I. NM: VP2VI. Happy 1994 from the whole VI gang. Hope Santa was good to you. 23 St Thomas hams and 23 members of the CB club, furnished H&W communications for the Americas Paradise Triathlon. The teamwork was great and the whole race was covered from one end of St Thomas to the other. At the last VE session on St Thomas, Andy, NP2FS, made Extra Class; Ken, NP2DS, made Adv; Margaret, NP2GP, made Gen; 2 made Tech & 4 others passed written elements for future use. Over on St. Croix the special-event station for the 500th Year of Columbus' landing was a success with more than 360 contacts. Participating were KV4JC, NP2R, NP2B, NP2I, NP2EU, NP2EF & KV4IH. Helping with the Tri-Forces Triathlon were: K1LAG, NP2GA, NP2EP & WP2AAA. Congrats to the VIARC on their 1st Place 2A finish for Field Day. St Thomas, St John ARES check-in total for Oct. was 43. 73 de Paradise de KP2N.

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford E. Hauser, KD6XH—I hope Santa brought you a few more toys. As we begin a new year of radio activity, please ask yourself a simple question: "What did I do during 1993 to help Amateur Radio? Was I active in community/state activities? Did I help someone learn about our hobby? I hope the answer is positive. Everyone of us needs to do his/her part to promote the growth of Amateur Radio. During 1993, we saw a growth in the number of licensed hams and ARRL Members. Club membership has increased and new classes for beginners are going strong around the state. This is a good sign for Amateur Radio. Congratulations to N AZ DX Assn for having 100% of club membership as ARRL Members. Several clubs participated in community service projects during Oct and Nov. The annual Tour de Tucson bicycle event was handled well by the Tucson Repeater Assn and the Old Pueblo RC. Ted Willis, AA7HX, was the coordinator for this event. 50 Amateur Radio operators helped provide health-and-welfare communications with few problems. These events give us practice for emergencies and help promote Amateur Radio through community cooperation. Several clubs throughout the state are involved in this type of activity, with several clubs helping in more than 1 event during the year. Speaking of clubs, I'm trying to compile a list of all Amateur Radio clubs in Arizona. So if your club didn't receive a letter from me during the month of Nov or early Dec, then I don't know your club even exists. Please write and give me the club address. Better yet, send me your club newsletter every month so I can keep up on your club activities. I've visited many clubs during the past several months and plan to try to visit more in 1994. To start off the year, I'll visit the Yuma ARC on Jan 7, 1994. Thank you for your support in 1993. 73, Clifford Hauser, KD6XH. *Net ON/QTC/Sess:* AETN 891/75/31; ACN (2 M) 208/84/31. Tfc: W7EP 80, W7OIF 37, WA7JCK 37, WA7OGM 10. (Sep) WA7OGM 10.

LOS ANGELES: SM, Phineas J. Icenbice Jr, W6BF—According to the Associated Radio Amateurs of Long Beach Inc, its official bulletin invites you to operate W6RO on the *Queen Mary* if you want to feel like a DX station and remain in Long Beach. Any licensed Amateur Radio operator is eligible and you don't even need to be a member of ARALB. All it takes is for you to agree to operate at least 4 hours once a month. (Call Bill Holder, W6TNB, 310-597-6544 or Nate Brightman, K6OSC, 310-427-5123 for information.) This is equal opportunity employment! Repeater coordination is usually one of the major topics discussed at local amateur gatherings. The fact that a repeater is "coordinated" doesn't mean that the frequency assignment is their sole property. In fact, several coordinating groups can "coordinate" the same channel. According to rumors, this is likely to happen in the LA area soon. One reason is that frequency assignments have been exhausted and waiting lists exist on the VHF and UHF bands. Some groups have several frequency assignments and a few groups are composed of only 3-4 active operators who only use the frequency a few times per week and resent anyone trying to use the frequency when it's not in use. Some repeater Coordinating Groups are reluctant to answer mail or phone calls in a reasonable time frame, like 30-60 days. In some cases, meeting notices are changed without adequate notification and voting is of the "Good-Old-Boy" and closely held to prevent unwanted intrusion. The new FCC policy of "macromanagement" may awaken present coordinators!—Repeater "Coordination"" could become a thing of the past if rule violations by coordinators continue. Joining the ARRL as a Life Member is a fantastic bargain when you're young (under 35 or so). The rules should be adjusted to donate $25 to each ARRL club that sponsors a new Life Member. Life Members should be the lifeblood of the ARRL. Older Members who tend to drop out over the age of 70 should get a break on the price for Life membership. (Maybe they should pay only $150 for this privilege) Computer actuarial statistics should provide the optimum choice for these exact numbers. About 20 local RCs send me their bulletins. Only about 15% pay the bulk mailing rate. A few clubs should join together at least for their bulletins and save a bundle in postage and printing. (Your local Post Office will provide the necessary forms and rules.) Active clubs and active membership is the key to the future of the Amateur Radio service. Many hams keep saying, "This is only a hobby." Call it what you may, but commercial interests are quietly waiting for an opening; if it's only a hobby, so who could care if you're displaced, zeroed *out*! 73 de W6BF, Phineas.

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co-Bob, W6LKN 909-686-3823; Org Co-Art, W6XD 714-556-4396; SB Co-Ken, WA6ZEF 909-983-1272. PIC & ASM for Section News: Jerry, AD0A 909-689-1923. The Corona-Norco ARC boasts 9 new Techs as a result of NF6Y's class. The Inland Empire ARC net meets the 1st Thu of the month on 145.48- (CTCSS 77.0 Hz) at 8 PM. The Moreno Valley ARA recognized Larry Marcum, KA6GND, as a MVARA life member for his extensive support and service to the club since 1987—congrats, Larry! KM6LM of the Lee DeForest ARC has established a fine node on 144.95 simplex that ties to San Diego, LA to San Fernando Vy and Palmdale. Ring it up and follow the instructions given for some good

MFJ's world famous 3 KW Antenna Tuner

If you won't settle for less . . . here is the finest 3 KW tuner money can buy!

The MFJ-989C is not for everyone. **However**, if you make the investment, you'll get the finest 3 KW antenna tuner money can buy. **Here's** why . . .

Massive Transmitting Capacitors

You get two *massive* 250 pf transmitting variable capacitors with detailed logging scales. They can handle *amps* of RF current and withstand 6000 RF volts because the plates are smoothed and polished and have extra wide spacing.

Precision Roller Inductor

A precision roller inductor lets you tune your SWR down to the absolute minimum. A 3-digit turns counter plus a spinner knob gives you exact inductance control.

Ball bearings on front and back shafts give you a velvet smooth vernier feel. Steel end plates and shafts give you lifetime durability.

You won't have arcing problems with this roller inductor. That's because firm springs put considerable pressure on a plated contact wheel for excellent electrical contact.

Wide, low inductance straps are used for high current connections and a new core gives you excellent RF properties for minimum loss.

MFJ-989C **$349.95**

Cross-Needle Meter

You get a lighted *peak* and average reading Cross-Needle SWR/Wattmeter with 200 and 2000 watt ranges. Its new directional coupler gives you accurate SWR and power readings over the entire 1.8 to 30 MHz range.

Super Heavy Duty Balun

You get a super heavy duty current balun for balanced lines. It's made with two giant 2½ inch powder iron toroid cores and wound with *Teflon®* wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines without core saturation or voltage breakdown.

Ceramic Antenna Switch

You get a two wafer 6 position *ceramic* antenna switch with extra large contacts for trouble free switching.

Plus much, much more

You also get a *built-in 300 watt dummy load*, full one year *unconditional* guarantee, flip stand, all aluminum cabinet, tough baked on paint, locking compound on all nuts and bolts. 3 KW PEP. Meter lamp needs 12 volts. Compact 10¾x4½x15 in. Made in the USA. Add $13 s/h.

Don't settle for less--get yours today!

MFJ's *deluxe* 300 Watt Tuner

MFJ-949E **$149.95**

More hams use the MFJ-949E than any other antenna tuner in the world! **Why?** Because you get proven reliability, the ability to match just about anything and a one year *unconditional* guarantee.

You get a lighted *peak* and average reading Cross-Needle SWR/wattmeter, antenna switch, 4:1 balun for balanced lines, 1.8-30 MHz coverage and a *full size* dummy load that easily handles 300 watts of abusive tune-up power.

New 8 position antenna switch lets you *pre-tune* into dummy load to minimize QRM.

The inductor switch is designed to withstand extreme voltages and currents--it's not an underrated off-the-shelf switch that can put you off-the-air.

Each MFJ-949E aluminum cabinet is chemically etched to strongly bond MFJ's tough *baked-on* paint. You won't find a tougher, longer lasting finish anywhere.

MFJ's *new* 300 Watt Tuner

MFJ-948 **$129.95**

If you don't need a dummy load but want *all* the other features of the MFJ-949E, choose the MFJ-948 for $129.95. The MFJ-948 features a *peak* reading *lighted* Cross-Needle meter with a built-in lamp switch, one year *unconditional* guarantee and is made here in the USA.

MFJ's *smallest* Versa Tuner

MFJ-901B **$59.95**

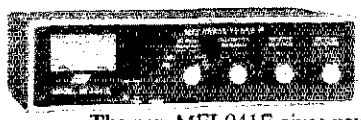
The MFJ-901B is our smallest --5x2x6 inches --(and most affordable) 200 watt PEP tuner -- when both your space *and* your budget is limited. Great for matching solid state rigs to linear amps.

MFJ's *artificial* RF Ground

MFJ-931 **$79.95**

Creates *artificial* RF ground. Eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

MFJ's *super value* Tuner

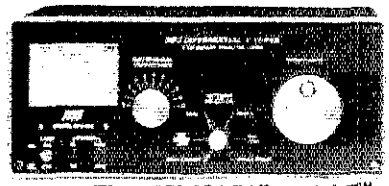


MFJ-941E **$109.95**

The new MFJ-941E gives you a 300 watt PEP tuner that covers everything from 1.8-30 MHz -- plus you get a lighted cross-needle meter, antenna switch and balun . . . for an incredible $109.95.

Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors. Measures 10⅝x2⅞x7 inches.

2 Knob Differential-T™ Tuner



MFJ-986 **$289.95**

The 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. Handles 3 KW PEP.

Roller inductor makes tuning smooth and easy. Turns counter lets you quickly re-tune to frequency.

MFJ's lighted *peak* and average reading Cross-Needle meter reads forward and reflected power in 2 ranges. Current balun reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced. Covers 1.8-30 MHz. $13 s/h.

MFJ's *random wire* Tuner

MFJ-16010 **$39.95**

Operate all bands anywhere with any transceiver with the MFJ-16010. It lets you turn a random wire into a transmitting antenna. 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 inches.

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Artificial ground *and* full feature 300 watt 1.8-30 MHz antenna tuner. Has lighted Cross-Needle Meter, 4:1 balun for balanced lines.

An artificial ground can turn a random wire into an effective antenna that really works.

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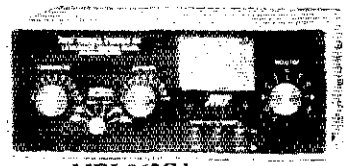
Don't leave home without this *mobile* tuner! Have an uninterrupted trip as the MFJ-945D extends your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8x2x6 inches uses little room. *Lighted Cross-Needle* SWR/Wattmeter makes tuning easy while in motion. Has lamp switch. 1.8-30 MHz. 300 watts PEP. **Mobile mount**, MFJ-20, $4.95.

MFJ's *versatile* 1.5 KW Tuner



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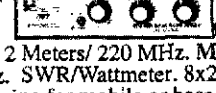

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digital DX. WA6PFA of the Org Co ARC has announced that the Braille Institute of Anaheim is looking for volunteers to teach ham radio during the day on Wed; call Mary Johnson at 714-821-5000 if you can help. The Fullerton RC sadly reports the passing of its 1st club president, Jack Tielrooy, W6HDT. It's not too late to write your congressman and senator regarding their support for the Amateur Radio Service Joint Resolution (HJR 199 & SJR 90), which recognizes Amateur Radio as a public benefit and encourages the FCC to continue to enhance the development of the Amateur Radio service; and the Amateur Radio Volunteer Service Act (HR 2623), which would amend the Comms Act so that no amateur licensee who provides volunteer services for the FCC, such as a VE or monitor, shall incur personal financial responsibility for alleged damage, loss or injury. US senators and representatives are listed in the US govt section of local phone directories. Even a QSL card to them will help; if you want a copy of a sample letter to them, contact our PIC, AD0A, at 909-689-1923. ARRL Washington Area Coordinator Perry Williams, W1UED, is retiring in Apr '94; our thanks to Perry for his dedicated service to Amateur Radio for so many years! A big applause to the many hams, ECs, DECs, ROs and others who provided communications support to the firefighters during the recent swarm of fires in S CA. We're gathering reports from the RACES/ARES leadership and forwarding it to the ARRL Field Services Dept, which will compile it into a future article for *QST*. STM WF6O report: SCN/CW 31 sess, QNI 124, QTC 78, SCNV 31 sess, QNI 324, QTC 264; PSHR: WF6O, N6GIW, KC6SKK, KD6CCF, KA6TND; PBBS Tfc: WF6O 218. Indv tfc: KD6CCF 447, KC6SKK 150, N6GIW 81, W6RE 71, KA6HMS 70, WF6O 58, AD0A 45, KA6TND 39, KC6YRH 35. Very 73!

SAN DIEGO: SM, Harry A. Hodges, WA6YOO, 619-743-4212—ASM/SEC: Rich Medhurst, KD6BFO. ASM/ACC: Pat Bunshold, WA6MHZ. ASM for Youth: Frank Forrester, KI6YG. STM: Warren Dilley, KT6A. Papers headlined "Firestorm 1993" referring to the numerous wildfires throughout CA in Oct and Nov. Although the fires were devastating to life and property, local hams again proved their worth in assisting government and private agencies with adjunct communications. ARES and RACES communicators spent countless hours at the scene of the fires, at shelters, serving with damage-assessment teams, and at EOCs doing what they do best: Communicating. Many operators volunteered in excess of 40 hours weekly, and this on top of their regular jobs! Thanks to the operators who kept the repeaters clear for emergency traffic. Also worthy of recognition are local clubs participating in charity food drives. SDCTN: sess 29, QNI 209, QTC 169. AREST: sess 4, QNI 40, QTC 1. ARESN: sess 4, QNI 20, STC 4. PSHR: KC6ZEC 246, KT6A 145, KR6K 141. Tfc: KT6A 520, KC6ZEC 377 BPL 108, KR6K 255, KI6MP 134, K6WQR 34, WA1ZEN 33, WA6IIK 5.

SANTA BARBARA: SM, Thomas I. Geiger, W2KVA—As promised, here's the tale of Santa Ynez Valley ARES and the Marre fire, as reported by SYV EC Dave Lamb, WA6BRW. On Oct 2, the Marre fire had been burning for several days when Rod Finch, WB6KFA, comms leader for the US Forest Service, contacted Dave to request hams as "shadows" for fire officials working community outreach. 10 volunteers convoyed to the fire camp "which was now like a small city with more than 3400 fire and support personnel." After a quick orientation, the team accompanied PI officers who were passing vital information to endangered residents. The following day Ground Support asked for help with traffic control on the narrow mountain roads. "Large water trucks, personnel carriers, pickups, 'low boy' flatbed trailers carrying huge bulldozers all had to pass on these roads as one shift came off duty and another went on." One ham was stationed at the bottom of the mountain, another at the top (often just a few feet from the fire), each accompanying a safety officer. WA6BRW got a firsthand look at the firefighting operations when he was asked to go to Zaca Lake *in front of the fire!* The hams' working day started with a 5:45 AM arrival at the fire camp, beginning work almost immediately with the changing shifts, and continuing well into the evening. After several days, the NCSs had to be relieved and several hams from Santa Maria pitched in with mutual aid. A measure of how valuable ARES was to the firefighters is found in the fact that the "ham desk" got 1 of only 20 phones available. Thanks to the following for their terrific support: SYV hams–WA6BRW, W6MSY, KD6GIK, KC6RPN, KC6RPL, N6JNS, K3NXF, KN6MR, KD6FJA, KD6KYK; SM hams–KK6AD, KB5OO, KD6GIO, KI6XG, KM6XI, KC6BAY, N6TME, N6XJO; SB - WB6RDV (Los Padres Reserve Comm. Tech).

WEST GULF DIVISION

NORTH TEXAS: SM, Bob Adler, NZ2T—ASMs: W5GPO, W5IWE, KG5SC, WD5IVD, N5SKG, KF5BL, KB5LES, KB5OQX, WB7NPH, N5UQA, KB5YAM. ACC: W5SOQ. STM: KJ5GE. SEC: K5UPN. PIC: WW5L. SGL: K5LP. TC: K5SXK. OOC: WB5UDA. Welcome Jay Stanfield, WB5UDA, new OOC. Please send your OO reports to Jay on the 1st of each month. Thanks to W5IAB, outgoing OOC, for his service to his fellow hams; we wish him well. Sorry to report Bob Nelson, KB5BNU (recently changed to AB5NM), SK. Bob's contributions to Amateur Radio would be far too long for me to list here, but they included coordinating public service events for the Dallas ARC and service as the security communications coordinator at Ham-Com. He was a great amateur, a friend to all, and will be missed by all. Upgrades at Oct 29 session Longview, TX: Techs Tim G. Zehner, Cheyenne T. Greatorex and Tim Rhodes; Gen KC5DSO; C5DSP. Thanks VEs N5RQC, KI5AC and W3PC. Thanks W5QXK and N5TD for continued support through bulletin distribution. TPRS is developing the Cardinal TexNet node to "grab" and format ARRL bulletins from W1AW for injection into the packet network. Tom McDermott, N5EG, has done much of the work on this project and we appreciate it. There are many "behind the scenes" people who maintain TexNet, and more people who spend time and money to keep those great UHF/VHF repeaters in good working order. Thanks y'all!! NTX ARES has 1069 members. The following DEC/ECs reporting: KA1CWM, W5OJP, WD5F, KA5OZC, N5WQX, KB5CZH, KF5YR, WB5CVR, W5HOO, WB5FLQ, WB4WXD, K5UPN,

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IC-737 New HF	1652.00	Call $
IC-735 Gen Cvg Xcvr	1239.00	Call $
IC-728 New All-Band HF	1105.00	Call $
IC-729 All-Band HF Plus 6 Meters	1492.00	Call $
IC-2KL 500W Amp	2260.00	Call $
IC-4KL 1kW Amp	7865.00	Call $
Receivers		Call $
IC-R9000 100kHz to 1999.8 MHz	6265.00	
IC-R7100 25 MHz - 2 GHz	1585.00	Call $
IC-R71A 100 kHz - 30 MHz Rcvr	1279.00	Call $
IC-R1 100 kHz - 1300 MHz	567.00	Call $
IC-R72 30 kHz - 30 Mhz	1145.00	Call $
IC-R100 100 kHz - 1856 MHz Rcvr	772.00	Call $
VHF		Call $
IC2iA 2 Meter HT	372.00	
IC-P2AT New 2 Meter HT	399.00	Call $
IC-2GAT New 7W HT	425.00	Call $
IC-2SAT Micro Sized HT	372.00	Call $
IC-2SRA 2M HT/Scanner	599.00	Call $
IC-229A/H 25/50W 2 Meter Mobile	452/465	Call $
IC-901 New Remote Mount Mobile	465.00	Call $
UHF		Call $
IC-4iA 440 MHz HT	452.00	
IC-P4AT New 70cm HT	492.00	Call $
IC-4SRA 70cm w/Scanner HT	612.00	Call $
IC-W2A 2M/70cm New HT	599.00	Call $
IC-W21ATNew Dual Band HT	625.00	Call $
IC-V21AT New 2M/220 Dual-Band HT	783.00	Call $
IC-24AT New 2M/440 Mini HT	465.00	Call $
IC-A1A 2M 440 1.2 GHz HT	1199.00	Call $
IC-2330 2M/220 Mobile	865.00	Call $
IC-2410H 2M/70cm Mobile	865.00	Call $
220 MHz		
IC-3SAT Micro Sized HT	385.00	Call $
IC-P3AT Mini FM HT	452.00	Call $
1.2 GHz		
IC-X2A 440 MHz/1.2 GHz HT	772.00	Call $
IC-12GAT Super HT	505.00	Call $

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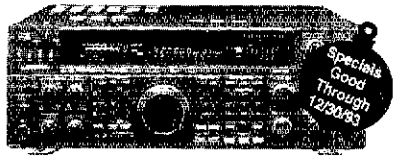

HF Equipment	SAVE	List	Jun's
TS-950SDX New Digital Processor HF	$100	4799.95	Call $
TS-850S/AT New All Mode All Band	$50	2149.95	Call $
TS-850S New All Mode All Band		1949.95	Call $
TS-450S/AT New HF Xcvr	$50	1639.95	Call $
TS-450S New HF Xcvr	$50	1439.95	Call $
TS-140S Gen Cvg Xcvr		1079.95	Call $
TS-690S HF Plus 6M Xcvr		1699.95	Call $
TS-50S New HF Moible	$30	1279.95	Call $
TL-922A HF Amplifier		2099.95	Call $
Receivers			
R-5000 100 kHz - 30 MHz		1179.95	Call $
R-2000 150 kHz - 30 MHz	$15	849.95	Call $
VHF			
TH-22AT New 2 Meter HT		349.95	Call $
TH-28A New 2 Meter HT	$20	399.95	Call $
TH-78A New 2M/70cm HT	$20	449.95	Call $
TM-742A 2M/440 Mobile	$30	929.95	Call $
TM-641A 2M/220 Triple Receiver		929.95	Call $
TM-241A 50W Mobile FM	$20	459.95	Call $
TR-751A All Mode Mobile 25W		769.95	Call $
UHF			
TH-42AT New 70cm HT		349.95	Call $
TH-48A New 70cm HT		449.95	Call $
TM-441A Compact 35W Mobile		529.95	Call $
TM-541A Compact 1.2 GHz Mobile		649.95	Call $
TM-941A 2M/440/1.2 GHz		N/A	Call $
TM-732A 2M/440 Mobile	$30	769.95	Call $
TM-942A 2M/440 MHz 1200 MHz		1279.95	Call $
220 MHz			
TM-331A Compact Mobile		519.95	Call $

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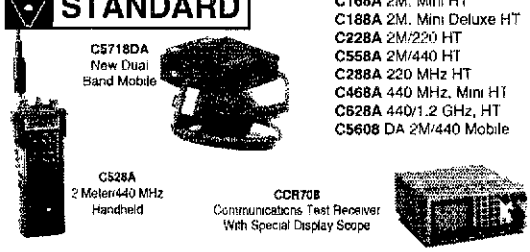
HF Equipment	SAVE	List	Jun's
FT-1000D Top Performer	$100	4919.00	Call $
FT-990 All Mode New	$50	2579.00	Call $
FT-747 GX Economical Performer	$35	909.00	Call $
FT-890 HF Base w/ I-30 MHz Rec	$35	1439.00	Call $
FT-767GX Band New	$35	2299.00	Call $
FL-7000 15M-160M Solid State Amp		2459.00	Call $
Receivers			
FRG-100B New Mini Receiver		669.00	Call $
VHF			
FT-416/25B New 2 Meter HT	$15	415.00	Call $
FT-411 New 2M Loaded HT	$15	369.00	Call $
FT-26 Mini 2 Meter HT		309.00	Call $
FT-23 R/17 Mini HT		299.00	Call $
FT-2400 50 Watt Mobile	$15	439.00	Call $
FT-290R/690R-6M All Mode Portable		699.00	Call $
UHF			
FT-816/25 New 440 MHz HT		469.00	Call $
FT-76 Mini 440 MHz HT		329.00	Call $
FT-815 70cm HT		N/A	Call $
FT-911 Compact 1.2 GHz HT		529.00	Call $
FT-790 R/II 70cm/25W Mobile		819.00	Call $
FT-912 1.2GHz 10W Mobile		709.00	Call $
VHF/UHF Full Duplex			
FT-736R New All Mode 2M/70cm	$35	2149.00	Call $
Dual Bander			
FT-470 Compact 2M/70cm HT	$25	509.00	Call $
FT-530 2M/70cm HT	$25	569.00	Call $
FT-5100 Ultra Compact 2M/440 Mobile	$25	749.00	Call $
FT-5200 Ultra Compact 2M/440 Mobile	$25	789.00	Call $
FT-6200 Ultra Compact 440/1.2 GHz Mobile	$25	879.00	Call $
Repeaters			
FTR-2410 2M Repeaters		1247.00	Call $
FTR-5410 70cm Repeaters		1247.00	Call $
Rotators			Call $
G-800SDX Med/Hvy Duty 20 Sq Ft	$25	439.00	Call $
G1000SDX Heavy Duty 22 Sq Ft	$25	539.00	Call $

STANDARD



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IC-2GAT 7w 2 mtr. HT	$289.95	$429.95
IC-02AT 5w 2 mtr. HT	$269.95	$399.95
IC-03AT 220 Handheld	$269.95	$399.95
IC-4SRA 440/Scanner	$479.95	$612.95
KENWOOD		
TL-922A 2K Amplifier	CALL	
YAESU	**SALE**	**LIST**
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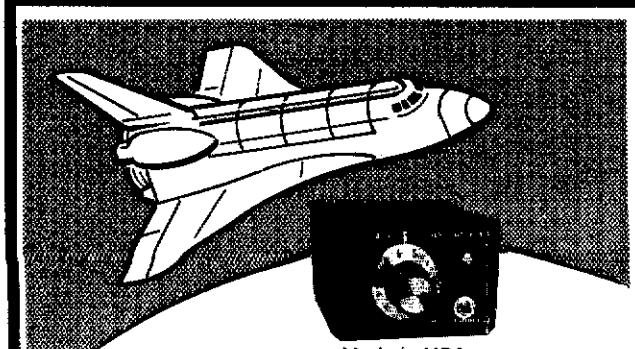

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N5NWY, K4HIX, W5GPO, WA4HKW, N5XSD. There are 41 active nets, 28 of which have NTS liaisons. Welcome new ARES appointees (as reported by SEC K5UPN): K5HW/EC, N5QQE/EC, AB5BX/EC, N5XSD/EC and John Newman/EC. Congratulations to McKinney ARC on 25 years of ARRL affiliation, and our best wishes for another 25. Garland ARC offering weekly tests at Tuckers–more info next month. Dallas County REACT ARC, one of our ARRL Special Service Clubs, holding classes with 20 students; N5IAG, W5SOQ, K5JD, WB5JBP, AB5LQ and N5EYR instructors.

Net	Freq	Time	QNI/QTC/SSN	NM
TEX	3643	1900/2200	436/256/62	K5SV
TSN	3719	0200Z	190/71/31	KI5LQ
TTN	3873	1830	611/167/31	W5OJP
DTTN	7273	0830	469/271/31	K5UPN
7290	7290.0	10AM/1PM	3433/564/47	N5OWQ
DFWF	146.88	1830	390/107/30	N5SKG
DFWL	146.72	2230	402/214/31	N5SKG
NTXD	Digital	NA	N.R.	KI5LP
ARES	3873	MON/2000	55/XX/5	K5UPN
THNN	7105	M-F 1200	108/40/22	KG5TL
HRTN	-	-	155/37/13	N5SRI

The West Gulf Division ARRL Task Group operated W5TEX special event Oct 16-17 at the State Fair of TX. 22 operators made 397 contacts during this event. Thanks AARC, DARC and IARC for their support of the 2-day event that featured a lot of public participation. Welcome new ORSs: KI5NL, N5TFB and KB5YAM. Happy 1994. God bless and 73 till next time, Bob, NZ2T. Tfc: NZ2T 3706, N5SKG 1070, KF5BL 410, N5UQA 288, W5YQZ 204, KI5NL 178, KJ5GE 168, W9OYL 130, N6KCL 79, N5ZCC 76, K8LUY 66, WB5SDD 60, KB5GLV 55, WA5EZT 39, KB5SFE 37, N5TTU 29, KB5YAM 29, N8OVT 25, WB5BKM 24, N5VGV 22, N5TFB 20, W5VMP 14, KI5LP 13, NT5R 7, AC5Z 5, N5WOY 0

OKLAHOMA: SM, Joe Lynch, N6CL—250 of you braved a prewinter chill to attend the Enid Hamfest Nov 6. Green Country has been designated as the West Gulf Division convention this year. QCWA Chapter 63 now has a 2-meter net. It meets Thu at 7 PM on the 145.41 MHz repeater. New officers for 1993-1994 for Enid ARC: pres Bill Blom, N5NDS; vp Bill Thompson, N5YVH; secy Bill Watkins, N5SDC; treas Clint Clay, KB5OEQ; board member Wendel Gard, WB5OQX. Hmm, I wonder which officer answers when someone hollers, "Hey,Bill!" Congratulations to OKDXA on its affiliation with the ARRL. Watch for a couple of people from OKDXA being appointed as DXCC QSL card checkers soon. Congratulations to the Kiamichi ARC on its tremendous growth. I remember making a trip to Hugo for its organizational meeting and there were 8 present. Now there are 35 members and the club is still growing. If you missed the Oct meeting, you missed a great program put on by John, N5GCL, on his homebrew 4-element circular quad antenna. If you live in the SE part of the state, particularly near Hugo, and aren't yet a member, contact Ron Henson, KJ5GG, at RT 2 Box 960, Hugo, OK 74743. Tfc: WB5NKC 1538, WB5NKD 301, N5IKN 156, WA5OUV 75, KI5LQ 117, KE5JE 88, W5REC 41, KC5OU 29, WA5OGC 23, K5GBN 23, WA5ZOO 23.

SOUTH TEXAS: SM, Alan Cross, WA5UZB—BM: N5LYG. ACC: KB5AWM. OOC: K5SBU. PIC: N5FIX. SEC: K5DG. STM: WD5GKH. TC: WA5WCY. ASMs: NV5L, KS5V, WA2VJL, K5PFE, WA5TUM, KA5QAP, N5OLU, WA5JYK, KB5JON. Congratulations to Katy ARS for renewing ARRL affiliation. Beaumont ARC has interesting group of 11 amateurs, all hremen! N5SXF of Katy ARS had good article on shoestring operations; his point was to find a way to operate a mode without spending a fortune, and have some fun! Houston's Sierra Club helped by NW ARC members N5FIX, KB5QLX, KC0LM, N5PJI, KI5MD, KB5RXT, KF5SB, KB5WQJ, N5RBC, N5MGM, N5NXS, KC5CVN, KJ5IP, WA5DWX, WD5GNI, KB5SCA, KC5BAK and AB5KK. The Hill County ARC did well in the 1993 SET with KA5M, WØHLV, KB5TWU, KC5CIG, W5FES, K5LOX, N5KAO and KB5KEY participating. Did your club, organization or ARES group participate in the SET? Emergencies don't always happen around the last weekend in June–be prepared. Brazos Valley continues to license people, with 14 passing in last session. B-VARC did testing at the Houston Convention. Team lead by ND5F, assisted by AB5IV, K5DIY, AA5JW, AB5OK and KG5IT. NW ARS and B-VARC working with ham radio at the Ronald McDonald House at Houston Medical Center. If you're in the area and want to help, contact N5FIX for details. Stephen F. Austin ARC has its plate full of ARES, RACES and public service events–off to a good start! Thanks to the people at the Houston ECHO Society for having me out to speak; visiting clubs and speaking is part of my job. Clear Lake ARC was the 1st to participate at the Ferguson Elementary School museum. Thanks to KA5GLX, WB5WOW, N5SYI and N5SPU, the 1st month's theme at the school's museum (a glass display case) was Amateur Radio–great going! I've seen in several newsletters that 2 clubs in the Section are looking for new meeting places. This isn't an easy task. Most clubs are visitors at a meeting place, and if there are rules to follow, you as a member should follow them to the letter. As a help in locating a net, here's a little different presentation for Section nets:

Net Name	Abbr	NM	Liaison
Central TX Traffic	CTTN	KS5V	TTN,TEX, DRN5,RN5, DTTN
TX CW Traffic	TEX	KS5V	TTN,DFW, CTTN,TSN RN5
TX Slow CW	TSN	KI5LQ	TEX,DFW
TX Traffic	TTN	W5OJP	TEX,DFW, CTTN
TX Traffic (Day)	DTTN	K5UPN	DRN5,TEX
Travis County ARES	TCAN	KF5NI	CTTN
HOTROCS Traffic	HTN	N5SRI	TTN,CTTN
S TX Digital	STXDN	KS5V	NTXDN, CTTN,RN5
TX High Noon CW	THNN	KG5TL	DTTN,TTN
RN5 Cycle Two	DRN5	WB5YDD	-

Activity for the nets (net/sessions/traffic): CTTN/60/167; TEX/62/256; TSN/31/71; TTN/31/167; DTTN/31/271; TTN/13/32; THNN/22/40; DRN5/62/471. Tfc: W5TFB 293, N5NAV 177, W5KLV 154, K5GM 128, W5CTZ 92, N5UAP 92, N5OWO 86, WB5YDD 79, WD5GKH 57, WA5FXQ 56, KD5GM 52, N5OUJ 43, AK5M 26, W5BGE 25, N5SCO 16, KG5CX 14, NZ5J 1.

WEST TEXAS: SM, A. Milly Wise, W5OVH—The city of Odessa and Ector County conducted a "Technological Hazard Exercise" on Oct. 27, 1993. The EOC was manned and communications were provided by operators Dan, WD5CWJ, Gaylan, KE5CH, John, KF5NI, and Les, N5KOA, and many thanks for their participation. Thanks to the hams who helped with the Jamboree on the Air (JOTA). I know the Scouts and their Scoutmasters appreciated it. The Panhandle ARC has a new meeting place at the Texas State Tech College off Ave J, between 2nd St and 4th St on the 2nd floor of the ELT Bldg. Many thanks to the hams who helped with the Wild West 150 Bike Tour and hams who participated: Dave, KB5EDP; Jerold, N5MGU; Joshua, KB5SGP; Jim, WB5UDX; Ronnie, N5ZLU; Dick, N5AE; Kathy, WD5BWR; Chester, KA5KOH; Dave, KB5IAS; Kim, KB5VIT; Jimmie, KB5WIO; Mark, N5NLL; and Earl, WD5GSV. Midland ARC had Boy Scouts visit the club station and visit with other Scouts across the world, and thanks to Wayne, WT5M, who headed the project. Oct upgrades in Midland: James, N5CLR, to Gen; Gerry Petree of Crane to Tech; James, KC5DGA, to Tech with code. Sorry to be late with these upgrades. Nathan, KB5ZHM, to Gen; Lloyd Finch to Tech; Roy Douglas to Tech with code. Officers of the El Paso ARC: pres Clay, K5TRW; vp John Schilling, KJ5EM; secy Ed Jensen, K5ED; treas Milly Wise, W5OVH; directors Don, KB5NBR; Richard, N5LVW; Bill, N5OGJ; and Mary, KA5EWJ. When any of the clubs of WTX Section have elections, please notify me as to the new officers. 73, Milly Wise, W5OVH.

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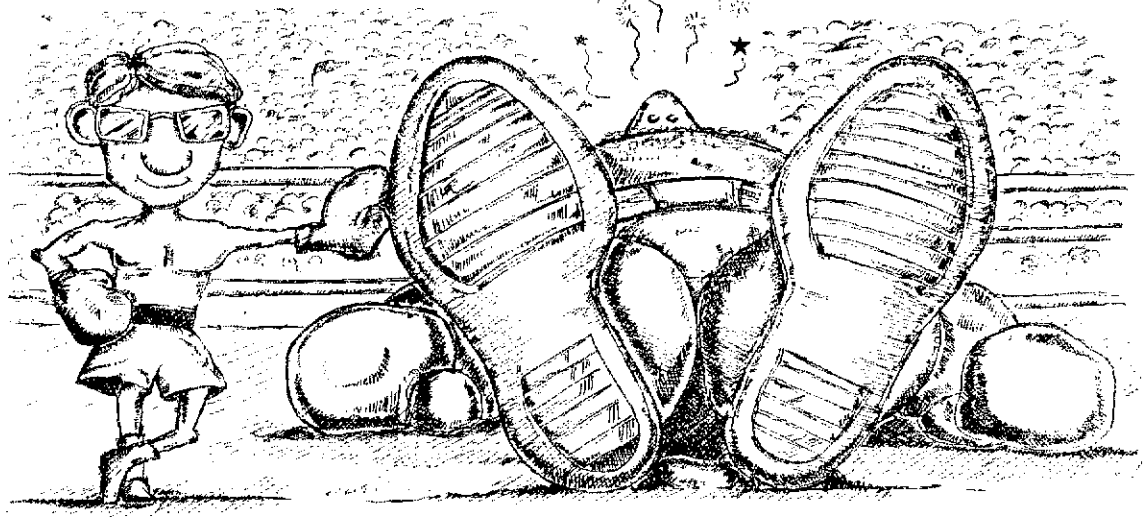

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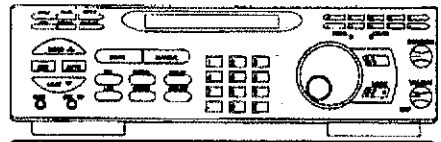

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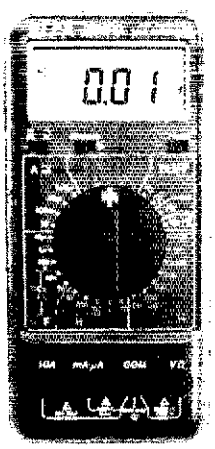

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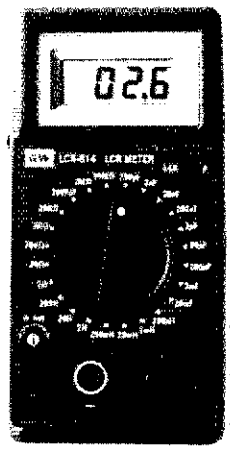

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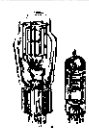

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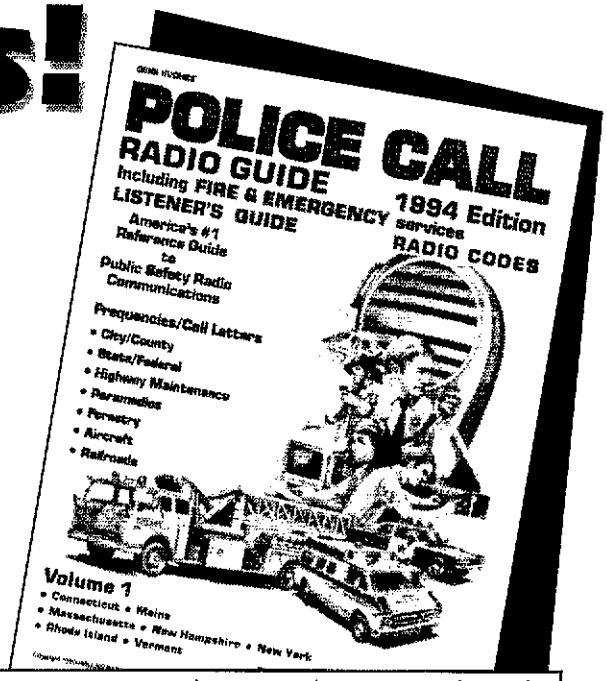

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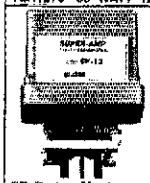

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- HEWLETT-PACKARD: 1740A, 339A, 400FL, 435A, 436A, 478A, 8478B, 8481A, 3312A, 3314A, 3325A, 3457A, 3466A, 3468A, 3478A, 3488A, 3577A, 3580A, 4191A, 4192A, 4193A, 4342A, 4261A, 4328A, 4329A, 5315A, 5316B, 5342A, 5370B, 6000series of power supplies, 8111A, 8350B, 8610B, 8568B, 8656A, 8753A, 8756A, 8901A, 8920A, 44421A, ...d Many More Related Items - Let Us Kn... You Have!
- TEKTRONIX: 212, 465, 465B, 492, 577, 1405, 1420, 1502B, 2215, 2236, 2465, 5110, 5111, 5CT1N, 7A29, AA501, AM503, PG501A, PG506, SG503, SG504, TM5006 and Many More.
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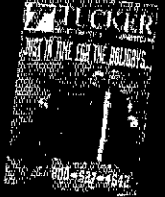

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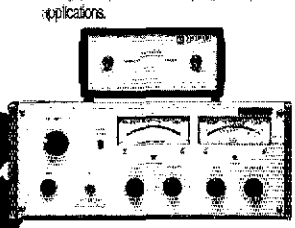
New Year's Resolution: Buy Smart...Buy Tucker!

Systron-Donner 6152A $199

512 MHz Frequency Counter

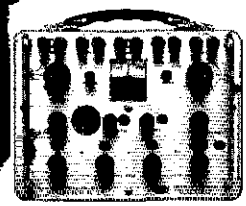
The 6152A is an easy to use counter with large 7-digit readout, covers the frequency range from 0 to 50 MHz (DC), 10 Hz to 50 MHz (AC), 10 to 512 MHz (prescaler range). Resolution of 0.1 Hz to 1 MHz in decade steps. Sensitivity of "A" input 100 mV rms (DC to 200 MHz), "B" and "C" inputs DC to 10 MHz, "D" input 10 mV rms (10 to 512 MHz). Period measurements (DC to 10 MHz) 1 period to 10^8 periods in decade steps and time interval measurements from 0.1 µS to 10^8 Sec. Ratio measurements: fA/fB with multiplier from 1 to 10^8 in decades steps; range of 0 to 200 MHz (fA), 0 to 10 MHz (fB). Scaling: 0 to 200 MHz with scale factors of 10 to 10^8 in decade steps. Features include: display storage, 500 µS to 5 Sec sampling times plus hold, and marker outputs. A versatile counter capable of a wide range of applications.



PRD 2020/2021 $995

Vector Voltmeter System

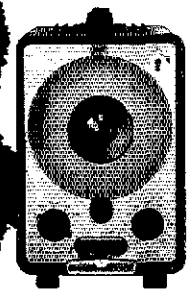
Here's an easy way to measure the amplitude and phase relationship of two RF voltages. Frequency range from 1.5 MHz to 2.4 GHz. Sensitivity is -65 dBm. Incorporates twenty-three position range switch, selects overlapping bandwidths, fine tuning is fully automatic. Includes 0 to 1 V recorder output. Equipped with the S3 Sampling Head.



ESI 815AF $299

Impedance Bridge

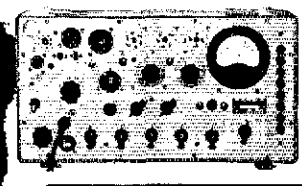
The 815AF Impedance Bridge is a portable, self-contained instrument designed to measure resistance (to 12 MΩ), inductance (to 1200 mH) and storage factor "Q" of inductors (to 1000), capacitance (to 1200 mF) and dissipation factor "D" of capacitors (to 1.05) easily and accurately. Internal generator makes measurements at 1 kHz and also has external generator capability for measurements at other than 1 kHz. Features include null meter, decade readout, zero check function, and protective cover.



HP 200CD $295

Test Oscillator

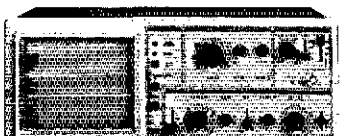
Provides higher output power than most solid state oscillators and offers good frequency coverage and stability. You save hundreds or thousands of dollars by buying the HP 200CD instead of a typical new competitive unit. Frequency range is 5 Hz to 600 kHz (5 bands), dial accuracy of ±2% and flatness is ±1 dB (1 kHz, ref.). The frequency adjusting dial, with 1/2% increments and 2% calibration accuracy, eliminates the need for a frequency counter. A dial vernier allows precise adjustment of the needed frequency. With 20 V open circuit, and 10 V balanced output into 600 Ω impedance, has the power to drive most circuit applications without the need for an additional amplifier. This unit incorporates a continuously variable attenuator. Distortion: (5 Hz to 20 Hz) < 0.5%; (20 Hz to 200 kHz) < 0.2%, (200 kHz to 600 kHz) <0.5%. Balance: < 0.1% at lower frequencies approximately 1% at higher frequencies.



Military TV7 $149

Tube Tester

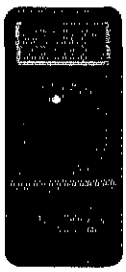
- Portable tube tester
- Built to Military specifications and construction
- Provides features to test a vast range of tube types
- Filament voltage meter and lamp indicator for shorts



Goldstar OS-9020A $379 FACTORY NEW!

Oscilloscope

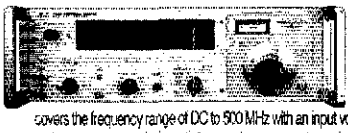
The Goldstar OS-9020A oscilloscope provides both high quality and performance with lower cost to fill the requirements of schools, industry, service shops and hobbyists. This 20 MHz oscilloscope is loaded with features such as automatic focus, variable hold-off, TV sync circuit, X-Y operation, and a 6-inch rectangular CRT with internal graticule. Basic specifications include a vertical deflection bandwidth of DC to 20 MHz, (7 MHz magnified), modes of operation are CH1, CH2, add, dual/chop. Deflection factor of 5 mV/div to 5 V/div in 10 calibrated steps. Accuracy in normal operation is ±3%. Time base of 0.2 µS/div to 0.2 S/div in 19 calibrated steps. Trigger system modes of auto, norm, TV-V, TV-H with source of CH1, CH2, line and external. The OS-9020A meets IEC- 348 safety requirements. The OS-9020A is sold factory new and includes a 2 year warranty. For an economic choice with high quality the Goldstar OS-9020A can't be beat.



Wavetek DM15XL $59 FACTORY NEW!

Digital Multimeter

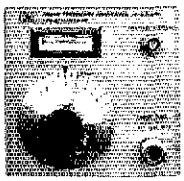
This versatile hand-held Digital Multimeter provides all basic measurements of DC and AC Volts, DC & AC Current to 10 Amps, and Resistance. Readout is providing by a 3 1/2 digit LCD display. Other features include Auto Polarity, Over-Range indicators, Auto Zero, Diode Tester, and an Audible Continuity Tester. Plus the ability to make Logic measurements of high and low TTL logic pulses. A great safety feature is also built into the DM15XL which warns the operator if the test leads are plugged-in incorrectly for making current measurements. Comes complete with one pair of test leads, one spare fuse, battery, and operator's manual. 6.1" x 2.8" x 1.3".



HP 5245L/5253B $299

Frequency Counter System

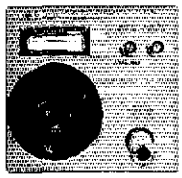
The HP 5245L/5253B Frequency Counter System has been the industry standard for many years and for good reason. This sy covers the frequency range of DC to 500 MHz with an input voltage range of 50 mV to 1 VRMS. This versatile, easy to operat system measures period, multiple period, average, ratio and multiple ratio with measurements read directly from an 8-digit dis The timebase has a short-term accuracy of 2 parts in 10^{10}. The mainframe will accept a wide variety of other plug-ins.



HP 5254B $125

Plug-In

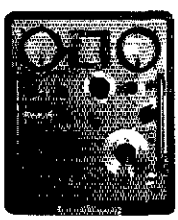
- Designed to increase frequency range of HP 5240-Series of counters
- Frequency Range: 0.2 to 3 GHz, mixes frequencies from 0.2 to 3 GHz in 50 MHz steps
- Input Voltage Range: 50 mV to 1 V
- 50 Ω Input Impedance, AC Coupling



HP 5255A $300

Plug-In

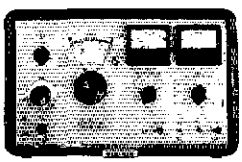
The HP 5255A Frequenc Converter extends the ra of the 5245L and 5246L counters from 3 to 12.4 GHz and can also be used as a direct counting prescaler from 1 to 200 MHz. The input voltage range is 100 mV to 0.7 V with an input impedan is 50 Ω with a type N (F) input connector.



HP 608E $350

Signal Generator

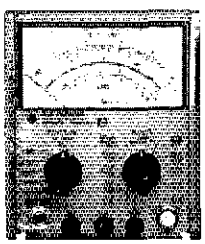
- 10 MHz to 480 MHz
- 0.1 µV to 1.0 V OUT
- 0 to 95% AM MOD; + CW or PULSE
- ±0.5% frequency accuracy



HP 606A

HF Signal Generator $250

- 50 kHz to 65 MHz in six bands
- Frequency accuracy of ±1%
- Harmonic output <3%
- 0.1 µV to 3 V output ±1 dB
- -(20 dBm to +23 dBm
- 0 to 95% AM modulation
- AM frequency: (internal) 400 & 1000 Hz, ±5%; (external) D to 20 kHz maximum



HP 410C $299

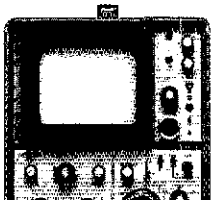
Multifunction Meter

Solid-state version of famous 410B voltmeter. Frequency range is 20 Hz to 700 MHz. Measurement ranges are: DC Volts from ±15 mV to ±1500 V in 11 ranges, ±2%; AC Volt from 0.5 to 300 V in 7 ranges; DC Current from ±1.5 µA to ±150 mA in 11 ranges, ±3% accuracy; Resistance measurements from 10 Ω to 10 MΩ in 7 ranges; Amplifier Voltage Gain of x100. Includes HP 11036A Detachable AC Probe for AC measurements from 50 to 300 V at 20 Hz to 700 MHz.

Electro Impulse DPM-3 $169

RF Power Meter

The DPM-3 has 50 & 150 watt ranges and covers the frequency range of 2 to 500 MHz. N(f) input connector, air cooled, 50 ohm impedance. Refurbished unit.



Military 50 MHz Solid-State Oscilloscope

(USM 251E, Manufactured by Dumont) Oscilloscope

$299

You've been asking for a low cost, dependable Dual Trace Oscilloscope and you won't find a better deal than this! This solid state, portable scope is capable of accurately displaying and measuring simple and complex waveforms from DC to 50 MHz. Consi of the mainframe, vertical, and horizontal plug-in units. Vertical deflection factor is 5 mV to 10 V/div in 11 calibrated steps with an accuracy of ±2%. Vertical input impedance MΩ (±2%) paralleled by 24 pF ±1 pF. Dual channel with dual trace in alternate, chopped and added algebraically modes. Horizontal plug-in provides a time base of 0.1 µS/div to 2 S/div in 22 steps and includes a X10 magnifier. Delayed sweep is a included as are multiple options of coupling and triggering modes. Works with 47.5 to 400 Hz power input including aircraft power! Loaded with features including front and rear covers, calibrator output, Z input, and Gate outputs. Portable (43 lbs).

Wavetek DM5XL $39 FACTORY NEW!

Digital Multimeter

Hand-held Digital Multimeter, loaded with features and easy to use! Provides 3 1/2 digit LCD displ with Auto Polarity and Auto Zero functions. Measures DC & AC Volts, AC & DC Current, and Resistance. Extra added abilities include Diode Testing, Audible Continuity Tester, Over-Range, a Low Battery indicators. Comes complete with one pair of test leads, one spare fuse, battery, and operator's manual. 6.1" x 2.8" x 1.3".

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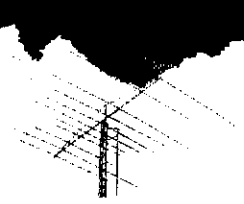
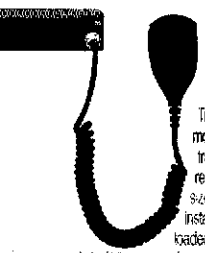


Hy-Gain TH11DX

Element Broadband 5 Band Super Thunderbird Beam - 10, 12, 15, 17, 20 Meters **$859**

ll new Hy-Gain TH11DX 5 band Super Thunderbird is designed to give the mum DX performance to the serious amateur. Having the power capability times the maximum legal limit, the TH11DX features a lossless log-periodic n array on all bands with mono-band reflectors for 17 and 20 meters and ed directors for 10, 12,15, 17 and 20 meters. The TH11DX features a new ian BN 4000 high power balun. These standard features contribute to uce a maximum power rating of 2000 watts continuous-duty, 4000 watts PEP l modes. The TH11DX also features a new corrosion resistant wire boom- ort system, hot dipped galvanized and stainless steel parts. Stainless steel ware and clamps are used on all electrical connections.



Alinco DR130T

High Power 2m FM Mobile

$319

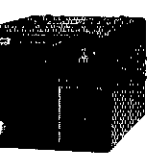
The DR130T is a powerful 2-meter mobile boasting 50 watts in high power transmit. Now, reaching those distant repeaters is no problem, and its compact size is ideal for even the tightest mobile installation applications. The DR-130T is loaded with great features like 20 memory nels (expandable to 100 memory channels w/optional EJ-19U memory nsion unit), user programmable transmitter time out timer, CTCSS encoder lard (optional EJ-20U tone squelch unit is also available), priority scan, memory & VFO scan, and much, much more.

Icom IC-2SAT/3SAT/4SAT

Handheld Transceivers

IC-2SAT 2m HT (with FREE BP-82).....$299
IC-3SAT 220 MHz HT.....$339
IC-4SAT 440 MHz HT.....$399

These great little handhelds are another marvelous breakthrough from Icom in the field of handheld miniaturization. They feature a convenient keyboard, 5 W of extraordinarily high output power(with optional battery) 48 memories, a call channel and more. You can use the internal batteries or add a variety of external battery packs for more life/power. It can also be powered from a 6 to 16 VDC supply. Other great features include a built-in clock, numerous tuning step increments, 4 output power levels, high sensitivity (less than .18 µV) and that legendary Icom rugged construction and dependability. Order the IC-2SAT today and we'll even include a FREE BP-82 7.2 V 300 mAh extra battery!



Daiwa PS140II

13.8 V, 14 A Power Supply

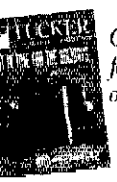
$69 *COMPARE AT $99*

The PS140II is perfect for use with VHF/UHF mobiles, handheld transceivers and cellular es. Built-in cigarette lighter socket. 12 A continuous. 5" x 4" x 9". 11 lbs.

Daiwa CN101

HF Cross-Needle SWR/PWR Meter **$79**

World famous Daiwa cross-needle meters eliminate the major headache of using your na tuner: the constant recalibration of your VSWR meter- and throwing the REV switch back and forth as you change bands, modes and power levels. ross-needle metering, you get hassle-free, full ower, reflected power and VSWR readings aneously at a glance. The CN-101 covers 1.8 to Hz with up to 1.5 kW power-handling capability. 3 scales: 15/150/1.5 kW and comes standard -259 connectors. Backlit display (requires 12 V).



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Bearcat BC 890 XLT

200 Channel Scanner-With 800 MHz! **$275**

This new item from Bearcat has frequency coverage through 956 MHz* with 200 channels of action in 10 banks! The turbo scan feature lets you zip through the channels in lightning speed. 10 priority channels let you scan important frequencies every 2 seconds. It even includes a VFO knob for up-down frequency control. Other features include weather search, auxiliary tape out weather alert, illuminated LCD display, reception counter, and step select. Frequency Range: 25 to 956 MHz. *Cellular Blocked- modifiable

Alinco DJ-560

Dual Band (2M/440) HT **$299**

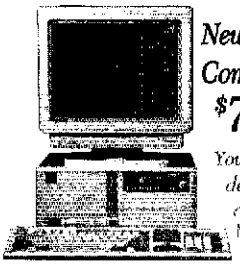
The DJ-560 combines superb performance and features with an incredibly low price in a dual band HT. This unit allows simultaneous reception of both bands for full duplex oper normal memories and a call channel allow full storage of all repeaters. Three scanning modes let you easily find repeat when traveling. All of this combined with code squelch, DS paging functions, an auto-dialer, 5 W output with 12 VDC or optional 12 V battery and much more make this your best choice in a dual band HT.

Icom 2GAT

2M HT

$319

The IC-2GAT is the only handheld on the market which gives you 7 watts capability. It also includes 30 memories, CTCSS encode, call channel, multiple scan modes, and a rugged durable design.



New Tucker Packet Computers!

$749 *New! 386 Power*

Your choice of either desktop or mini-tower case-style!

New from Tucker Electronics, complete source for Amateur Radio and computers comes a product that combines our expertise in both fields, the Tucker Packet Computer. The Tucker Packet Computer combines a Tucker PC compatible computer with our line of amateur radio equipment to form a complete, ready-to-operate 2M packet radio setup. No longer do you have to worry about buying separate TNC's, radios and a computer...we at Tucker Electronics have done the work for you! The Packet Computer combines a powerful Tucker 386SX/33 with 1 MB of RAM, your choice of a high-density 5 1/4" or 3 1/2" floppy drive, mono monitor, serial and parallel ports and a keyboard. Packet control is provided by the DRSI PC Packet adapter 1 which fits inside the case and includes software for easy control. RF is provided by the Alinco DR-120 2M Data Radio which features 25 W RF output, 14 memory channels and much more. It is completely self-powered, just plug in an antenna and go! Custom configurations are listed below. Get into the exciting world of Packet Radio without all the hassle- order a new Tucker Packet Computer today!

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With a 120 MB hard drive .....add $200
With CGA color .....
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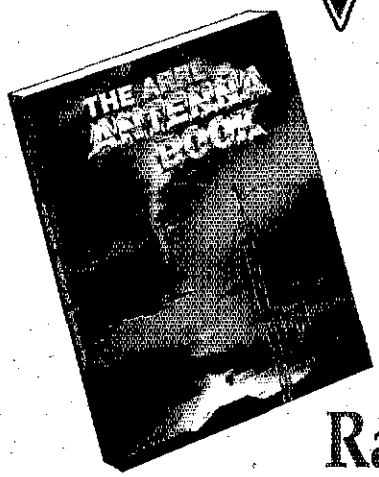
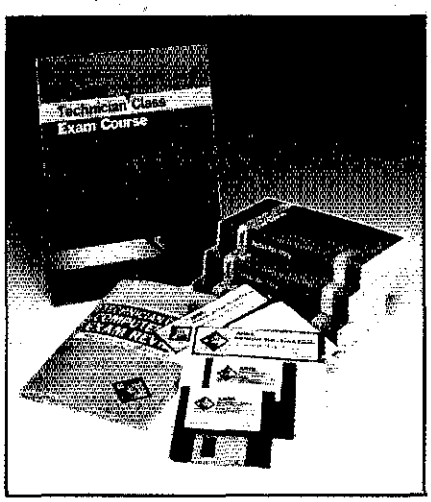
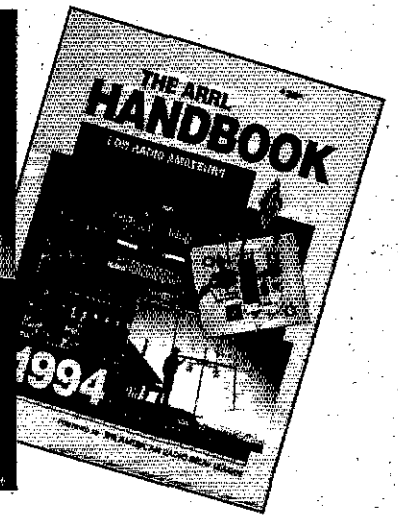
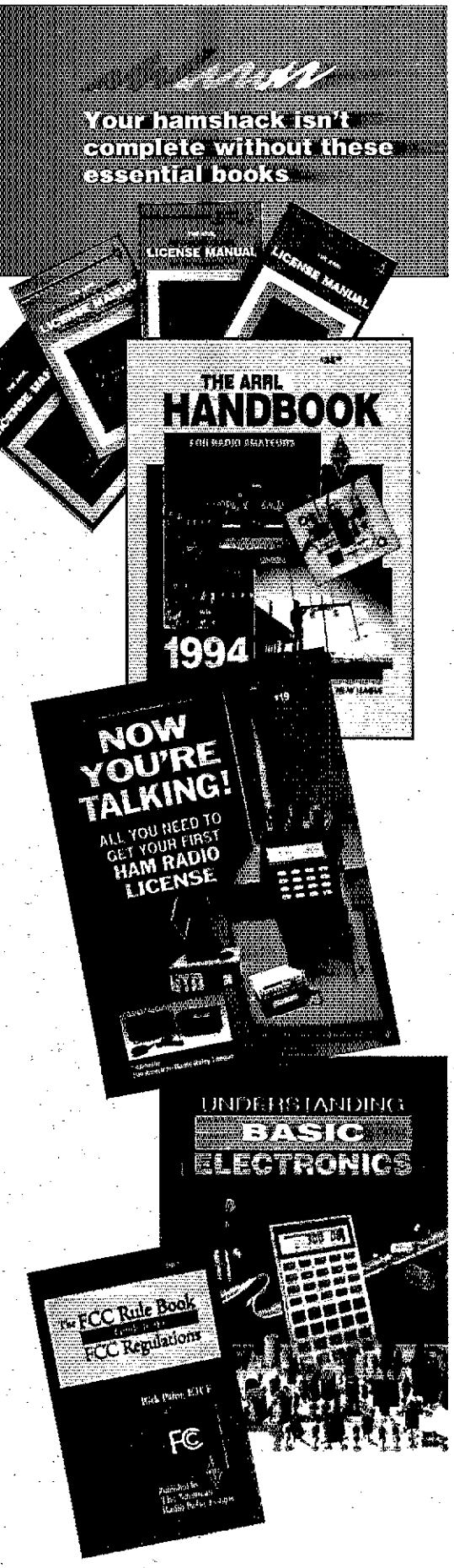








Now You're Talking!: All You Need to Get Your First Ham Radio License is a complete study guide for the Technician exam and the Novice written exam. But it's far more! It will help you select—and set up—radios, accessories and antennas for your ham radio station. It will also guide you through your first contacts on all the popular operating modes, including FM repeaters and packet radio. Practical information every beginning ham needs is presented clearly and simply, in small doses. Whether you start with the Technician or the Novice license, ***Now You're Talking!*** shows you how to enjoy ham radio to the fullest.

If you're starting with the Novice license you should also purchase audio cassettes or computer software to learn Morse code (described below).

Now You're Talking!: All You Need to Get Your First Ham License. 2nd ed, ©1993 ..... #4173 **$19**

The **ARRL Technician Class Video Course** is the fast, easy and fun way to prepare for your Novice- and Technician-class written exams. Imagine: One course with everything you need to get your first ham license! Watch it straight through or review any or all sections at your convenience.

You get three exciting video tapes (5 full hours), a detailed 164-page course book and six practice exams. The course covers every FCC question—with correct answers, detailed explanations and full-screen graphics and animation. There's even optional Exam Review software for PCs and Macintosh computers.

Produced in association with King Schools, a world leader in video training courses, the ARRL Technician Class Video Course comes with the assurance of a money-back guarantee: You pass your test, or you don't pay! Call for details.

With our exclusive Technician Class Video Course, you'll be on the air in no time!

ARRL Technician Class Video Course, ©1993 ..... #4572 **$99**
Extra Course Books (with course purchase), ©1993 ..... #4602 **$19**
ARRL Technician Class Video Course with Computerized Exam Review Software, ©1993. IBM compatible, 3.5- and 5.25-inch disks and Macintosh 3.5 inch (hard disk req'd) ..... #4580 **$119**

Hampass—ARRL's license-exam-review software is a great way to prepare for the Novice and Technician tests. ***Hampass*** drills you on the Novice or Technician question pools by selecting questions from the entire pool or from subelements you specify. It also creates sample tests. Each package includes 5.25-inch *and* 3.5-inch disks.

Hampass for DOS, for IBM PC or compatible (286 or better microprocessor best), DOS 3.1 or later, hard disk, EGA or better display, mouse recommended, but not required ..... #4475 **$35**

Hampass for Windows 3.1, for 286 or better microprocessor, DOS 3.3 or later and Windows 3.1 or later, hard disk with 1 MB of free space, VGA graphics card and color monitor, mouse recommended, but not required ..... #4467 **$35**

■ Upgrade Your License the Easy Way!

After you receive your license and get on the air, you'll probably want to explore additional operating privileges. The ***ARRL License Manual Series*** represents the best study material for the Technician, General, Advanced and Extra Class Amateur Radio exams. Each book is carefully revised and updated as new exam questions are released by the VEC Question Pool Committee. The appropriate examination question pool, complete with an answer key, is included for easy reference. The answer key contains page references so you can locate appropriate text explanations as you review the questions before your exam. Our ***FCC Rule Book*** should be used along with each publication in the series.

ARRL License Manual Series
Technician Class for Novice Class Licensees 2nd ed, ©1993 ..... #4181 **$6**
General Class, 1st ed, ©1989 (good through June 30, 1994) ..... #2383 **$6**
Advanced Class, 3rd ed, ©1990 (good through June 30, 1995) ..... #3274 **$8**
Extra Class, 5th ed, ©1990 (good through June 30, 1996) ..... #3282 **$8**

The FCC Rule Book, 9th ed, ©1993 ..... #4270 **$9**

Code Proficiency

When it comes to the code, whether you're just starting out, or you're working on your Extra Class upgrade, practice makes perfect!

The ARRL produces five sets of Morse code tapes to get you from 0 to 22 words per minute. Each set includes two C-90 cassettes. ***GGTE Morse Tutor*** software for IBM PCs and compatibles teaches you the code, provides plenty of practice for exams and helps keep your code speeds sharp in easy, self-paced lessons. Features include code speeds from 1 to more than 100 words per minute, standard or Farnsworth modes and random QSOs. The ***Advanced Morse Tutor*** has even more features. You can send code from an ASCII text file that you create on the computer, save to disk the random QSOs created by the program for later replay, and even create your own practice text with special emphasis on problem characters, and more.

Your Introduction to Morse Code, our cassette program for beginners, makes learning the code fun. It teaches you all the characters and provides plenty of practice ..... #3487 **$10**

ARRL Code Practice Cassettes. Each set of two C-90 tapes provides three hours of practice.
Set 1: 5 to 10 WPM ..... #2227 **$10**
Set 2: 10 to 15 WPM ..... #2235 **$10**
Set 3: 15 to 22 WPM ..... #2243 **$10**
Set 4: 13 to 14 WPM ..... #2251 **$10**
GGTE Morse Tutor (5.25-inch) ..... #2081 **$20**
GGTE Morse Tutor (3.5-inch) ..... #2936 **$22**
Advanced Morse Tutor (5.25-inch) ..... #3231 **$30**
Advanced Morse Tutor (3.5-inch) ..... #3258 **$30**

■ Help for Beginners

Ham Radio Horizons: The Book, What Ham Radio is All About and How to Get Started introduces nonhams to the exciting world of amateur radio. You'll find tips from expert hams on DXing, Contesting, Serving the Public, Ham Radio in Space, Experimenting, Digital Communications and more. 1st ed, © 1993 ..... #1234 **$12.95**

Novice Notes: The Book is a selection of articles for the beginner from the popular ***QST*** series. It's filled with useful information: What you should do before your license arrives; how to buy used gear; and much more. 1st ed, ©1989 ..... #2561 **$6**

Written in an easy-to-understand style for electronics beginners, ***Understanding Basic Electronics*** is also for those who want to brush up on electronics principles. Loaded with illustrations, the book starts with math skills and progresses to dc and ac electronics principles. It concludes with clear, simple explanations of how components like diodes, transistors and integrated circuits work. 1st ed, ©1992 ..... #3983 **$17**

First Steps in Radio by Doug DeMaw, W1FB, is a tutorial on electronics principles tailored to the beginner. Reprinted from the popular ***QST*** series, this book will help you learn the electronics theory helpful for licensing exams and to gain some insight into how radio equipment works. 1st ed, ©1985 ..... #2286 **$5**

■ Handy References

The 1994 ARRL Handbook

We're proud of the 71st edition of the ***ARRL Handbook for Radio Amateurs***. That's right—the

71st edition! ***The Handbook*** has been the "ham's bible" since 1926, and each new edition brings you the latest on what's new in Amateur Radio state of the art. ***The Handbook*** is many things:

• **a reference guide,** with updated lists of parts and equipment suppliers and other indispensable data on solid-state components and transmitting tubes

• **a guide to radio theory every ham should know,** including the latest digital modes and hundreds of explanatory and practical circuits

• **a goldmine of construction projects** that will allow all hams—beginners, old-timers and everyone in between—to build useful amateur gear for their stations.

What's new in the 1994 edition? Plenty! Here's some of what you'll find:

• Added coverage of Digital Signal Processing (DSP).

• Improved treatment of Pi and Pi-L matching networks for high-power amplifiers.

• A new all-digital-logic ID-timer section in the repeater CW IDer.

• The "Ugly Transceiver" is a simple and enjoyable introduction to RF construction!

• A five-band quad that covers all amateur bands from 20-10 meters. An indispensable reference for hams and engineers alike, ***The ARRL Handbook***, with its 1184 pages and 2100 charts and illustrations, is an exceptional value. ©1993 ...#1719 **$25**

Every chapter of the 4th edition of ***The ARRL Operating Manual*** has been updated to include the latest information about every aspect of our dynamic hobby. It's simply the best book available covering on-the-air amateur operating practices. How do I operate on a repeater or on *PacketCluster?* How can I snare a contact through a DXpedition pileup? What satellites are available and how can I use them? You'll find the answers to all of these questions and many more in ***The ARRL Operating Manual!***

One impressive and colorful section features dozens of US and overseas operating awards, and a handy reference section includes an ARRL DXCC Countries List, beam-heading information, a series of maps, US counties, sunrise/sunset tables, and much, much more. No shack is complete without this valuable reference. ©1991 .....#1086 **$18**

The ARRL Radio Buyer's Sourcebooks are for anyone who buys, sells or owns Amateur Radio equipment. Two volumes are available: ***The ARRL Radio Buyer's Sourcebook*** covers selected ***QST*** Product Reviews from 1981 through 1991 and a few "golden oldies." ***The ARRL Radio Buyer's Sourcebook Volume 2*** contains *all* ***QST*** Product Reviews published in 1991 and 1992.

Both books explain what radios do, how well they do it, where to get them serviced and where to find articles about modifications. Handy comparative feature and performance charts cover equipment reviewed in the books. Each contains a history of Amateur Radio technology and a glossary of radio features and terms. Heading for a hamfest or ham dealer? Don't leave home without both ***Radio Buyer's Sourcebooks.***

The ARRL Radio Buyer's Sourcebook (1st ed, ©1991).....#3452 **$15**

The ARRL Radio Buyer's Sourcebook Volume 2 (1st ed, ©1993) .....#4211 **$15**

The ARRL Electronics Data Book is a valuable aid to the radio amateur, RF design engineer, technician and experimenter. All those commonly used tables, charts, and those hard-to-remember formulas and semiconductor pin-out diagrams are found in one handy source. You'll also find hundreds of popular circuits and "building blocks," including oscillators, mixers, amplifiers, other devices and their operating parameters. By Doug DeMaw, W1FB, 2nd ed, ©1988 .....#2197 **$15**

The 13th edition of ***Hints and Kinks for the Radio Amateur*** has the best tips, suggestions and projects from the popular ***QST*** column (covering the years 1987-91). It's loaded with helpful techniques and easy projects that will enhance your operating enjoyment. ©1992 .....#3851 **$9**

The 1993-1994 ARRL Repeater Directory includes more than 19,000 listings for voice and digital repeaters and propagation beacons located in North, Central and South America. This edition also lists more than 500 beacons from 14 MHz to 24 GHz. You'll also find band plans, a CTCSS (PL™) tone chart, a list of frequency coordinators and a new user-friendly list of ARRL Special Service Clubs. The ***Repeater Directory*** comes in a handy pocket size for your operating convenience. 22nd ed, ©1993 .....#4246 **$6**

The ARRL DXCC Countries List is the ideal way to record the DXCC countries you've worked and QSLed. The latest printing includes DXCC Advisory Committee members, an expanded cross reference for prefixes and exotic countries and more. (Free shipping). Jun 1993 ed, ©1993 .....#0291 **$2**

The ARRL Net Directory lists hundreds of Amateur Radio nets of interest to North American hams—DX, ragchew, special-interest, fun and public service nets—they're all here. Updated annually. (Free shipping). 1993-1994 ed, ©1993 .....#4262 **$2**

Your QRP Operating Companion shows that you don't need special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. Ragchewing, DXing, contesting—all are more enjoyable with QRP. Includes operating tips, lists of QRP clubs and organizations, net and calling frequencies, and much more. 1st ed, ©1992 .....#3762 **$6**

Passport to World Band Radio is the "TV Guide" of shortwave listening. Updated annually, ***Passport*** contains comprehensive schedules for hundreds of international shortwave broadcast stations—when they're on, who they're targeting and what languages they're using—in an easy-to-understand format.

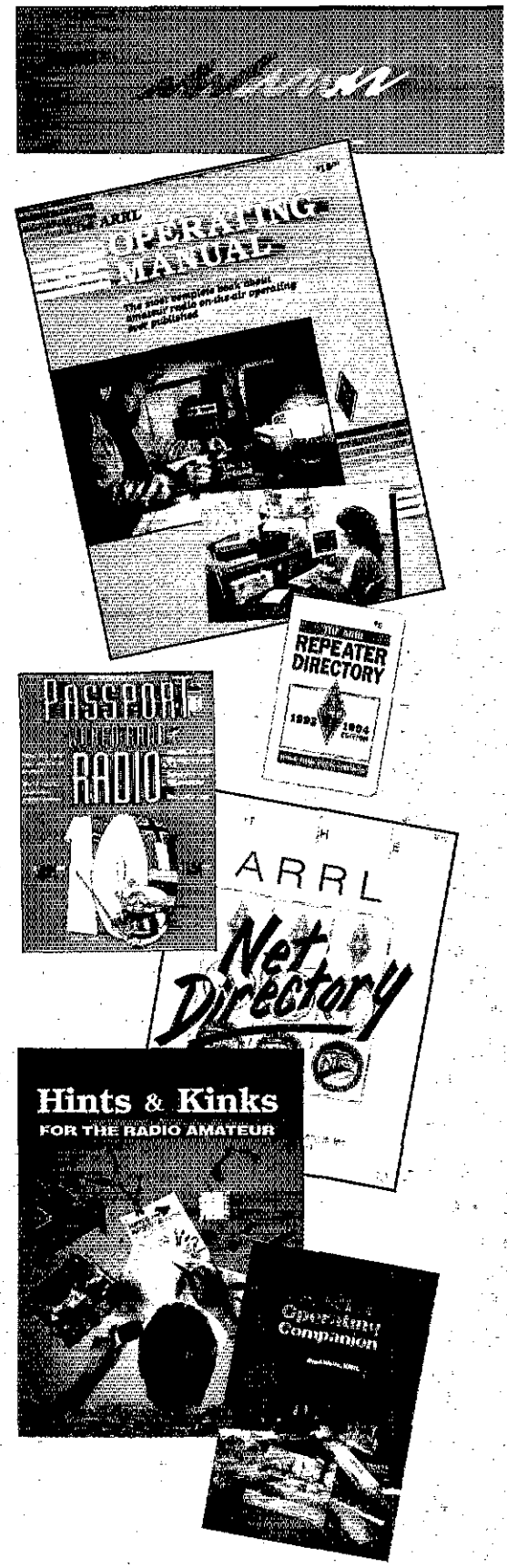
Also included are useful reviews of nearly every shortwave radio currently available, and excellent articles describing the best shows to be found on the international shortwave bands.

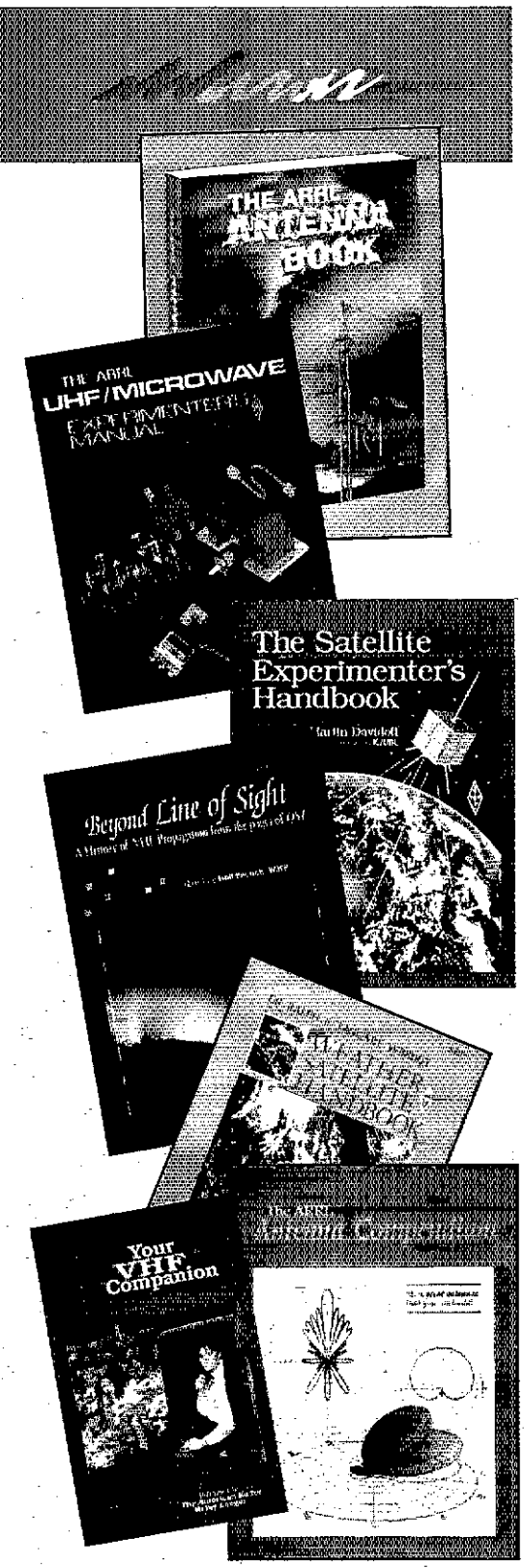
Increase your knowledge of today's changing world with ***Passport to World Band Radio*** and make the most of your listening. ©1993 .....#4459 **$18**

Ferrell's Confidential Frequency List is recognized throughout the world as the most comprehensive list of shortwave utility stations available. What ***Passport to World Band Radio*** is to shortwave broadcasting, ***Ferrell's*** is to utility DXing. This 8th edition has been considerably expanded and now contains well over 30,000 CW, SSB, RTTY and fax frequencies from 4-28 MHz—military, maritime, aeronautical and more—they're all here. ©1992 .....#2206 **$20**

The RSGB Amateur Radio Awards Booklet gives details of major Amateur Radio awards throughout the world. Each award is listed in an easy-to-use format that includes all the information on how to earn it. This edition even includes a checklist so you can track your progress. 3rd ed, ©1988 .....#R819 **$15**

World Radio TV Handbook is your personal 24-hour guide to the world's broadcasters and their services. Information is listed by country and in an hour-by-hour guide to English language shortwave broadcasts. Comprehensive station information includes call signs, station locations, frequencies, transmitter power, operating times, languages and much more. Join the many who have discovered the world of the international listener. 1993 ed, ©1993 ...#4165 **$20**





The RSGB Operating Manual is filled with information on setting up your station, operating practices and procedures, DX, contests, mobile, portable and repeater operation, amateur satellites, RTTY, slow-scan television and much more—all with a European twist! 3rd ed, ©1989 .....#R69X **$14**

■ VHF/UHF/Microwave Communications

Your VHF Companion lets you explore the fascinating activities on the VHF bands: FM and repeaters, packet, CW and SSB, satellites, amateur television, transmitter hunting, and more. A handy reference section helps you locate equipment, books, magazines and software. A must for all new hams—and all "veterans" as well! 1st ed, ©1992 .....#3878 **$8**

The ARRL UHF/Microwave Experimenter's Manual is written for the growing number of radio amateurs who are discovering that there is life on our frequencies above 420 MHz. Technicians and engineers will find this book particularly useful. You'll find information on design and fabrication techniques, propagation, antennas and feed lines, transmission media and much more. Companion software is available for IBM PCs and compatibles.
Book, 1st ed, ©1990 .....#3126 **$20**
Software (5.25-inch) .....#3134 **$10**

The Satellite Experimenter's Handbook has the information you need to communicate through or receive signals from a growing "fleet" of orbiting satellites. Whether your interest is in Amateur Radio, weather, TV-broadcast or other spacecraft, you'll find an immense store of valuable data—everything from satellite design to ground station equipment and antennas. Written by Martin Davidoff, K2UBC. 2nd ed, ©1990 .....#3185 **$20**

If you're tired of hunting for bits and pieces of information on spread spectrum, the ***ARRL Spread Spectrum Sourcebook*** is for you. You'll find reprints of most spread spectrum articles from ***QST*** and ***QEX***, as well as articles and news items from the ***AMRAD Newsletter*** that show how SS developed from theory to a viable communications system. 1st ed, ©1991 .....#3177 **$20**

Weather Satellite Handbook by Dr Ralph Taggart, WB8DQT, is for ANYONE with an interest in electronics, meteorology, earth science, image communications and computer science. Packed with projects, the fourth edition allows you to get in on the fun of monitoring a variety of weather satellites. Today's technology makes it easier and less expensive than ever before. The ***Weather Satellite Handbook*** is expanded and revised to reflect today's weather-fax satellite technology. Companion software available for IBM PCs and compatibles.
Book, 4th ed, ©1990 .....#3193 **$20**
Software (5.25-inch) .....#3290 **$10**

Beyond Line of Sight: A History of VHF Propagation from the Pages of QST explores the ways hams helped discover and exploit the propagation modes that allow VHF signals to travel hundreds and even thousands of miles. It's a subject all hams will find fascinating. 1st ed, © 1992 .....#4025 **$12**

ARRL Satellite Anthology is a must for everyone interested in amateur satellites. A compilation of ***QST*** articles, it will show you how easy it is to track, decode telemetry from and communicate through such amateur satellites as AMSAT-OSCARs 10 and 13, the Russian RS series and the Microsats. You'll also find articles on satellite DXing, antennas, computer software, and more. 2nd ed, ©1992 .....#3800 **$8**

The VHF/UHF DX Book helps you with one of Amateur Radio's greatest challenges: Contacting stations in far away places. Here's some of what you'll find: How to assemble your VHF/UHF station, VHF/UHF propagation information, operating techniques, designs for VHF and UHF transverters and much more .....#4238 **$35**

Radio Auroras by Charlie Newton, G2FKZ, from the RSGB, details the interesting and unpredictable world of Amateur Radio communications via auroral propagation. Presented with a European twist is information on what causes auroras, how they are forecast and how to best use them to work DX. You'll find an abundance of tables and charts. ©1991 .....#3568 **$18**

VHF/UHF Manual, from RSGB, is must reading for the VHF and UHF enthusiast. You'll find information on the history of VHF/UHF communications, propagation, tuned circuits, receivers, transmitters, integrated equipment, filters, antennas, microwaves, space communications, and test equipment. 4th ed, ©1983 .....#R630 **$30**

Microwave Handbook, Volume 1, from RSGB, covers operating techniques, system analysis and propagation, microwave antennas, transmission lines and components, microwave semiconductors and tubes. ©1989 .....#2901 **$35**

Microwave Handbook, Volume 2, from RSGB, continues where Volume 1 leaves off with construction techniques, common equipment, microwave beacons and repeaters, test equipment, safety, filters and additional circuit data. ©1991 .....#3606 **$35**

Microwave Handbook, Volume 3, from RSGB, contains a review of microwave theory and practice, reference information, practical designs, hints and tips. Covers 1.3-24 GHz. ©1992 .....#3975 **$35**

■ Antennas and Transmission Lines

The ARRL Antenna Book is the definitive source for information on state-of-the-art antenna and transmission line theory and construction. The 16th edition presents the best and most highly regarded information on antenna fundamentals, propagation, transmission lines, Yagis and quads, as well as all popular wire antenna designs. You'll find antennas for limited space, portable, mobile, VHF, UHF and microwave and space communications. Contains more than 700 pages and nearly 1000 illustrations. Edited by Jerry Hall, K1TD. ©1991 .....#2065 **$20**

Three volumes are available in ***The ARRL Antenna Compendium series***, and each is packed with previously unpublished articles on all the popular types of HF/VHF/UHF antennas and some you've never heard of! In Volume 1 you'll find articles on a multiband portable, quads and loops, baluns and the Smith Chart. Volume 2 features several verticals, an attic tri-bander, antenna modeling and propagation. Among the 40 articles in Volume 3, you'll discover a 12-meter quad, a discone, modeling with MININEC and VHF/UHF ray tracing.

All three volumes are a feast for the antenna enthusiast!
Companion software is available separately for Volumes 2 and 3.
Volume 1, 1st ed, ©1985 .....#0194 **$10**
Volume 2, 1st ed, ©1989 .....#2545 **$12**
Companion software (5.25-inch) .....#2626 **$10**
Volume 3, 1st ed, ©1992 .....#4017 **$14**
Companion software (5.25-inch) .....#4033 **$10**
Companion software (3.5-inch) .....#4041 **$10**

Reflections: Transmission Lines and Antennas is written by Walt Maxwell, W2DU, to clear the air of the half-truths and outright myths you hear these days about transmission lines, standing waves, antenna matching, reflected power and antenna tuners. This book has a wealth of information on matching networks, antennas and use of the Smith Chart. Companion software is available for IBM PCs and compatibles.
Book, 1st ed, ©1990 .....#2995 **$20**
Software (5.25-inch) .....#3118 **$10**
Software (3.5-inch) .....#3924 **$10**

Yagi Antenna Design by Dr James L. Lawson, W2PV, presents 210 pages covering performance calculations, simple Yagis, performance optimization, ground effects, stacking, practical designs for 7-28 MHz. Hardcover. 1st ed, ©1986 ...#0410 **$15**

W1FB's Antenna Notebook Not everyone has the room or the budget to put up a forest of aluminum. Doug DeMaw tells you how to get the best perfor-

mance out of unobtrusive wire and vertical antennas, and how to build simple antenna tuners and SWR bridges. 1st ed, ©1987 ..... #2618 **$10**

Transmission Line Transformers is a source of practical design data covering the use of these devices for both commercial and amateur applications. Written by Dr Jerry Sevick, W2FMI, this book covers types of windings, core materials, fractional-ratio windings, efficiencies, multiwinding and series transformers, baluns, limitations at high impedance levels and test equipment. Hardcover. 2nd ed, ©1990 ..... #2960 **$20**

Physical Design of Yagi Antennas, by Dr David B. Leeson, W6QHS, is packed with information on how to design or reinforce Yagi antennas so they can survive in the most adverse weather conditions—like 120-mile-per-hour winds! Covers the structural design of elements, booms and masts, plus the electrical design of Yagi antennas. 1st ed, ©1992 ... #3819 **$20**
5.25-inch spreadsheet diskette for IBM or compatible ..... #3827 **$10**
3.5-inch spreadsheet diskette for IBM or compatible ..... #3835 **$10**
3.5-inch spreadsheet diskette for Macintosh . #3843 **$10**

Antenna Impedance Matching shows you how to use the Smith Chart to develop even the most complex matching network to maximize antenna effectiveness by minimizing feed line losses. With more than 200 pages, this book is a must for the antenna designer and serious amateur. Written by Wilfred Caron. Hardcover. 1st ed, ©1989 ..... #2200 **$20**

Low-Profile Amateur Radio is for the ham who lives where antennas are frowned upon. You'll see that you don't need a house with acreage to enjoy your favorite hobby. One practical solution: hide your antennas. Another: operate with low power. This book tells you how to get on the air using these techniques—and others—without calling attention to yourself. 1st ed, ©1993 ..... #4114 **$8**

ARRL MicroSmith V2.00, by Wes Hayward, W7ZOI. ***ARRL MicroSmith*** is a Smith Chart simulation program for the IBM PC and compatibles. You don't need detailed knowledge of the Smith Chart. Use ***MicroSmith*** to design matching networks with fixed or variable L-C components, stub-matching sections with transmission lines, and more. It's all done graphically on your computer screen. It's also useful for a variety of network analysis problems. Includes a 48-page user's guide with numerous illustrations.
5.25-inch diskette ..... #4076 **$39**
3.50-inch diskette ..... #4084 **$39**

Practical Wire Antennas, by John D. Heys, G3BDQ, is an RSGB book that delves into the practical aspects of HF wire antennas: how the various types work, and how to buy or build one that's right for you. Marconis, Windoms, loops, dipoles and even underground antennas—they're all covered! The final chapter covers matching systems. ©1989 ..... #R878 **$14**

HF Antennas for All Locations, written by L.A. Moxon, G6XN, for the RSGB, details the design and construction of hundreds of amateur antennas—including some unusual designs. Don't let a lack of real estate keep you off the air. Whether you're in a downtown apartment or on top of a mountain, you'll find at least one antenna that'll work for you! 2nd ed, ©1993 ..... #4300 **$20**

HF Antenna Collection contains outstanding articles from RSGB's *Radio Communication*. It covers single- and multielement horizontal and vertical antennas, very small transmitting and receiving antennas, feeders, tuners and more. ©1991 ..... #3770 **$18**

Interference/Direction Finding

Radio Frequency Interference: How to Find It and Fix It is a new approach to an old Amateur Radio problem. Written by RFI experts, it's filled with proven ways to solve common—and not-so-common—RFI or EMI problems, whatever their cause. In addition, you'll learn how to build a cooperative environment with neighbors and how to contact skilled volunteers who can assist with those tricky situations. 1st ed, ©1991 ..... #3754 **$15**

Interference Handbook, by William Nelson, WA6FQG, will help you locate and resolve interference problems of every type. Sources of interference are described along with the methods used to locate them. Suppression circuits for interfering devices are discussed in detail, as are protection techniques for home entertainment equipment. 2nd ed, ©1981 ..... #6015 **$12**

Transmitter Hunting: Radio Direction Finding Simplified, by Joseph Moell, K0OV, and Thomas Curlee, WB6UZZ, is all the information you need about equipment and techniques for HF and VHF radio direction finding. Transmitter hunting is both practical and fun. Using the information in this book, you can not only locate jammers and other sources of malicious interference, but you can also locate downed aircraft, engage in "sport hunting," even help search-and-rescue groups save lives! 1st ed, ©1987 ..... #2701 **$19**

Practical Circuits

WIFB's QRP Notebook by Doug DeMaw is packed with construction projects for QRP transmitters, receivers and accessories. This second edition is the completely rewritten successor to Doug's popular ***QRP Notebook***, and features totally new circuits. Learn the inside secrets from this veteran builder, writer and former ***QST*** Technical Editor. Most of the projects feature printed circuit boards that are available from a commercial source. Gain understanding of circuits. Experience firsthand the thrill of making contacts using equipment that you built. 2nd ed, ©1991 ..... #3657 **$10**

WIFB's Design Notebook: Practical Circuits for Experimenters is just the book for the avid builder of Amateur Radio equipment. This plain-language book is filled with simple, practical projects that can be built using readily available components and common hand tools. There are explanations of how the various circuits work—without heavy mathematical analysis. 1st ed, ©1990 ..... #3207 **$10**

QRP Classics is a collection of projects for low-power enthusiasts taken from ARRL publications over the past 15 years. The equipment is generally simple and easy to build. You'll find projects for receivers, transmitters, transceivers and accessories. 1st ed, ©1990 ..... #3169 **$12**

Solid State Design for the Radio Amateur is packed with information on Amateur Radio circuit design and applications, descriptions of receivers, transmitters, power supplies and test equipment. Much of the data cannot be found elsewhere. Essential for every technical library. ©1986 ..... #0402 **$12**

Radio Communication Handbook, from RSGB, is packed with technical information and practical circuits on semiconductors, HF receivers, VHF/UHF transmitters, modulation systems, RTTY, propagation, HF and VHF/UHF antennas power supplies and more. ©1982 ..... #R584 **$35**

Packet Radio/Computers/RTTY

Your Packet Companion, by Steve Ford, WB8IMY, perfect for the packet newcomer, covers everything—from assembling a station to sending mail, from packet satellites to the latest networking systems. Its straightforward writing style and clear drawings will get you on the cutting edge of digital ham radio in no time. 1st ed. ©1992 ..... #3959 **$8**

Your RTTY/AMTOR Companion: Explore HF Digital Communications with Your Multimode Controller, by Steve Ford, WB8IMY, is your introduction to the exciting world of HF digital communications. Learn how to assemble your own RTTY/AMTOR station and communicate effectively on the air. You'll also learn the basics of new HF digital modes such as CLOVER and PacTOR. 1st ed, ©1993 ..... #4092 **$8**

Your Gateway to Packet Radio explores one of the most fascinating areas of Amateur Radio today.

Packet radio has found its way into thousands of shacks and continues to grow in popularity. If you never tried it, find out what you're missing. If you're a packet veteran, you'll still learn something new. Written by Stan Horzepa, WA1LOU. 2nd ed, ©1989 ..... #2030 **$12**

AX.25 Amateur Packet-Radio Link-Layer Protocol represents the culmination of several years of work by amateurs to develop a standard data-transfer protocol for global use. Packet stations and networks can easily talk to one another if common standards are used. The link layer is level 2 of the International Organization for Standardization (ISO) seven-layered reference model of Open Systems Interconnection (OSI). ©1984 ..... #0119 **$8**

In ***NOSintro: TCP/IP over Packet Radio*** you'll find a wealth of practical information, hints and tips for setting up and using the KA9Q Network Operating System (NOS) in a packet radio environment. The emphasis is on hands-on practicalities. You'll see exactly: how to install NOS on a PC, how to set up the control files, how to check out basic operations off-air, and how to use NOS commands for transferring files, logging in to remote systems, sending mail, etc ..... #4319 **$23**

■ DX/Callbooks

The 1994 North American Callbook lists call signs, names and address information for more than 500,000 licensed radio amateurs in North America, including Greenland, Bermuda and the Caribbean Islands, Hawaii and US possessions ..... #C094 **$30**

The 1994 International Callbook lists call signs, names and address information for more than 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia and the Pacific (excluding Hawaii and US possessions) ..... #C194 **$30**

The Complete DX'er is a book by Master DXer Bob Locher, W9KNI, that shows what is going through the DXer's mind as he cracks pileups and snags rare DX stations using tried and true techniques. You'll learn how to hunt DX and how to obtain hard-to-get QSL cards. 2nd ed, ©1989 ..... #2083 **$12**

The DXCC Companion: How to Work Your First Hundred Countries, by Jim Kearman, KR1S, is filled with practical, easy-to-understand information for the beginning DXer. Follow the advice given by KR1S and you'll have your first hundred countries confirmed in no time. You'll learn about equipment, antennas, propagation and the rights and wrongs of QSLing. 1st ed, ©1990 ..... #3398 **$6**

N6RJ's SECOND OP is an operating aid designed to quickly provide DX information available for all countries recognized officially by the amateur societies of the world. Distributed by Radio Amateur Callbook Inc. N6RJ's SECOND OP ..... #243X **$9**

■ For Instructors

In addition to ham radio study guides for students, we also produce instructor's guides to help you teach license courses. These are for use with ***Now You're Talking!*** and ***ARRL License Manuals***. The ***Instructor's Manual*** is a valuable aid for those teaching Amateur Radio classes at any level.

Proceedings of the ARRL National Educational Workshop presents ideas from top instructors to help you motivate your students and increase their enjoyment. Proceedings from the 1989 thru 1993 workshops are available.

ARRL Novice/Technician Class Instructor's Guide, 2nd ed, ©1993 ..... #4394 **$8**
ARRL General Class Instructor's Guide, 2nd ed, ©1989 ..... #2669 **$8**
ARRL Instructor's Manual, 2nd ed, ©1992 ... #2448 **$8**
Proceedings of the ARRL National Educational Workshop 1993, 1st ed, ©1993 ..... #4408 **$12**

■ Amateur Radio Adventure/History

The ARRL offers three adventure titles by Cindy Wall, KA7ITT. In ***Night Signals***, Amateur Radio performs a life-saving feat for Marc Lawrence, snowbound and injured in the rugged Cascade Mountains. In the electrifying sequel, ***Hostage in the Woods***, what starts out as a hospital Christmas party for children turns into a nightmare of terror for Kim Stafford, KA7SJP, and ham radio is her only hope. Join Kim and Marc in their latest ham radio adventure, ***Firewatch!***, as they're faced with fires everywhere in Oregon's tinder-dry Cascade Mountains. All three are great for hams and nonhams alike.

Night Signals. 1st ed, ©1989 ..... #4289 **$6**
Hostage in the Woods. 1st ed, ©1990 ... #3428 **$5**
Firewatch! 1st ed, ©1993 ..... #4106 **$6**

Tommy Rockford adventure series by the late Walker Tompkins:
SOS at Midnight. 3rd ed, ©1985 ..... #5005 **$5**
CQ Ghost Ship 3rd ed, ©1985 ..... #5013 **$5**
DX Brings Danger, 3rd ed, ©1985 ..... #5021 **$5**
Death Valley QTH. 1st ed, ©1985 ..... #503X **$5**
Grand Canyon QSO. 1st ed, ©1987 ..... #5048 **$5**
Murder by QRM. 1st ed, ©1988 ..... #5064 **$5**
Set of 6 Tompkins books ..... #1490 **$25**

Morse Code: The Essential Language by Peter Carron, W3DKV, covers both the code's fascinating history and its up-to-date applications. You'll learn how to receive and send, and for the proficient operator there's a chapter on high-speed operation. Learn how to handle distress calls heard not only on the ham bands but on maritime and aircraft frequencies as well. Finally, there is a look into the future and "super CW." Expanded 2nd ed, ©1991 ..... #0356 **$6**

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Simply put, ***QST*** is the best source of news and practical information from the world of Amateur Radio. Hams and others interested in Amateur Radio from North America and around the world find it indispensable. ***QST*** comes with your ARRL membership. Here's some of what you'll find in each issue:

Technical Articles provide fascinating theory and practical designs that will expand your Amateur Radio horizons.

Product Reviews present comprehensive yet readable reports on the latest transceivers and accessories; only ***QST*** product reviews are based on careful and comprehensive testing done in the ARRL Lab and painstaking field testing.

Hints & Kinks are clever and useful tips sent in by ***QST*** readers who have found a better way to accomplish a task or solve a problem. You never know what you'll find each month, but you can be sure you'll find something practical and imaginative.

DXing/Contesting, two of the most popular on-the-air activities, are covered in detail in each issue. The How's DX? column provides profiles of well-known DXers and hints on getting more out of your station. ARRL-sponsored contests are fun ways of seeing how your station stacks up against others.

Feature articles cover all the fascinating aspects of ham radio, from a colorful DXpedition to a rare atoll, to a personal story of how a ham introduced her family to the wonders of her favorite hobby.

Ham Ads and display ads are the best way to find a piece of Amateur Radio gear, new or used, top shelf or barebones. Whether it's a new 20-meter beam or a computer program that teaches the Morse code, you'll find it advertised in ***QST***.

Useful and Timely News, from the FCC, or the international scene, is included in articles and columns like League Lines and Happenings. If it's happening, you'll learn about it by reading ***QST***. Single issue price is $3. Contact ARRL for complete membership information.

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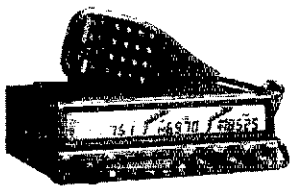

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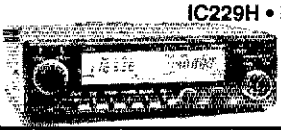

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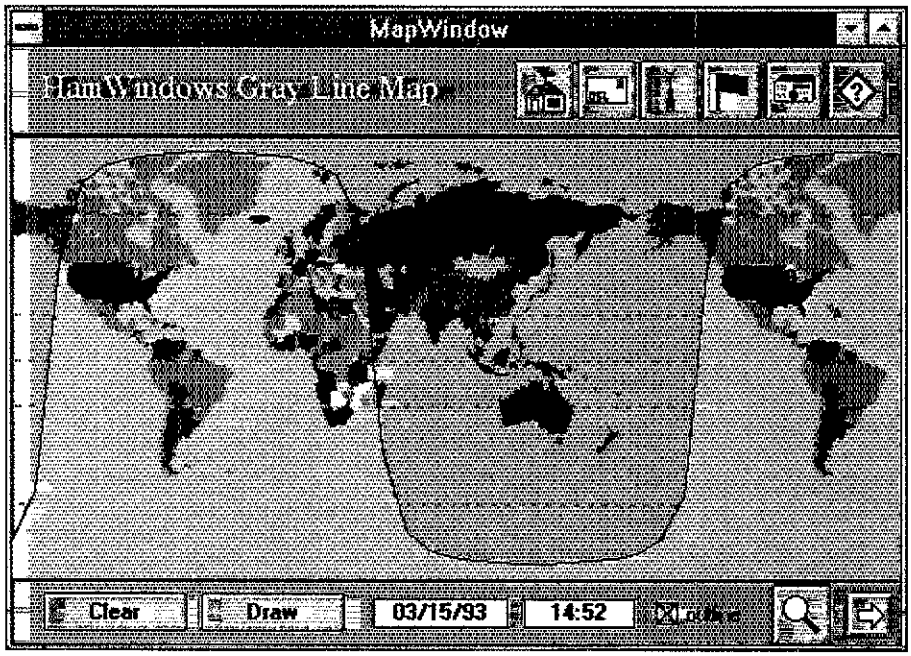
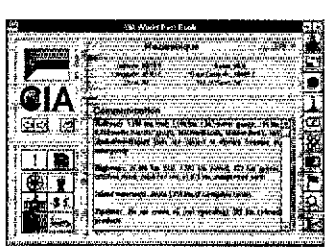


The Grey Line Map is a part of HamWindows 2.3 and HamWindows Plus. clicking on any region of the world will bring up one of the 31 regional maps. Access the CIA World Fact Book to gather the information you want on all the countries around the world.

HamWindows broadens the experience of Amateur Radio operations, opening a visual interpretation of the world you now only hear. Our interactive computer software programs, in essence, gives you a passport to the world.

The low-cost entry-level software program; HamWindows Radio Construction Set gives you the freedom to build, design and control your Amateur Radio Station.

If you're a power operator, then HamWindows 2.3 is for you. Receive the Radio Construction Set, TNC window and a selection of full color screens which allows you to access a computerized station log, Grey Line Map, SunSpot Breaker, CIA World Fact Book and SWL window.



HamWindows Plus 3.0 gives you all the features of HamWindows 2.3 with SVGA compatibility, new awards tracking and reporting, a new TNC window and much more. The idea of a Personal Communications Control Center becomes a reality, all in this easy-to-use software program.

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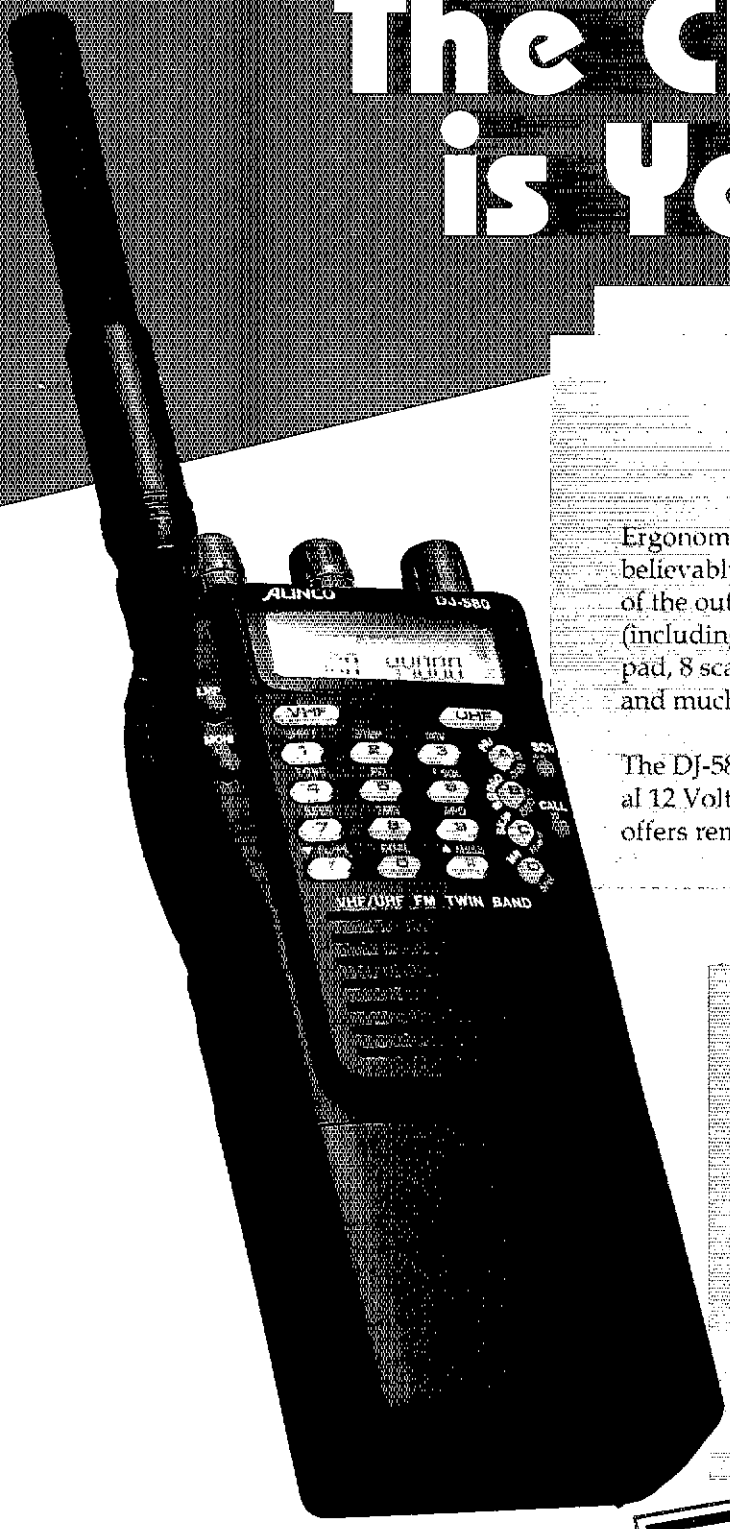


DJ-580T

Loaded Package

Ergonomic design, combined with excellent sensitivity and unbelievably great sound put the DJ-580T in a class by itself. Some of the outstanding features include extended receive range (including AM aircraft), Cross-Band Repeat function, backlit keypad, 8 scanning features, CTCSS encode/decode, DSQ Paging, and much more.

The DJ-580T will deliver a solid 5 Watts of power with the optional 12 Volt battery, and our EMS-8Z Remote Speaker Microphone offers remote control of Memory Channels and Scanning features.

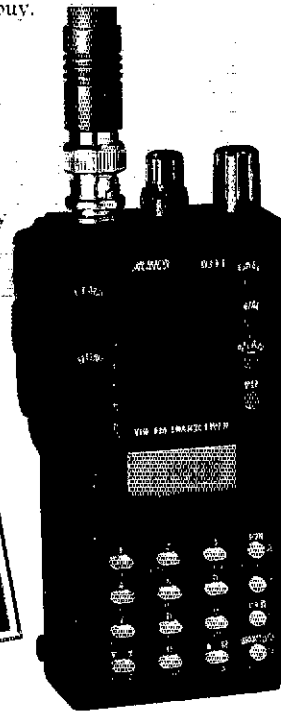
DJ-F1T / DJ-F1TH

Sometimes Smaller is Better

Rugged construction and the most advanced technology make the DJ-F1T the best 2-Meter value available. The DJ-F1TH (High Power version) is the smallest 5-Watt rig you can buy.

Both of these models feature 40 memory channels, extended receive range (including AM aircraft), CTCSS encode, Superior audio quality, "battery save" function, and a backlit keypad.

All this is packed into a cast aluminum frame and tough poly-plastic case that has set a new industry standard for durability.



Holiday Price Break

Discounts extended thru Jan. 10 '94

DR-600T $30 DJ-F1TH $20

DJ-580T $20 DR-130T $10

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DR-600T New

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Some of the other outstanding features of the DR-600T include Wide Frequency coverage, with AM Aircraft receive after simple modification. Direct frequency entry from the microphone is also possible, and the CTCSS Encoder is built in.

There are three Output power selections, and other features such as Dual Band Receive, ABX (Automatic Band Exchange), DSQ, Private Paging, Autopatch, memories, Full Duplex Operation, and Six Scanning Modes are included.

The DR-600T has the rugged construction that you have come to expect from ALINCO, for reliability even under the worst conditions. Housed in a steel chassis, complete with a thermally controlled fan, this radio can run hard, and run long.

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Ham Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham-Ad rate is $1.00 per word. This includes firms or individuals offering products or services for sale. A special rate of 30 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-½" x 11" sheet of paper.

4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received December 14th through January 13th will appear in March *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

6) New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

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IMRA — International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1:00-3:00 PM Eastern Time. Sr. Noreen Perelli, KE2LT, 2755 Woodhull Avenue, Bronx, NY 10469.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN The Old Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C., 1409 Cooper Drive, Irving, TX 75061.

JOIN FAIRS — The Foundation for Amateur International Radio Service. Hams who are dedicated to building international friendships by providing technical assistance, training, exchange visits, and equipment donations on a global basis. Donations tax deductible with 501(c)(3) IRS status of FAIRS. Free information toll free 1-800-FB-KK4WW or 703-763-3311, P.O. Box 341, Floyd, VA 24091.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information write: MARCO, Box 73, Acme, PA 15510.

THE GREAT HAGERSTOWN, MD HAMFEST returns May 22, 1994. Amateur radio dealers, computer dealers, manufacturers, and other vendors interested in table rental in HJC's giant athletic and recreation center may write: Antietam Radio Association, P.O. Box 52, Hagerstown, MD 21741 (or call Page Pyne, WA3EOP, daytime-weekdays at 301-714-0688).

CITRUS COUNTY FLORIDA HAMFEST AND COMPUTER SHOW. January 22, 1994. National Guard Armory, Seven Rivers Drive, off US 19 in Crystal River, FL. Vendor set-up 3PM to 5PM Friday and 7AM to 8AM only Saturday. Public 8:30AM. Admission $4 (SASE) until Jan 1, 1994. $5 thereafter. Indoor tables $15 each. Tailgate spaces $8. Vendors must purchase admission. Call Bill McEown, 904-382-5755 or write SHARC Hamfest, 17 Dogwood Drive, Homosassa, FL 34446.

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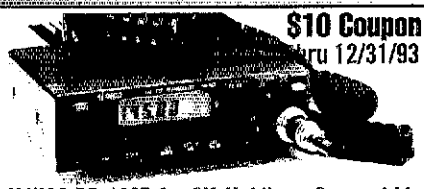
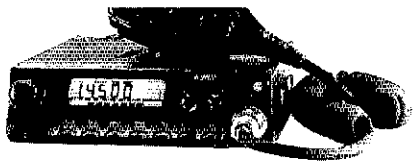


$10 Coupon thru 12/31/93

ALINCO DR-130T 2m FM Mobile • Covers 144-148MHz transmit and 140-174MHz receive. 50/5W output. 20 multi-function memory channels (100 optional), 38 standard CTCSS tones (12 additional tones optional). Programmable transmitter timeout timer with 5 second warning before shut-off. Programmed memory scan, LCD display, 16 button DTMF microphone with up/down control buttons. 12V DC @ 10.5A 5½"w x 1½"h x 6"d, 2¼ lbs .....**CALL** ☎



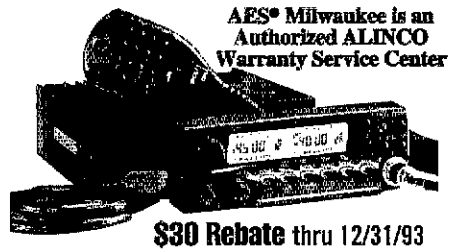
DR-119T High Power 2M Mobile • A Super-Compact 2m mobile in a size no bigger than a ordinary car stereo. Covers 144-148MHz transmit with receive modifiable for 130-174MHz coverage. Highly visible LCD display, 14 multi-function memory channels with lockout, 4 scanning modes. Programmable CTCSS encode and decode. DTMF microphone with UP/DOWN buttons for easy frequency and memory selection. 5½"d x 2"h x 6¾"d, 2.4 lbs..... ☎

DR-570T 2m/70cm Twin Band Mobile • Two radios into one! Covers 2m/440MHz transmit with broadband receive including 130-170, 340-470 and 870-890MHz with MARS/CAP modification. 45W out (2m)/35W (70cm). Full duplex cross band operation (transmit on one band and simultaneous receive on the other). Large, dual digital LCD display, illuminated front panel controls. Volume, squelch and tuning controls for each band. 20 memory channels, 4 scanning modes, priority. CTCSS encode/decode, internal duplexer. 16-key DTMF microphone with UP/DOWN key. 5⅛"w x 2"h x 6¾"d, 3¾ lbs ..... ☎

Due to space limitations, the Optional Accessories for the products shown in this ad are not listed. For information, call us Toll Free or see the Winter '93/94 AES® Catalog. Or call . . .

ALINCO Customer Service

Phone (310) 618-8616



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ALINCO DR-600T 2m/70cm Twin band FM Mobile

Two radios in one! Combines rugged construction, wide frequency coverage, and *high-tech* features to produce a dual band FM transceiver suited for both mobile and base station use. Covers 144-148 and 440-450MHz, plus receives 150-173 and 420-470MHz. Modifiable for aircraft band receive and MARS/CAP transmit. Output: 45W 2m/35W 70cm The front panel can be separated from the transceiver's main body with an optional kit for a custom installation. 40 memory channels, multi-function scanning. Remote controls from any DTMF capable 2m or 70cm transceiver. Separate VHF and UHF outputs. Full duplex cross band operation allows for transmit on one band and simultaneous receive on the other. Large dual LCD and separate volume and squelch controls for each band. CTCSS and DTMF encoders built-in. 5⅛"w x 2"h x 7"d, 3¼ lbs ..... ☎

DR-1200T 2m Data Radio • Engineered for optimum Packet Radio performance and operating convenience in one compact package. Covers 144-148MHz, 25W output with high/low power select. 1200/2400 baud (modifiable to 9600 baud). Highly visible illuminated LCD with function indicators, 4 scanning modes (VFO, memory, band, priority), 14 fully programmable memory channels, programmable CTCSS encode and decode. Voice transmission with the optional microphone. Includes DC power cord and TNC interface cable. 5½"w x 2"h x 6¾"d, 2.2 lbs ..... ☎

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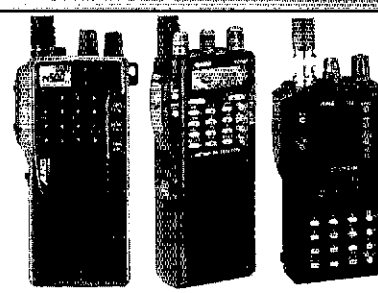

ALINCO DJ-180T 2m FM HT (left) • Superior receive audio and tough construction with simple intuitive operation. Designed so you won't have to spend hours studying the manual. Covers 144-148MHz transmit and 130-174 MHz receive. 2.0W, 5W with opt.12V battery. Illuminated LCD display, 16 digit DTMF, 10 memories. 5½"h x 2⅜"w x 1⅜"d....**CALL** ☎

ALINCO DJ-180TH • 5W 2m FM HT ..... ☎

ALINCO DJ-580T 2m/70cm Twin Band HT (center) Super Audio! 2m/440MHz tx, rx 130-174 and 410-470MHz. Mod. for MARS/CAP tx, + 118-136MHz & 800MHz rx. 40 memories, CTCSS encode/decode, DTMF encode, DSQ. Full duplex cross band repeat, 8 scan modes, autodialer, back-lit keypad. Simultaneous receive on both bands with separate squelch and volume controls. 2.5W; 5W w/12V or opt. battery. 6½"h x 2¼ "w x 1¼ "d, 0.97 lbs ..... **SPECIAL** ☎

DJ-580T – **$20 Coupon** thru 12/31/93

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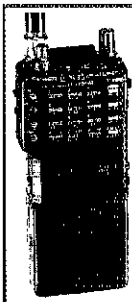

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BUY, Sell, Collect and Restore early tube equipment? Early receivers, transmitters and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets", flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $12. Write for information and Museum hours: Bruce Kelley, W2ICE, Route 3, Holcomb, NY 14469.

WANTED: WWII Military Radios and Accessories. Need ATD Tuning Units, DY43 Dynamotor, BC 222/223 Manuals, ART-13 Connectors, ARR/41/MT-1518 Mount, ATB, GRC 105 Receiver, Hallicrafters HT20. Charlie, 501 Mystic Valley Pkwy., Medford, MA 02155.

WANTED By Collector: Old Radios, Parts, Microphones, Advertising Signs, and TVs. Jerry Finamore, 87 Stonewood Place, Catasauqua, PA 18032, 215-264-8412.

WANTED: Books; Pre-1900 Electricity and Telegraphy, Pre-1925 Radio, Pre-1940 Television. Books, Magazines or any *other related literature. Jim Kreuzer, N2GHD, Box 398, Elma,* NY 14059, 716-681-3186.

BROADCAST MICROPHONES And Accessories (Call Letter Plates, Stands) Wanted. Early carbon, condenser, ribbon, dynamic models used in broadcasting. James Steele, WK8X (FM), Box 2525, Kingsland, GA 31548, 912-729-6106.

CODE/CIPHER Machines Wanted! Historian buys code/cipher devices, manuals, books, etc.! All periods! Melton, Box 5755, Bossier City, LA 71171, 318-798-7319.

MANUALS for most ham-gear made 1935/1970, plus Kenwood. No quotes. Our current catalog "L", ($2 USA, $3 elsewhere) required to order. Hi-Manuals, Box L-802, Council Bluffs, IA 51502.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify model numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: Collins product catalogs and promotional literature from 1930-1950. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91605, 805-259-2011.

TELEGRAPH INSTRUMENTS WANTED: Collector buys early or unusual telegraph keys, sounders, relays, parts, call boxes, signs, books, etc. Also want pre-1910 electrical test instruments. Larry Nutting, WD6DTC, 4025 Slate Court, Santa Rosa, CA 95405, 707-539-1883.

WANTED: Hallicrafters Skyriders with entire front panel dull *aluminum color, S-30, S-33, S-35, SX-112, EP-132,* console speakers R-8, R-12, other very old or unusual Hallicrafters items including advertising signs, memorabilia, parts. Also want RCA model AVR-11. Chuck Dachis, "The Hallicrafter Collector", 4500 Russell Drive, Austin, TX 78745.

WANTED: pre-1925 battery radios, crystal sets, and vacuum tubes. Also early telegraph keys and pre-1900 electrical apparatus. Jim Kreuzer, N2GHD, Box 398, Elma, NY 14059, 716-681-3186.

TUBES. (Thousands in stock.) Send SASE for list. Fala Electronics, P.O. Box 1376-1, Milwaukee, WI 53201.

COLLECTOR Looking for Pre-1942 Communications Receivers, Commercial, Amateur, Government, Kit, Homemade, etc. Anything considered. Wayne, N0TE, 1212 17th Road NW, Burlington, KS 66839, 316-364-5353.

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COLLINS VIDEO LIBRARY! Dennis Brothers demonstrates how to service your KWM-2, S/Line and 30L-1! Hi-Res Communications, 18464 Ashcreek, Macomb, MI 48044, 313-228-1600.

WANTED: Wireless detectors, wavemeters. Military radios - WWI to 1935. W. Jensby, W0EOM, 645 Giannini Drive, Santa Clara, CA 95051, 408-296-6071.

COLLECTOR BUYS mono or stereo power amplifiers by - Dynaco, Heathkit, Fisher, Scott, Brook, Brociner, Leak, Quad, McIntosh, Marantz, etc. Also other hi-fi components, old radios, ancient TV's, pocket transistor radios from 1950's, and most associated items. Any condition, any quantity. Stan Jacobs, 232 Highbrook Avenue, Pelham, NY 10803, 914-738-3483.

WANTED: WW II to 1970 x-band radar/microwave equipment. Working or not, complete/incomplete. TM's, test equipment. SHF, Box 10215, Pittsburgh, PA 15232-0215.

WANTED: McIntosh Tube Hi-Fi Gear. Also, old Fender and VOX guitar amps. Pick-up within 200 miles. Frank Czaja, AI9T, 8968 W. Forest Home, #4, Milwaukee, WI 53228.

WANTED: Telegraph Keys. Collector bitten by the bug! Joel Wisotsky, N2LAI, 31 Cow Lane, Great Neck, NY 11024, 516-482-3241 eve.

WANT MAC KEY with "mfd in Boston, Mass USA" on left side, and other models. State condition, price. Tom French, W1IMQ, "The McElroy Collector", 120 Great Road, Maynard, MA 01754.

KEYS: Last few 1940 vintage used British spy keys, from India Telegraph service. $45 ppd. Government reject WW-II "tear drop" keys at $25 ppd. Total Electronic Concepts, P.O. Box 400, Lincoln, MA 01773.

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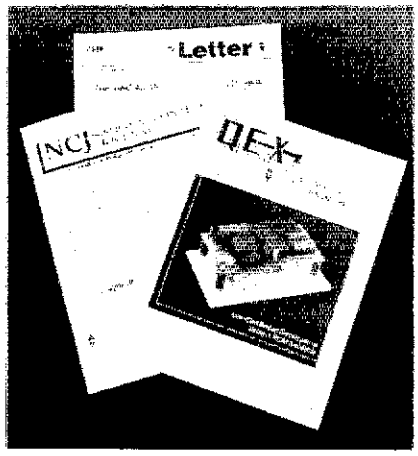

QEX, the ARRL Experimenter's Exchange, provides a medium for the exchange of ideas and information between Amateur Radio experimenters in order to document advanced technical work and support efforts to advance the state of the Amateur Radio art. Monthly. For 12 issues to ARRL members: US, $12; Canada and Mexico by first class mail $25; Elsewhere by airmail $48. Non-members add $12 to these rates.

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WANTED: 1956 or 57 Allied Radio Catalog. State condx & price. Rick Berg, 201 Pemberton Road, Rochester, NY 14622.

WANTED: Old Callbooks: Amateur, Commercial, Military, Govt and Broadcast for the years 1900-1930. Bob, W4JNN, P.O. Box 166, Annadale, VA 22003 or call collect 703-560-7161.

MILITARY Keys, Bugs, Meters, Telegraph, etc. Large list, $1 plus 2 stamp SASE. Joe Jacobs, 60 Seaview Terrace, Northport, NY 11768.

WANTED: 1928, 29, 30, or 31 *QST*. Jeanne Bloom, AA7YK, 601 Pattee Canyon Road, Missoula, MT 59803, 406-728-4275.

MCELROY IS HERE. W1IMQ's biography of T.R. McElroy, World's Champion Radio Telegrapher. Includes every Mac Key. Limited hardcover edition (if available) $39.95. Regular softcover $19.95. Add $2 shipping to order. Artifax Books, Box 88-Q, Maynard, MA 01754.

COLLECTORS: 30 years of *QST*, BC-221 with manual and AC PS. Just pay shipping. K1NFD, 508-443-3877.

WANTED: 1950 to 1975 receivers and transceivers from Collins, Hammarlund, Gonset, etc. Will consider any brand or model. Write KD4AJ, 1988 Huntington Hall Court, Atlanta, GA 30338.

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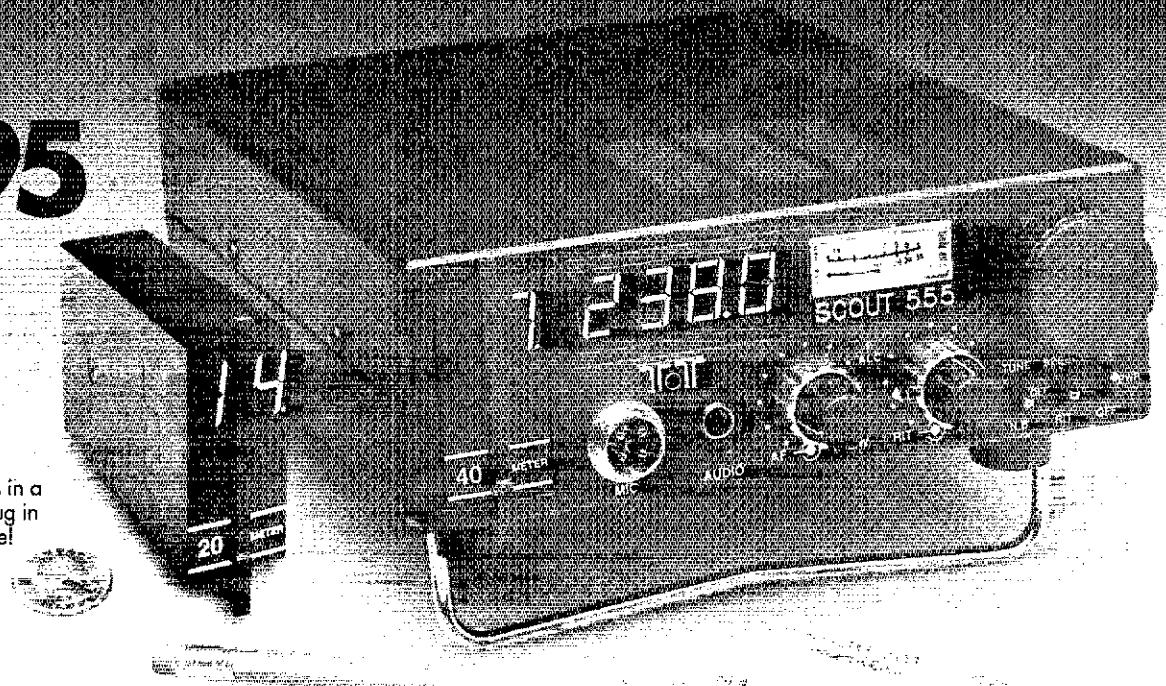

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51J4, 75A3, SX-88 or PRO310 Wanted. Don, 602-743-9711.

COLLINS: 312B-4 w/manual. Collins S-Line manuals. Denny, KA9DZR, 217-662-6265.

COLLINS RADIO RECEIVERS WANTED. Models 651S1, 51S1, matching accessories, etc. What do you have, I would like to know. Please write to Mr. Jeff Markey, 231-10 Route #6, Greely, PA 18425, telephone 717-226-9741 day or 516-766-7813 night.

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April 29, 30 & May 1, 1994

General Chairman, Dave Grubb, KC8CF — Asst. General Chairman, Ken Allen, KB8KE

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994 Deadlines
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USA - April 8 Canada - April 1
lea Market Space: February 1

Flea Market
Flea Market Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. A maximum of 3 spaces per person (non-transferable). Electricity is available in a portion of the last Flea Market row for $40 additional per space. Rental tables and chairs are not available in the Flea Market. Vendors ***MUST*** order an admission ticket when ordering Flea Market spaces. Please send a separate check for Flea Market space(s) and admission ticket(s). Spaces will be allocated by the Hamvention committee from all orders received by February 1. Please use 1st class mail *only*.

Notification of Flea Market space assignment will be mailed by March 15, 1994. Checks will not be deposited until after the selection process is complete.

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Novice thru Extra exams scheduled Saturday and Sunday only. Send FCC form 610 (Aug 1985 or later) - with requested elements shown at top of form, copy of present license and check for prevailing rates (payable to ARRL/VEC) to Exam Registration, 708 Mapleside Dr. Trotwood, OH 45426

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☐ Send admission tickets **only** if flea market space(s) assigned.
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Admission (valid all 3 days)	____	@ $11.00*	$____
Grand Banquet	____	@ $22.00**	$____
Alt. Act. Luncheon (Saturday)	____	@ $8.50	$____
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HEATH SB-220, mint condition, $600. WB6YHT, 134 Linden Lane, San Rafael, CA 94901, 415-454-3939.

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WANTED: National NCX-3 Transceiver or Parts. Vinne, KB1AYK, 203-366-5736.

WANTED: Collins 51J1-51J4, 75A1-75A3, 32V1-32V3, National HRO, NC-400, AGS, SW-3, Carter Elliott, WD4AYS, 1460 Pinedale Road, Charlottesville, VA 22901, 804-979-7383.

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QRP HEADQUARTERS: Beginner, advanced. Priced right. Kits, parts. Call/SASE. Radiokit, Box 973, Pelham, NH 03076, 603-635-2235.

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KENWOOD YG-455CN-1 Filter $100. Harry, KA1KX, 617-891-7680.

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WANTED: Kenwood R-600 and Yaesu FRG-7 receivers. Must be in mint or like new condition. Rick, N6NVG, 510-687-2719 after 4PM PST.

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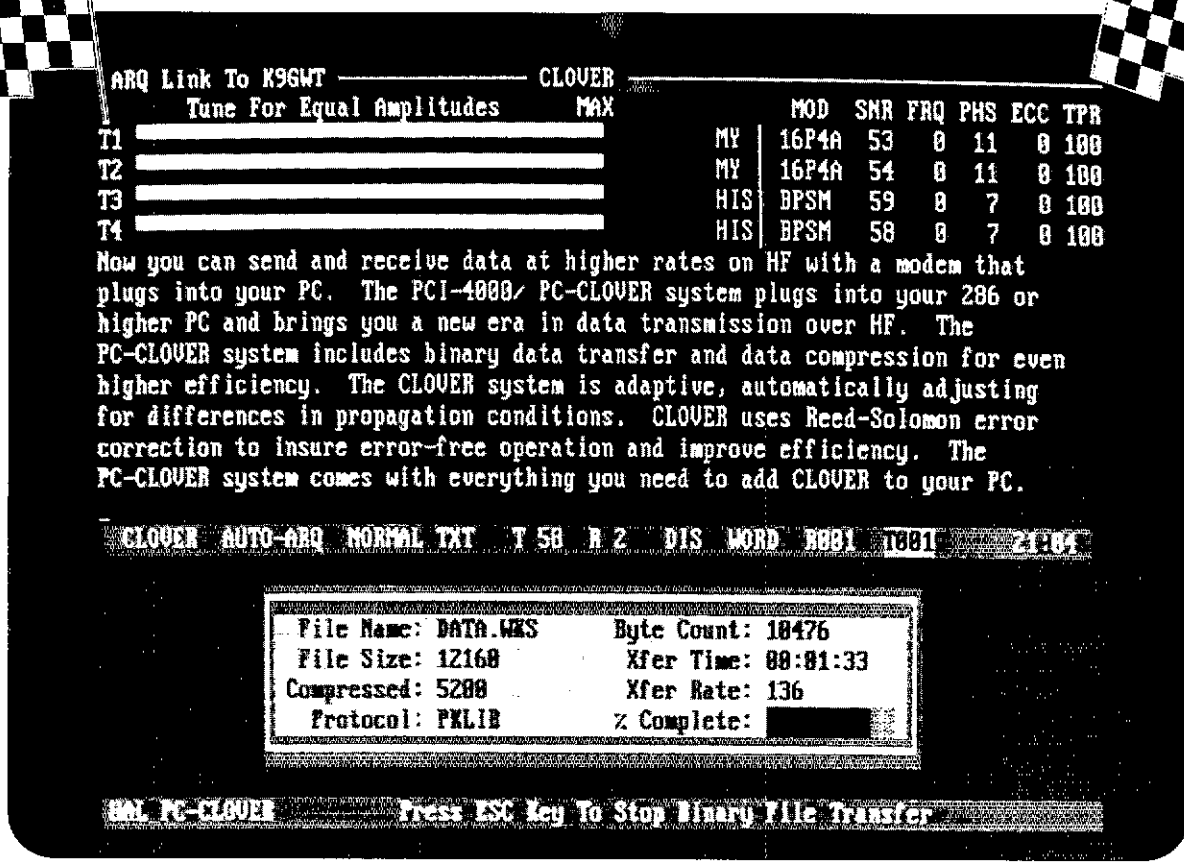

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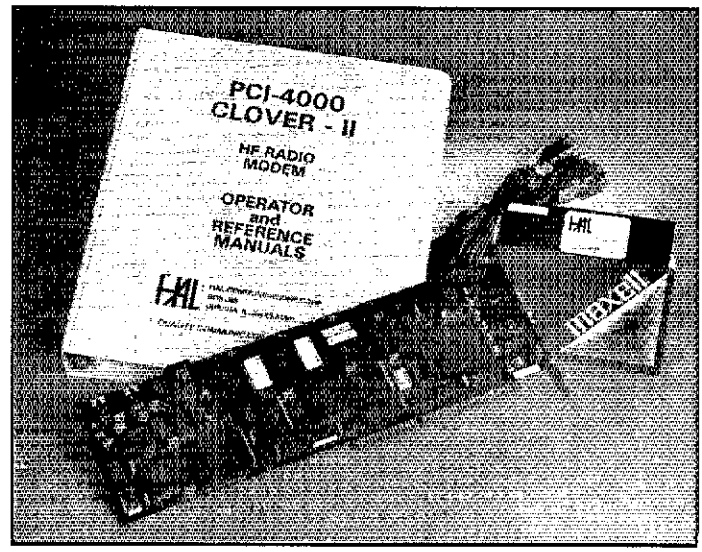

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WANTED: 4 pin tubes 211/VT4C, 845, 501250, 245, 2A3, etc. Garrard 301, 401, SME RMA, 309, 3012 Arms. Call Paul Gil, 201-751-5959, 180 Union Avenue, Belleville, NJ 07109.

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FOR SALE: Corsair II Transceiver with matching VFO 263 and power supply speaker 961 three filters 1.8, 500 and 250, internal keyer, late model like new with manuals and cables, non-smoker. $850 firm, share shipping. W8RHS, phone 304-727-4626.

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WANTED: Motorola MICOR decode/encode PL reads 114.8Hz/2A. Dave, KY0L, 4362 North Thomas Avenue, Minneapolis, MN 55412-1006, 612-521-0438.

WILL TRADE Ham gear or cash for old tube broadcast or recording compressors, limiters, equalizers, or tube mics. Any condition. Stan, KM6XZ, 415-455-9348.

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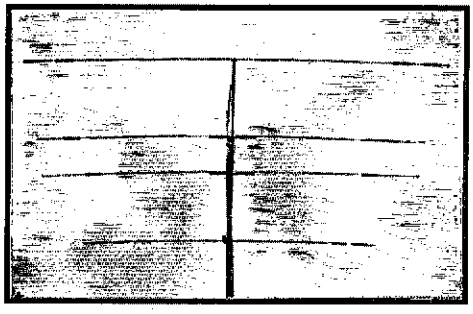

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10,12,15,17,20

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For those who want a BIGGER beam choose another MOSLEY 1st— the PRO-57-B or the PRO-67-B. These are the latest improved designs of the 1st PROs, which were introduced in 1983. These antennas give you HURRICANE-TESTED strength with a BROAD-BANDED BIG SIGNAL! If you value your MONEY, and want the best all around antenna, at any price, the MOSLEY PRO series is for YOU!

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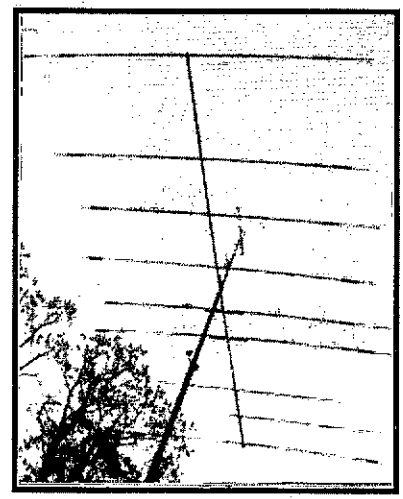
The PRO-95 and PRO-96 will give you one antenna, which will take on a 5 or 6 tower mono-band station setup. Nobody will move you on any of these bands!



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COLLINS STATION: KWM-2, 312B5, 30L1, 516F2, DL-1, noise blanker, similar mic. All manuals. Spare tubes. $1500. W5ROD, 214-247-2089.

KENWOOD TS830S, very clean with two filters and DFC 230 digital VFO. Steve, N5DGS, 512-576-2270.

FOR SALE: Tri-Ex Tower w/51 power transformer 3000 volts 750 MA. No shipping. Call WB2CIV, 201-226-1247 evenings.

COLLINS 302C-1 Directional Wattmeter Coupler Unit only. With instruction book, $35. Heathkit model HD1250 solidstate dip meter, $10. Heathkit deluxe antenna tuner model SA2060, kit with all parts not assembled, $75. Will ship. E.E. Adkins, N7CP, 602-981-5976, 2638 Leisure World, Mesa, AZ 85206.

COMMODORE 64 HAM PROGRAMS - 8 disk sides - over 200 Ham programs $16.95. 29 cent stamp gets unusual software catalog of utilities, games, and British disks. Home-Spun Software, Box 1064-O, Estero, FL 33928.

KENWOOD TS-940AT with 500 cycle filters and Kenwood microphone in original box with manual, exellent condition, $995. W2ADB, 803-884-8108.

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CUSHCRAFT R5, never used, $225; MFJ-9017, $130; IC-230, $75; Ramsey PA-10, $65. WE0R, 314-544-5584.

DRAKE R4C, T4XC, MS4, AC4, FS4, Torrestronics Digital Display, all Sherwood Mods and Filters, high serial numbers, $700. WA8ZRK, 313-584-2066.

MOTOROLA MICOR REPEATERS 440, 2M, 6M; crystalled and tuned, ready to operate $400; 440 duplexer sales and service. Matt Bush, KA9RIX, 813-345-0609 evenings.

WANTED: Heathkit IR-5204 chart recorder or equivalent, with manuals. Bill Emerson, WA1EVD, 115 Westgate Road, Wellesley, MA 02181, 617-235-8086.

YAESU 767GX, 2 meter module, mike, $1200. Ten-Tec Corsair II, 961 power supply, filter, mike, $800. Yaesu FL2100B linear, $400. Ten-Tec 229 antenna tuner, $200. Hammarlund HQ140X general coverage receiver, $150. AEA Morsematic, $100. Atronics code reader, $80. Kenwood MC-50 mike, $50. N5WPE, 405-524-3533.

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HEATHKIT AMATEUR RADIO REPAIR by RTO Electronics, 4166 Maple Street, Berrien Springs, MI 49103, Phone 616-473-3201.

BENCHER BY-1 Paddle $45; AEA PK232 Controller $200; Palomar RX Noise Bridge $45; Kenwood SP940 Speaker $85; Heath HM2102 Wattmeter $25. Bill, AA6S, 209-732-7163.

AMIGA CopyCode. See page 64 August *QST*. KY6P, 619-453-9446.

SELL: Kenwood TS-830S, like new, up/down mike, NSSB, AM, and CW filters, mobile mount/cables/hardware, $650. Jack, N6UC, 714-544-5369.

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WANTED: Heathkit HW-9 and manual. Please call Steve, KE0WX, collect 507-645-4310.

WANTED: AC power supply in working condition for the Tempo One Transceiver. Frank, N6EGI, 415-726-4183.

TEN-TEC Triton IV HF Transceiver $400. Wanted serial adapter for IBM laptop convertible. N2MBC, 516-338-4550 or Callbook.

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DRAKE T-4XC, R-4C, AC-4, MS-4, one owner and mint condition, $550. Stan, K5EW, 304 William John, Bonaire, GA 31005.

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MFJ-1024 active antenna new $85. Drake FS-4 $300. Heath HD-1420 VLF converter $20. Kenwood TH21AT w/ accessories $125. Two Kenwood TH31AT w/accessories $140 each. Kenwood TM-3530A $300. Kenwood TM-321A w/CTCSS $300. MFJ-941C HF tuner $50. Kantronics UTU $75. Paul Newland, AD7I, 908-949-3183 anytime.

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QUADS 5 Band 2 Element $289. Lightning Bolt Antennas, RD 2, Rt. 19, Volant, PA 16156, 412-530-7396.

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FOR SALE: unused, still wrapped Eimac 4CX1000A, $400 or BO. Jim, KR1S, 203-667-2568 eves, 203-656-1541 days or jkearman@arrl.org.

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AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio PD Software $4/disk. Two stamp SASE brings catalog. Specify computer! Kinetic Designs Hamware, Box 1646, Orange Park, FL 32067-1646.

HAM RADIO: Heathkit Model SSB Transceiver, SB101, 180 Watt PEP Input 80-10 Meter, Heathkit AC Power Supply Model HP23, Microphone, Good Condition, $175. Dorothy, 718-446-1812.

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D-104 Mic, mint, $25. W2IXU, 305-485-5913.

WANTED: Johnson Desk Kilowatt and Hallicrafters SX-88. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170, 313-453-8303.

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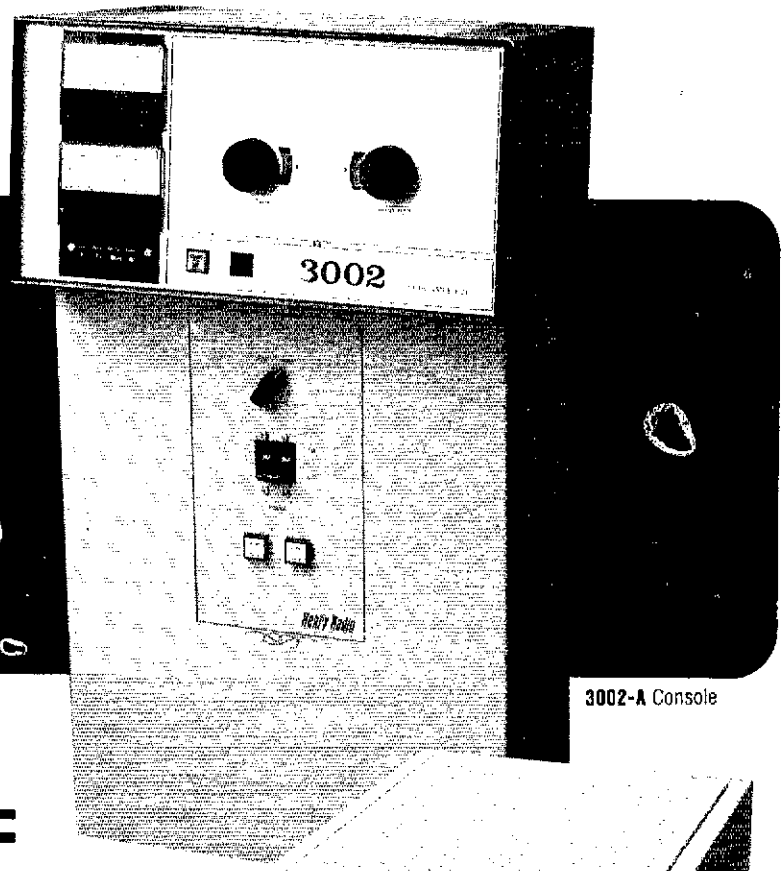

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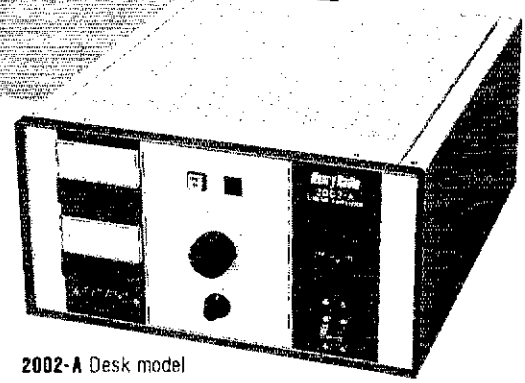

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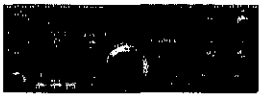

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TX-438	22'6"	38 FT.	18 SQ. FT.	919.00
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TX-472	23'8"	72 FT.	18 SQ. FT.	2279.00
TX-489	24'4"	89 FT.	18 SQ. FT.	3959.00
HDX-538	22'6"	38 FT.	30 SQ. FT.	1179.00
HDX-555	22'0"	55 FT.	30 SQ. FT.	2079.00
HDX-572	23'8"	72 FT.	30 SQ. FT.	3559.00
HDX-589M	24'8"	89 FT.	30 SQ. FT.	7119.00

In CA add 6% sales tax, please call for an accurate shipping quote.

ROTATORS

Onon OR-2300 (35 Sq.')	**999**
Orion OR-2300D (35 Sq.')	**1099**
Telex HAM IV (15 Sq.')	**355**
Telex Tailtwister (20 Sq.')	**420**
Telex HDR300 (25 Sq.')	**900**
Yaesu G500 (elevation)	**259**
Yaesu G800S (21 Sq.')	**309**
Yaesu G800SDX^ (21 Sq.')	**379**
Yaesu G1000SDX^ (23 Sq.')	**459**
Yaesu G2700SDX^ (34 Sq.')	**879**
Yaesu G5400^ (az./el.)	**479**
Yaesu GS-23^ RS232 control	**299**
Yaesu GS-232^ RS232 control	**475**

Please call for prices other rotators.

CUSHCRAFT

13B2 / 17B2 / 26B2	**Call**
10-3CD / 10-4CD	**Call**
12-4CD / 40-2CD	**Call**
15-3CD / 15-4CD	**Call**
20-3CD / 20-4CD	**Call**
A3S / A4S / AP8A	**Call**
A449-6 / A449-11 / AR-2	**Call**
AR-6 / AR-10 / AR-270	**Call**
ARX-2B / ARX-450B	**Call**
CS-28M / CS-147M	**Call**
CS-270M / CS-450M	**Call**
D3W / D40	**Call**
R5 / R7 / AV5	**Call**

Please call for Cushcraft prices.

TELEX / HYGAIN

TH11DXS	5 beam	**850**
TH7DXS	3 band beam	**650**
TH5MK2S / EX-14		**530/410**
218S	satellite system	**325**

Please call for Hygain crankup towers.

ALUMINUM

6063-T832 DRAWN TUBING

O.D.	WALL	I.D.	COST
.375"	.058"	.259"	.35/Ft.
.500"	.049"	.402"	.45/Ft.
.500"	.058"	.384"	.50/Ft.
.625"	.058"	.509"	.55/Ft.
.750"	.058"	.634"	.65/Ft.
.875"	.058"	.759"	.75/Ft.
1.000"	.058"	.884"	.80/Ft.
1.125"	.058"	1.009"	.90/Ft.
1.250"	.058"	1.134"	1.10/Ft.
1.375"	.058"	1.259"	1.20/Ft.
1.500"	.058"	1.384"	1.40/Ft.
1.625"	.058"	1.509"	1.60/Ft.
1.750"	.058"	1.634"	1.80/Ft.
1.875"	.058"	1.759"	1.90/Ft.
2.000"	.058"	1.884"	1.95/Ft.
2.125"	.058"	2.009"	2.05/Ft.

In 6' and 12' lengths; 6' ship via UPS. 12' ship via truck or air freight collect.

6061-T6 EXTRUDED TUBING

.188"	Solid	----	.15/Ft.
1.125"	.058"	1.009"	.70/Ft.
1.250"	.058"	1.134"	.85/Ft.
2.000"	.120"	1.760"	2.60/Ft.
2.000"	.250"	1.500"	4.10/Ft.
2.500"	.120"	2.260"	3.25/Ft.
3.000"	.065"	2.870"	2.20/Ft.
3.000"	.120"	2.760"	3.85/Ft.

In 6', 12', and 24' lengths; 6' ship UPS, 12' and 24' ship truck / air collect.

ROHN TOWER

25G / 45G / 55G	**65/149/197**
A25AG2 / 25AG3 / 25AG4 ..	**94/94/95**
45AG2 / 45AG4	**180/186**
AS25G / AS455G	**30/74**
EF2545 / EFBX	**375/399**
FK2548' / 58' / 68' .	**1350/1450/1485**
FK4544' / 54' / 64' .	**1775/1950/2075**
GGK25G2 / GGK45G2	**325/350**
HBX40 40' tower (10 Sq.')	**325**
HBX48 48' tower (18 Sq.')	**450**
HBX56 56' tower (10 Sq.')	**589**
HDBX40 40' tower (18 Sq.')	**429**
HDBX48 48' tower (18 Sq.')	**579**
TB3/TB4	**75/90**

COAX & CABLE

ANDREW HELIAX®

1/2" .. **2.49/Ft.** 7/8" ..... **5.99/Ft.**
connectors: 1/2" .. **32.00** 7/8" **78.00**

COAX

9086 (9913 equivalent)	**.49/Ft.**
9096 (stranded 9086)	**.65/Ft.**
RG-213/U (8267 equivalent	**.39/Ft.**
RG-8X (mini RG-8/U)	**.25/Ft.**
RG-58C/U	**.24/Ft.**

BARE COPPER WIRE

14 gauge stranded	**.10/Ft.**
14 gauge flex-weave	**.15/Ft.**

ROTOR CABLE

7 conductor (2-#18, 5-#22)	**.20/Ft.**
8 conductor (2-#18, 6-#22)	**.25/Ft.**
heavy duty 8 (2-#16, 6-#18)	**.45/Ft.**

PHILLYSTRAN

NONCONDUCTING GUY CABLE

HPTG1200I (1200#)	**.39/Ft.**
HPTG2100I (2100#)	**.48/Ft.**
HPTG4000I (4000#)	**.69/Ft.**
HPTG6700I (6700#)	**.89/Ft.**
end kits 2100/4000/6700	**4/5/6**

GUY HARDWARE

3/16EHS guywire (3990#)	**.18/Ft.**
1/4EHS guywire (6700#)	**.21/Ft.**
3/16CCM cable clamp	**.55**
1/4CCM cable clamp	**.65**
1/4TH thimble	**.55**
3/16 preformed big grips	**2.99**
1/4 preformed big grips	**3.49**
500D guy insulator	**2.29**
502 guy insulator	**4.49**
3/8EE turnbuckle	**8.95**
3/8EJ turnbuckle	**9.95**
1/2X9EE turnbuckle	**11.95**
1/2X9EJ turnbuckle	**12.95**
1/2X12EE turnbuckle	**13.95**
1/2X12EJ turnbuckle	**14.95**
GAR30 / GAS604 Anchor	**30/20**
Klein safety belt (S M L XL)	**69.95**

CARBON STEEL MASTS

WALL	5'	10'	15'	20'
.12	29	55	82	99
.18	49	95	139	179
.25	--	129	--	249

Don't be fooled by aluminum masts! The typical yield strength of our 2" O.D. galvanized steel masts is 87,000psi.

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IC-W21AT
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2M/440MHz Mobile 45W on 2M, 35W on 440 MHz

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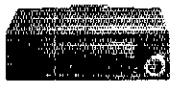

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FT-5200
2 Meter/440 Mobile

YAESU

$100.00 OFF

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Premium HF Transceiver

IC-728
Compact, Lightweight HF With General Coverage Receiver

IC-2SRA
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IC-228H
2 Meter Mobile With 45W Output, 20 Memories, Multiple Scan Functions

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New 100 Watt General Coverage Transceiver

IC-707
New, All-Mode HF With 100% Duty Cycle And Full General Coverage Receiver

IC-2SAT
Ultra Compact, 2 Meter HT With 48 Memories And Easy Operation

IC-P2AT
2 Meter Compact Handheld With 100 Memories, Backlit Keyboard.

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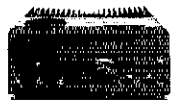
FT-2400
Military Spec'd 2 Meter



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IC-229H
2 Meter Mobile With 50 Watts And 20 Memories

IC-2GAT
2 Meter Handheld With 7 Watts Output

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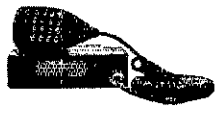
IC-Δ1A
2M,440MHz And 1200 MHz In One Compact Handheld Receive All 3 Bands Simultaneously.



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2 Meter, 50W Mobile

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FT-840
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2m/440MHz Mobile With 45W on 2/M and 35W On 440MHz

IC-R1
Compact Handheld Receiver Covers 100kHz - 1300MHz AM,FM, Wide FM, 100 Memories

IC-R7100A
All Mode Receiver. 25 To 2000 MHz, 900 Memories Analog S-Meter

FT-530
New 2 Meter 440MHz Handheld

$25.00 OFF

MFJ

1270B	$109
1274	$129
1278B	$259
1704	$ 54
1786	$214
1796	$159
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284, 5, 6, 7	$ 22
249	$169
9015, 20, 40	$149
949E	$129
986	$239
989C	$288

Large Stock, Call For Other Items

ALINCO ELECTRONICS INC.

DJ-580T
2 Meter/440MHz Handheld

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New Digital Controller Featuring PACTOR Along With CW, RTTY, ASCII, AMTOR and Packet

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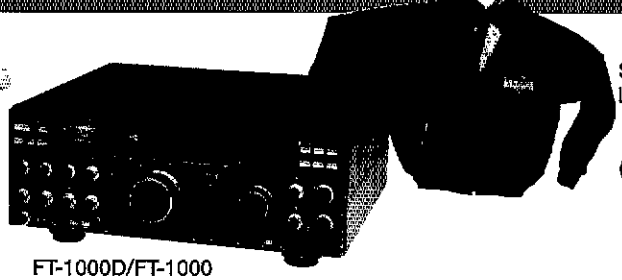

FT-1000D/FT-1000

Plus Special Bonus Limited Edition Embroidered Jacket ($169.00 Value)

GOOD OCT. 15 1993 THROUGH JAN. 10 1994

FT-990/FT-990DC

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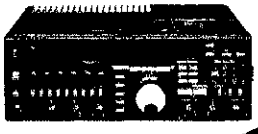
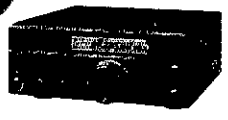
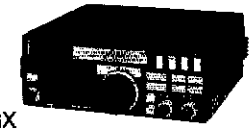
FT-890AT/FT-890



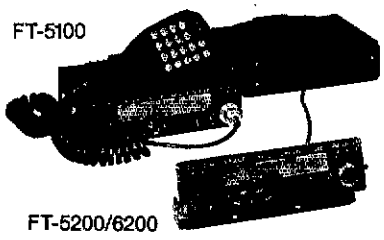
FT-767GX, FT-736R



FT-840

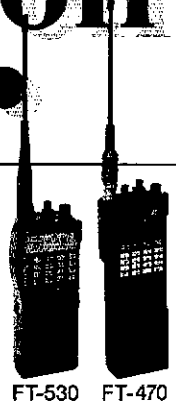


FT-747GX



FT-5100

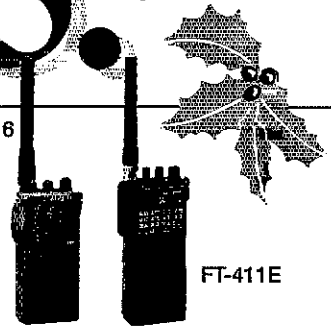
FT-5200/6200



FT-530 FT-470

G-2700SDX
G-1000SDX
G-800SDX

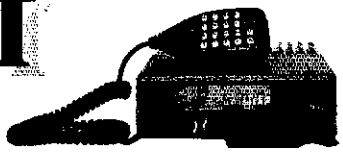
$25.off



FT-416/816

FT-411E

$15.off



FT-2400H

FT-2200

CUSTOMER: Surrender this coupon at time of purchase to your authorized Yaesu dealer for discount. Limit one coupon per purchase. Coupon is non-transferable and can be only used for products as advertised in this ad and for the discounts as stated. Offers only good at authorized U.S. and Canadian Yaesu dealers. DEALER: Send this coupon along with a copy of sales receipt to YAESU U.S.A., Sales Dept., 17210 Edwards Rd., Cerritos, CA 90701.

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- ☐ $100 OFF FT-1000D/FT-1000 FREE also with purchase of FT-1000D or FT-1000, Limited Edition Embroidered Yaesu Jacket. Dealer will provide redemption coupon for jacket.
- ☐ $ 50 OFF FT-990DC/FT-990
- ☐ $ 35 OFF FT-890AT/FT-890, FT-840, FT-767GX, FT-736R, FT-747GX
- ☐ $ 25 OFF FT-5100, FT-5200/6200,FT-530, FT-470, G-2700SDX, G-1000SDX, G-800SDX
- ☐ $ 15 OFF FT-2400H, FT-2200, FT-416/816, FT-411E

MODEL PURCHASED _____ SERIAL NUMBER _____

DATE OF PURCHASE: _____

YOUR NAME: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

PHONE: _____ CALL SIGN: _____

DEALER NAME/STATE: _____

Coupon offer valid in USA and Canada only. Offer void where prohibited by law. Coupon has no cash value. Limit one coupon per purchase. Not valid with any other Yaesu offers or discounts. Offers not applicable to purchases made prior to October 15, 1993 or after January 10, 1994.

COUPON VALID FOR PURCHASES MADE BETWEEN OCT. 15, 1993 AND JAN. 10, 1994.

FT-2200/7200
2-m/70-cm Mobiles

- **Frequency Coverage:**
  FT-2200
  RX: 110-180 MHz
  TX: 144-148 MHz
  FT-7200
  RX/TX: 430-450 MHz
- 50 Memory Channels
- Wide Receiver Coverage: 110-180 MHz
- AM "Aircraft" Receive: 110-139 MHz
- Built-In DTMF Paging/Coded Squelch
- Power Output 50/25/5 Watts
- CTCSS Encode Built-In
- 10 Memory DTMF Auto Dialer
- Selectable Channel Only Display
- Remote Operation w/ Optional MW-2
- Optional Digital Voice Storage System
- Backlit DTMF Mic
- **Accessories:**

FTS-27	CTCSS Decode Unit
DVS-3	Digital Voice System Unit
MW-2	Remote Control/ Wireless Mic
SP-7	External Speaker

"The FT-2200 answers my problem! It fits anywhere, and the 3 power levels are great!"

"Yaesu did it again!"

"I like the FT-2400H!"

"Rugged performance is my answer!"

For your sleek compact car, the sculptured FT-2200 looks terrific. With leading-edge features, performance and reliability too, it's the perfect answer to your 2-m needs.

At 5.5"W x 1.6"H x 6.5"D the FT-2200 installs nearly anywhere. And, it does "lead" with features like optional Remote Control Wireless Mic – first in the world for any 2-m mobile and AM Aircraft Receive – first in a Yaesu mobile. Performance? The FT-2200 has more than twice the memories of the competition! Reliability? Its bright, new LCD display and backlit DTMF Mic makes night mobiling safe. Features, performance, reliability – in a powerful little package. See your dealer for *this* answer to your 2-m needs.

FT-2400/7400H
2-m/70-cm Mobiles

- **Frequency Coverage:**
  FT-2400H
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Mil-Spec Design
- Advanced Track Tuning (ATT)
- 31 Memory Channels
- Wide Receiver Coverage: 140-174 MHz
- Selectable Alpha-Numeric Display
- Largest 2-Meter Display Available
- CTCSS Encode Built-In
- Power Output 50/25/5 Watts
- Flip Up Front Control Panel Hides Seldom Used Buttons
- Backlit DTMF Mic
- **Accessories:**

FTS-17A	CTCSS Decode Unit
FRG-6	DTMF Paging Unit
SP-4	External Speaker
FP-700	Power Supply

The Yaesu FT-2400H set the standard by which all 2-m mobiles are judged. The first and only amateur radio to pass rugged MIL STD 810D tests for shock and vibration, its one-piece die-cast chassis with extra large heat sink gives years of trouble-free operation.

With 50 watts of TX power, large alpha-numeric display, auto display dimmer, exclusive backlit DTMF Mic and advanced track tuning front end for superior receiver performance, the popular FT-2400H is the choice of amateurs in the know.

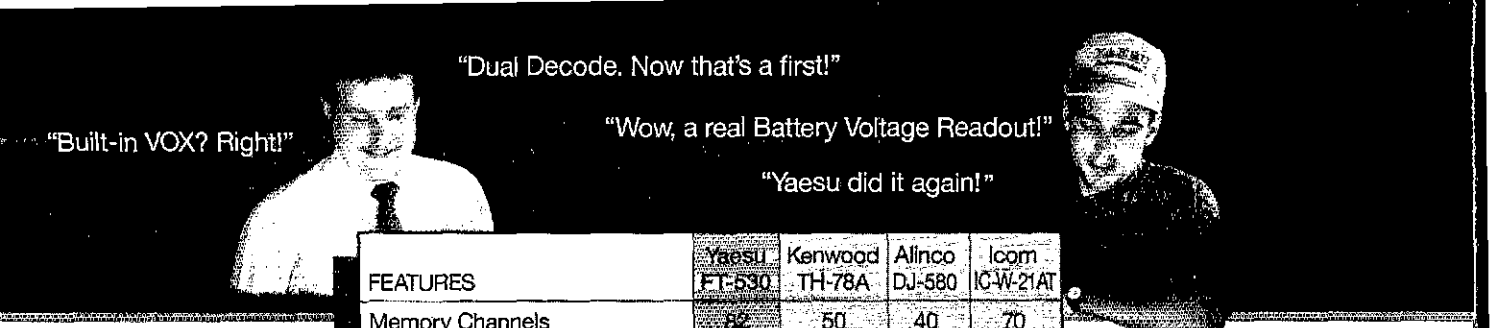
Features, performance, reliability – ready to go anyplace. See your dealer for *this* answer to your 2-m needs.

NEW

Yaesu answers your 2-m mobile needs.

YAESU

Performance without compromise.℠

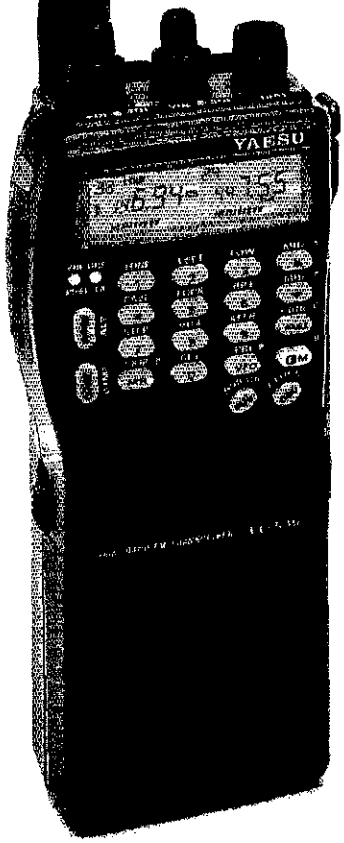


FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W-21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	YES
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	YES
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest".

FT-530
Dual Band Handheld

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
  NC-42 1-Hour Desk Charger
  FNB-25 600 mAh Battery (2 watt)
  FNB-26 1000 mAh Battery (2 watt)
  FNB-27 600 mAh Battery (5 watt)
  FBA-12 6 AA Cell Holder
  CSC-56 Vinyl Case w/ FNB-25
  CSC-58 Vinyl Case w/ FNB-26/27
  E-DC-5B 12 VDC Adaptor
  YH-2 Headset for VOX
  MH-12A2B Speaker Mic
  MH-18A2B Lapel Speaker Mic
  MH-19A2B Mini Earpiece Mic
  MH-29A2B LCD Display Mic with Remote Functions
  MMB-54 Mobile Mounting Hanger



No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

Performance without compromise.℠

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

Kenwood's TH-22AT/42AT—
Smaller, Lighter, Friendlier

MORE POWER!

TH-22AT/42AT
FM HANDHELD TRANSCEIVERS

Features

- 3-watt output from MOS FET power module and supplied 6-volt battery (TH-22AT: approx. 3 watts, TH-42AT: approx. 2.5 watts), and 5-watt output with optional PB-34!
- Compact design: 2-3/16 x 4-5/8 x 1 in.
- Built-in DTMF keypad with monitor
- Built-in DTSS page system ■ Large 1-7/16" speaker
- 41 E²PROM channel memories (including 1 call channel)
- Multiple scan functions (VFO, call & memory)
- Carrier-operated & time-operated scan stop modes
- Tone alert with elapsed time indicator
- Battery-saver circuit and auto power-off function to extend battery life ■ Selectable squelch configuration
- RF output power control (Hi/Low/EL)
- Built-in CTCSS encoder, optional TSU-8 decoder (any tone can be stored in any channel)
- User-friendly menu system to customize your operating preferences ■ Easy to program and use
- Modifiable for MARS and CAP. Specifications guaranteed for Amateur bands only. Permits required for MARS and CAP use.
- Wide range of accessories to enhance operating convenience and enjoyment

Power and performance are important factors in the choice of portable communications equipment—but too often this has meant abandoning the search for a transceiver that is smaller, lighter, and friendlier. Until now, that is. Kenwood has redefined the leading edge of handheld transceiver technology: meet the new TH-22AT (144MHz) and TH-42AT (440MHz). Slim enough to slip into your shirt pocket, these compact FM transceivers deliver full-size performance. How? The answer lies in the MOS FET power module—a world-first in this class—which enables low-voltage operation while enhancing reliability and increasing power output. This means longer hours of transceive operation on just one charge. The feature list is equally impressive, including a built-in DTMF keypad, easy-to-use menu system, multiple scan functions, and 41 E²PROM channel memories (including 1 call channel). You can even choose such options as a CTCSS decoder and a rapid charger. So if you're looking for full-featured fun in a palm-size package, check out Kenwood's TH-22AT and TH-42AT.

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